LAXMI CHARITABLE TRUST'S

SHETH L.U.J. & SIR M.V. COLLEGE OF ARTS, SCIENCE & COMMERCE

DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Fundamentals of Mass Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit I:** | 1. To understand the need of Mass communication<br>2. Learning of various mass communication models.<br>3. Understanding their functions and barriers of mass communication. | CO1- To introduce students to the history, evolution and the development of mass communication in the world with reference to India.<br>CO2- To study the evolution of mass media as an important social institution.<br>CO3- To understand the development of the mass communication models.<br>CO4- To develop a critical understanding of Mass Media.<br>CO5- To understand the concept of New Media and Media convergence and its implications. |
| **Unit-II:** | 1. Understanding the difference between mass communication and mass media.<br>2. To learn various tools of mass communication.<br>3. Understanding the importance and nature of Audiences. | |
| **Unit-III:** | 1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society.<br>2. Helping students to understand more clearly with the help of case studies.<br>3. Showing the contribution of various religion reformers in saving their valuable literature. | |
| **Unit-IV:** | 1. Understanding media and its convergence, how new mass media is a back bone to society.<br>2. To understand how the new mass media allows a huge increase in the volume of communication.<br>3. In- depth understanding of social media on mass communication. | |
| **Unit-V:** | 1. Creating awareness in the masses due to the emergence of technology.<br>2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom.<br>3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies. | |

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SHETH L.U.J. & SIR M.V. COLLEGE OF ARTS, SCIENCE & COMMERCE ANDHERI (E) MUMBAI-69

**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Current Affairs**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-I: | 1. To learn about political stories of national importance.<br>2. To also know in detail the contributions of political leaders and their history.<br>3. To know the environment more nearly covering genres of news. | CO1- To provide learners with an overview on current developments in various fields.<br>CO2- To generate interest among the learners about burning issues covered in the media.<br>CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news.<br>CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture. |
| Unit-II: | 1. To introduce and understand the government of India.<br>2. In-depth information about the Home Ministry and its Ministerial Team.<br>3. Covering all the aspects of communalism and communal violence/ tensions.<br>4. To know more about Jammu and Kashmir and its issues.<br>5. Understanding in-depth about Governmental schemes, projects and policies. | |
| Unit-III: | 1. To learn about United Nations Systems.<br>2. To highlight the key functions and roles of the United Nations General Assembly.<br>3. To discuss and understand international issues and conflicts. | |
| Unit-IV : | 1. To learn in detail about the history of polity in Maharashtra.<br>2. To also understand past and current situations of politics and their political leaders.<br>3. Introducing students to the marginalized and displaced Tribes.<br>4. Talking about developmental projects of the state. | |
| Unit-V: | 1. To highlight the use of mobile applications and strategies to capture the attention of readers.<br>2. To understand the cusp of rapid transformation with digital media.<br>3. To learn some of the content automation tools and its handlings.<br>4. Introducing students to Virtual Reality and Augmented Reality.<br>5. To learn and discuss digital gaming and how it leads to market growth. | |

Faculty Name – Ms. Charmy Shah

Program: Bachelors of Arts in Multimedia & Mass Communication

Course: Effective Communication-I

FYBAMMC SEM-I

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-I: | 1. To understand and introduce communication<br>2. To understand the process and types of communication<br>3. To enhance the listening skills required to communicate effectively. | 1. To make students aware of the functional and operational use of language in media. understand each type in detail.<br>2. To equip or enhance students with structural and analytical reading, writing and thinking skills.<br>3. To introduce key concepts of communications. |
| Unit-II: | 1. Understanding reading and its types.<br>2. Understanding languages and their aspects when communicating through various platforms.<br>3. To get deeper and broader knowledge about grammar aspects. | |
| Unit-III: | 1. To make students understand the importance of thinking and its role in communication.<br>2. Understanding types and errors of thinking.<br>3. To understand presentations and the tips on how to deliver and communicate effectively. | |
| Unit-IV: | 1. Understanding the concept, needs, and technologies of translation.<br>2. Understanding the difference between interpretation and translation.<br>3. To understand the translator's perspective for effectively communicating in the media. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the cultural and religion wise composition.<br>2. To learn the classification of Indian Languages.<br>3. To understand the regional variations in India. | CO- 1 To introduce students to the overview of the Indian Society.<br>CO-2 To help them understand the constitution of India.<br>CO-3 To acquaint them with the socio-political problems of India. CO-4 The student will apprehend regional variations according to rural, urban and tribal characteristics.<br>CO-5 Students will become more aware of the political frameworks. CO-6 Learners will comprehend the multi-cultural diversity of Indian society through its demographic composition. Appreciate the concept of linguistic diversity in relation to the Indian situation |
| **Unit-II** | 1. To learn the meaning of Social Inequality.<br>2. To learn about social stratification, its characteristics and its types.<br>3. To understand the class system.<br>4. To understand the declining sex ratio in India.<br>5. To learn about the status and portrayal of women in each era. | |
| **Unit-III.** | 1. To understand the inequalities of the caste system.<br>2. To learn about the causes of Communalism in India.<br>3. To learn about the remedial actions to overcome communalism, linguism, regionalism. | |
| **Unit-IV.** | 1. To understand the meaning of Preamble and its Characteristics.<br>2. To learn the structure of the Indian Constitution.<br>3. To learn about the significance of the Fundamental Duties, its advantages, and disadvantages. | |
| **Unit-V.** | 1. To learn about the multi-party system of Indian politics and its evolution.<br>2. To understand the working of the local self-government.<br>3. To learn the important features of the Amendments. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: History of Media**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn about the pointers in History of Newspapers in India.<br>2. To understand about the factors that added to the boom of newspapers in India.<br>3. To learn the role of the press in India's struggle for freedom.<br>4. To deeply understand the different Press acts of India. | CO1- Learner will be able to understand Media History through key events in the cultural history.<br>CO2- TO enable the learner to understand the major developments in Media History.<br>CO3- To understand the history and role of professionals in shaping communications.<br>CO4- To understand the values that's shaped and continues to influence Indian Mass Media.<br>CO5- Learner will develop the ability to think and analyze about Media.<br>CO6. To sharpen the reading, writing, speaking and listening skills that will help the students to understand the development of Media. |
| **Unit-II** | 1. To learn about the diversity and growth of Indian Language Newspapers.<br>2. To understand the effect of the vernacular press act on Indian Publishers.<br>3. To learn the difference between English newspapers and Language Newspapers. | |
| **Unit-III** | 1. To learn about different types of Documentaries.<br>2. To learn how to make documentaries.<br>3. To understand about Indian Documentary and the struggle for Indian Independence.<br>4. To learn about the New Media and their roles in Movie making. | |
| **Unit-IV** | 1. To study the history of Prasar Bharti Act.<br>2. To study the functions and objectives of Radio.<br>3. To study the Business model of the cable TV industry.<br>4. To understand the key recommendations of TRAI. | |
| **Unit-V** | 1. To study about the various movements of history.<br>2. To learn about our Media icons who played an important role in marking the change. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Visual Communication**

**39FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I:** | 1. To understand communication and the aspects.<br>2. To introduce students to VISUAL AIDS and the history of visuals.<br>3. Understanding visual communication in detail with various connections.<br>4. To learn about visible and invisible concepts. | CO1- To provide students with tools that would help them visualize and communicate.<br>CO2- Understanding Visual Communication as part of Mass Communication.<br>CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.<br>CO4- To acquire basic knowledge in theories and languages of Visual Communication.<br>CO5- The ability to understand and analyze visual communication from a critical perspective. |
| **Unit-II:** | 1. To extend the knowledge of the students by discussing theories and case studies.<br>2. To make them understand how the visual cortex works to create unified perception.<br>3. Knowing about complexity and multifaceted cognitive processes. | |
| **Unit-III:** | 1. To understand theories related to color for visuals.<br>2. Understanding the psychological influence of color on perception.<br>3. Understanding in detail visual plans and designs. | |
| **Unit-IV:** | 1. Understanding of various tools of visual communication.<br>2. Understanding various styles and types of visual communications.<br>3. To strategize visuals for mass appeals.<br>4. To understand the perception and structure of each platform. | |
| **Unit-V:** | 1. To adapt to new changes with the advent of technologies.<br>2. Understanding the ethics and audience behavior.<br>3. Understanding the role of stereotyping in social media. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Advertising**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the evolution of advertising<br>2. To relate with the advantages & disadvantages to consumers, traders, manufactures and society.<br>3. To understand advertising laws and ethics<br>4. To understand various types of advertising | CO1- To provide the students with basic understanding of advertising, growth, importance, and types.<br>CO2- To understand effective advertising campaigns, tools, models etc.<br>CO3- To comprehend the role of advertising, various departments, careers, and creativity.<br>CO4- To provide students with various advertising trends, and future. |
| **Unit-II:** | 1. To comprehend the concept of IMC<br>2. To understand the role and various tools of IMC<br>3. To be able to understand the difference between print media & Outdoor media<br>4. To get basic knowledge about Radio & Television as a means of mass communication and advertising | |
| **Unit-III** | 1. To make students understand the creative process in advertising industry<br>2. To make students comprehend the different elements in an advertisement | |
| **Unit-IV** | 1. To help students understand the different types of ad agencies and their basic difference<br>2. To be able to know the various departments in an ad agency<br>3. To understand the latest trends in career in advertising industry | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Content Writing**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn and revise English grammar.<br>2. To practice vocabulary building in order to understand its aspects and significance.<br>3. Learning about common errors while communicating in the English language and understanding the requirements for good writing.<br>4. In-depth knowledge of creativity exposure in creating phrases and idioms. | CO1- To provide students with tools that would help them communicate effectively.<br>CO2- Understanding crisp writing as part of Mass communication.<br>CO3- The ability to draw the essence of situations and develop clarity of thought. |
| **Unit-II** | 1. To understand some editing tips for better writing and encouraging readers to read which helps in publishing well.<br>2. To boost students to write and edit captions that are catchy and attractive.<br>3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning.<br>4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story. | |
| **Unit-III** | 1. To understand how to write tickers for the television medium.<br>2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks.<br>3. Understanding in detail writing methods for writing headlines and content briefs along with its software's and tools. | |
| **Unit-IV** | 1. Understanding PowerPoint presentations, their related terms and tools.<br>2. Understanding in detail infographics and their impact while making presentations.<br>3. Tips on how to make a presentation convincing to listeners and viewers.<br>4. To learn terms and concepts related to Google Advanced Search and Plagiarism in detail. | |
| **Unit-V** | 1. Understanding content and its essentials.<br>2. To differentiate between print and digital platforms and their content creation.<br>3. To understand the importance of keywords in Digital media. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn about report writing and its various elements.<br>2. Understanding in-depth headlines and their features.<br>3. To make students understand the need to communicate with internal and external publics of the organization company through types of organizational writing.<br>4. Understanding publicity in detail. | Co1- To make the students aware of the use of language in media and organization.<br>CO2- To equip or enhance students with structural and analytical reading, writing, and thinking skills.<br>CO3- To introduce key concepts of communication. |
| **Unit-II** | 1. To learn the ability to spot mistakes via editing.<br>2. To understand how editing is different from medium to medium.<br>3. To elaborate on grammar aspects for communicating effectively. | |
| **Unit-III** | 1. To understand paraphrasing in writing communication.<br>2. The role of plagiarism while paraphrasing and translations.<br>3. Understanding summarization. | |
| **Unit-IV** | 1. To learn to interpret data resulting from pies, graphs, maps, and charts. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study the elements of liberalization, its advantages, and disadvantages.<br>2. To study the impact of Globalization on Indian Industries.<br>3. To study the role of IT and Communication. | CO-1: To introduce students to the overview of the Indian Society.<br>CO-2: To help them understand the constitution of India.<br>CO-3: To acquaint them with the socio-political problems of India. CO-4: To understand stress and conflicts.<br>CO-5: To manage stress and conflicts in contemporary society.<br>CO-6: To learn about Contemporary Societal Challenges |
| **Unit-II** | 1. To study the basic characteristics of Human Rights.<br>2. To understand the evolution of Human rights.<br>3. To study the classification of the provisions of UDHR. | |
| **Unit-III** | 1. To study the concept and disciplines of Ecology.<br>2. To study the structure of Ecosystem and causes of environmental degradation.<br>3. To learns about Sustainable development and the global need for the Sustainable development | |
| **Unit-IV** | 1. To learn about the levels of Stress.<br>2. To study about the types of Organizational conflict.<br>3. To understand the measures for resolving aggression and violence in society. | |
| **Unit-V** | 1. To learn the assumptions & limitations in Hierarchy of Needs Theory.<br>2. To study the need for peace and harmony in India. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Journalism**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn the history and eras of journalism along with challenges.<br>2. To understand the new media and technology advances.<br>3. To briefly understand the news transmission and gathering process.<br>4. To discuss and learn about how the internet led to the rise of citizen journalism along with its pros, risks, and nature. | CO1- To help media students to acquaint themselves with an influential medium of journalism that holds the key to opinion formation and to create awareness. |
| **Unit-II** | 1. To get knowledge about news and the process of gathering news.<br>2. Elements required for a good news story.<br>3. Understanding the beats and parts of a news story in detail. | |
| **Unit-III** | 1. Understanding the avenues to explore in journalism.<br>2. To learn about journalists/ reporters and their practices on various platforms.<br>3. Understanding the types of news.<br>4. To make students understand the difference between PR and journalism. | |
| **Unit-IV** | 1. To learn and understand career prospects in journalism.<br>2. To encourage students to participate in grabbing opportunities related to the field. | |
| **Unit-V** | 1. To make students understand the importance of a piece of information to convert it into the news.<br>2. The unbiasedness and impartiality objectives must be cleared among the students.<br>3. To make understanding students to cover news from all angles and the format in writing news. | |

**Faculty Name – Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Gender & Culture**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the evolution of culture and significance of Cultural studies and media.<br>2. Brief learning on the concepts related to culture.<br>3. To learn and understand the various ideologies and theories reflecting the culture, gender, and media. | CO1- To discuss the significance of culture and the media industry.<br>CO2- To understand the association between the media, gender, and culture in the society.<br>CO3- To stress on the changing perspectives of media, gender, and culture in the globalized era. |
| **Unit-II** | 1. To understand and discuss social constructionism and its terms. .<br>2. To understand culture from various aspects such as politics, religion- technology and media.<br>3. Understanding how power is an integral element of culture and features.<br>4. To learn recent trends in culture consumption. | |
| **Unit-III** | 1. To have a deeper understanding about influences of media on gender and views.<br>2. To discuss and have better understanding on gender equality with reference to the media.<br>3.To relate the gender challenges on various platforms. | |
| **Unit-IV** | 1. To know about current trends of globalization.<br>2. To discuss case studies and concepts relation to global culture.<br>3. Understanding about consumer culture and its evolution.<br>4. Elaborating the aspects related to issues and impact of cultures along importance in media and gender. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Corporate Communication & Public Relations**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study the features of corporate identity.<br>2. To study the advantages of corporate reputation<br>3. To study important code and ethics of corporate communication.<br>4. To study corporate communication and management | CO-1 Define and introduce the various elements of corporate communication and public relations and consider their roles in managing organizations<br>CO-2 Classify key concepts of corporate communication and public relations.<br>CO-3 Examine how various elements of corporate communication must be coordinated to communicate effectively in today's competitive world.<br>CO-4 Compare and contrast the different practices associated with corporate communication with the latest trends and social media tools. CO-5 Critically evaluate the theories of public relations<br>CO-6 Construct effective corporate communication and public relation plans/strategies. |
| **Unit-II** | 1. To study the growth and importance of Public Relations.<br>2. To study the objective and significance of Public Relations in Business.<br>3. To study the key roles of PR in various sectors.<br>4. To study about theories and propagandas from various PR events. | |
| **Unit-III** | 1. To study the various importance of Media Relations.<br>2. To study the principles and analysis of Media Relations.<br>3. To study effective communication with employees.<br>4. To study on managing the crisis through communication with various examples. | |
| **Unit-IV** | 1. To study how technology plays an important role in corporate communication.<br>2. To study about social media influencers.<br>3. To understand E-Public Relations and its importance. | |

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SHETH L.U.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (E) MUMBAI-69

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study about the invention of Radio and the beginning of broadcasting<br>2. To study the golden age of American radio<br>3. To study the rise of radio networks and the Radio act of 1927<br>4. To understand the script writing style for Radio | CO1- The course is intended to explore the art of audio production.<br>CO2-The students are made familiar with the aesthetics of sound and its application in various radio program formats.<br>CO3-To provide them with the basic knowledge and understanding of radio business and production. |
| **Unit-II** | 1. To learn how to generate ideas for a radio program.<br>2. To study research on different target audience<br>3. To understand the structure of the organization and their roles. | |
| **Unit-III** | 1. To understand about various equipment used to broadcast a radio program.<br>2. To learn about digital mixers and its importance.<br>3. To study the history of Sound recording | |
| **Unit-IV** | 1. To study the News story material.<br>2. To understand news style for TV and Radio.<br>3. To study about Media Convergence and pragmatism | |
| **Unit-V** | 1. To learn about various questioning techniques.<br>2. To learn about preparation done before the interview. | |

**Faculty Name - Ms. Namrata Singh**

**Program:Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media Studies**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn various dynamics of culture and the theories.<br>2. To learn and differentiate various eras of Mass society. | CO1- To make students understand the dynamic role of the media in society<br>CO2- To introduce students to the study of contemporary forms of mediated communication<br>CO3- To introduces students to a variety of analytical perspectives and theories related to media<br>CO4 - To understand the impact of media on individual attitude, values, behavior, and geopolitics<br>CO5- To study the impact of new media technologies and pop culture in the field of advertising<br>CO6- To understand the impact of globalization on media |
| **Unit-II** | 1. To understand various theories laid by theorists<br>2. To adapt change in perspective and attitude along with society and mass communication | |
| **Unit-III** | 1. To understand theorists and their theories related to media and consumption<br>2. to learn about technological advances with eras.<br>3. To formulate and identify biases of communication and get in depth knowledge about social issues. | |
| **Unit-IV** | 1. To understand the theories on media effects<br>2. To learn about media and its effect on behaviors.<br>3. To get an in-depth idea about the history of politics and current scenarios as discussions. | |
| **Unit-V** | 1. To learn about new media and its effects<br>2. To understand the new global village concept by theorist<br>3. To understand the evolution of the internet via theory. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I:** | 1. To learn about History of cinema, its origin, and various phases of cinema<br>2. To learn about the language and key concepts of cinema<br>3. To understand the transition from documentary to feature films. | C01- To inculcate liking and understanding of good cinema.<br>C02- To make students aware with a brief history of movies; the major cinema movements.<br>C03- Understanding the power of visuals and sound and the ability to make use of them in effective communication.<br>C04- Insight into film techniques and aesthetics. |
| **Unit-II** | 1. To learn about techniques and technology in film making<br>2. To learn about film makers<br>3. To learn and understand various aspects of film appreciation and its components | |
| **Unit-III:** | 1. To learn about early years of world including Indian cinema<br>2. To understand the silent era and its transition till the development stage. | |
| **Unit-IV:** | 1. To know and introduce students to major cinema movements and filmmakers.<br>2. To know films from various countries and cultures and learn its concepts used in this industry.<br>3. To know about the contributions of people who got recognized and accredited for their hard work in the respective cinema. | |
| **Unit-V:** | 1. To understand and have knowledge about art and commercial cinema.<br>2. To understand Indian diaspora and Bollywood<br>3. Learning about the important contributions as directors, producers, actors, actress and so on of persons and learning Indian new wave cinema in detail | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Photography**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Uni-I** | 1. The understand about the body parts of a basic camera<br>2. To understand the formats and various concepts related to camera<br>3. To learn how a camera is a storyteller by capturing still images. | **C01-** To introduce to media learners the ability of an image into effective communication.<br>2. C02- To help the learner understand that media photography is a language of visual communication and beyond just point and shoot fun moments.<br>C03- To practice how a picture speaks thousand words by enlightening the learner on how.<br>C04- To develop the base of visualization among learners in using pictures in practical projects.<br>C05- To help learners work on a given theme of the subject into making relevant pictures or photo features. |
| **Unit-II** | 1. To understand techniques of how to capture images.<br>2. To understand various techniques and understand focal length.<br>3. To learn in detail the various types of lenses and its uses. | |
| **Unit-III** | 1. To learn about intensity and exposure of light while clicking an image<br>2. To understand in comparison with advertisements and various types of lighting.<br>3. To earn about color and moods in photography<br>4. To learn to be as creative as possible. | |
| **Unit-IV** | 1. To understand concepts related to frame and aspect ratio<br>2. To understand the types under composition<br>3. To understand in detail about viewpoints and perspectives along with types. | |
| **Unit-V** | 1. To learn about electronic format<br>2. To learn about pixels and its values and megapixel<br>3. To understand various types of files saved and limitations of RAW format | |

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. Learning Introduction to Photoshop Image editing theory Bitmaps v/s Vectors When to use Photoshop and when to use drawing tools.<br>2. Understanding the Photoshop Workspace, The tools, Toolbox controls Property bar, Options bar, Floating palettes.<br>3. Learning and working with images Image mode, Image size, canvas size Image resolution, size and resampling.<br>4. learning Image Editing Levels, Curves, Contrast adjustment, Color adjustment Photo filters.<br>5. Understanding and Working with Text layer, Character palate, Paragraph palate Text resizing, Text color, Text attributes Working on simple project/ one page design. | Co1- To equip the students with an understanding of industry knowledge required to make a career in the field of print and Advertising, Digital Marketing, Television media, Film etc.<br>CO2- To train them with the software knowledge required in the above-mentioned Industries. |
| **Unit-II** | 1. Understanding the Introduction to CorelDraw. CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats.<br>2. Learning to Using text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C.<br>3. Understanding the Exploring tools Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos.<br>4. Learning how to Applying effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Understanding the Exporting in CorelDraw Exporting, Types of export, Exporting for other software. | |
| **Unit-III** | 1. Understanding of Introduction to QuarkXPress List the menus, List the tools, Benefits of using Quark, Application of Quark.<br>2. Learning to Text Edits in Quark Format of text, Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images.<br>3. Learning how to Use palettes Using palettes for different types of publications made in quark, Magazine in quark, | |



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| | Newspaper in quark.<br>4. Understanding the Color correction in quark Embedding images in proper formats, Color correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning how to Export files Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **Unit-IV** | 1. Understanding of Introduction to editing importance, Great editing examples, Editing for different formats (film/ad/news.)<br>2. Learning How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers. Basics of editing (cut/layers/different windows.)<br>3. Understanding file formats Understanding different file formats (AVI/MPEG/MOV/H264), Importing raw footage for edits, performing video checks while editing.<br>4. Learning how to Use color grading What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning to Export and rendering Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintaining file format, Improving quality and time to render techniques. | |
| **Unit-V** | 1. Learning the Introduction to Digital Audio Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate.<br>2. Understanding the Concept of Dolby Digital Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker.<br>3. Understanding the Sound Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software.<br>4. Learning and Working with Sound Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter.<br>5. Understanding the Advanced Sound Processing Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters. | |

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## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study various Interview styles.<br>2. To study about different Radio formats.<br>3. To learn techniques for ending a radio program. | CO1. To give learners basic knowledge of radio/audio production theory, techniques, and aesthetics via practical experience in the writing and production of several program formats.<br>CO2. To make them familiar with the art of audio recording, editing, mixing, and aural storytelling techniques. |
| **Unit-II** | 1. To understand different Base Stations.<br>2. To learn structure of commentary as the state of art<br>3. To understand the beginning of sports broadcasting<br>4. To learn different types of Commentary. | |
| **Unit-III** | 1. To study the evolution of the Internet.<br>2. To understand the working of Social Networking.<br>3. To briefly understand the making & working of Radio podcasting | |
| **Unit-IV** | 1. To understand how-to pick-up subjects for the phone-in programs.<br>2. To learn the reasons to take live calls. | |
| **Unit-V** | 1. To understand the subsistence of Copyright.<br>2. To understand the difference between commercials vs. Non-commercial radio<br>3. To learn the tips to mastering Radio voice. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Writing & Editing for Media**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn the art and basic tools of writing.<br>2. To study the elements of News stories.<br>3. To learn the types of Feature stories and how to craft the story.<br>4. To study different writing style guides | CO1. Provide the ability to understand writing styles that fit various media platforms.<br>CO2. It would help the learner acquire information gathering skills and techniques.<br>CO3. On completion of this course, students will be able to understand similarities and differences in writing for all forms of media including the internet and digital.<br>CO4. The learner will gather knowledge of different news and copy formats along with appropriate style-sheets and layout.<br>CO5. The learner will imbibe the importance of writing clearly, precisely, and accurately for different types of audiences<br>CO6. Provide basic proficiency in proof-reading and editing. |
| **Unit-II** | 1. To study how to write scripts for the Broadcast media.<br>2. To study about the different scripting formats.<br>3. To learn the Rundown sheet for Radio program<br>4. To learn the tips and techniques to write the television commercial | |
| **Unit-III** | 1. To study the difference between newspaper writing and writing for the web.<br>2. To learn about Digital Convergence and audience engagement<br>3. To learn how to write blogs and essentials of blogging | |
| **Unit-IV** | 1. To learn how to edit a copy.<br>2. To study the principles of good news editing.<br>3. To learn the general tips for proofing and editing. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Laws & Ethics**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I:** | 1. To learn about preamble and constitution<br>2. To understand about various freedoms like speech and expression<br>3. To develop a sense of social responsibility towards society by understanding they theory<br>4. To learn social media and its related concepts in detail | CO1- To provide the learners with an understanding of laws that impact the media.<br>C02- To sensitize them towards the social and ethical responsibility of the media. |
| **Unit-II:** | 1. To know about Press Council of India<br>2. Introducing TRAI to students to understand the telecommunication industry<br>3. Understanding about various regulatory bodies related to media and their functions | |
| **Unit-III:** | 1. To know importance related to IPR<br>2. To learn defamation and it laws in India<br>3. To know and understand what is contempt of court and its punishments<br>4. To know prohibition of Drugs and magical Remedies advertisements under act. | |
| **Unit-IV:** | 1. To know and learn about privacy and its conflict to RTI<br>2. To discuss and learn about women in current situation and trends and Indecency Representation on Women's Act<br>3. To understand about various organizations laid by Media bodies underlying certain laws, sections, and its functions. | |
| **Unit-V:** | 1. To understand role and concepts related to ethics<br>2.The ethical responsibility as a journalist and confliet of interest<br>3.To widening knowledge about stereotypes and its applications on various categories of human and according to age | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Mass Media Research**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I:** | 1. To introduce students to research and the need for research in society.<br>2. Understanding about research process in detail<br>3. Understanding various types of research and learning about hypotheses and its use in research. | CO1- To introduce students to debates in Research approaches and equip them with tools to carry on research<br>CO2- To understand the scope and techniques of media research, their utility and limitations |
| **Unit-II:** | 1. To learn about research design and its importance in carrying out research.<br>2. The questions to be solved while preparing an outline of the research or thesis.<br>3. The types of research design. | |
| **Unit-III:** | 1. To learn various data collection methods<br>2. To learn about literature of review<br>3. To know about measurement techniques, tabulation, and Research Format. | |
| **Unit-IV:** | 1.To understand about Content analysis and its uses<br>2.To learn steps in content analysis<br>3.To understand the limitations of content analysis in detail | |
| **Unit-V:** | 1. Learning about the various applications of Research in Mass Media<br>2. To learn about the effect of media on people.<br>3. To find solutions to media-related questions. | |
| **Unit-VI:** | 1. To learn about codes of signs, symbols and actions and communicate the same with all masses- Study of signs "Semiotics"<br>2. The importance of semiotics<br>3. Understanding relation of semiotics and media | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-1: | 1. To learn about various regional cinema and its contributions to the industry<br>2. To know about social issues, topics and how films evolved by contributions of individuals.<br>3. To know famous personalities and their journey in the industry personal and professional both. | CO-1 Outline the cinema from different regions and understand the process of filmmaking.<br>CO-2 Understand the contribution of cinema in society.<br>CO-3 Apply various technical and grammatical rules to filmmaking. CO-4 Debate the use of mass communication in filmmaking and its marketing.<br>CO-5 Evaluate the economic aspects of film.<br>CO-6 Propose a new script for a meaningful film. |
| Unit-2: | 1. To understand the famous popular Hindi Commercial films<br>2. To get in-depth knowledge of how cinema has evolved from past to present with movie names. .<br>3. To learn about various economic aspects of cinema along with the genres. | |
| Unit-3: | 1. Understand about contemporary era of filmmaking<br>2. The conversion from celluloid to Digital cinema<br>3. To learn how people adapted a convergence in viewing culture of cinema<br>4. To learn about OTT platforms. | |
| Unit-4: | 1. To learn the process from Film production to Film Exhibition<br>2. To learn the stages of Film Making in brief<br>3. To learn the concepts in detail related to exhibition of movies through various techniques.<br>4. To grow the industry with more competition and creative skills. | |
| Unit-5: | 1. To learn about institutions and Trade associations for Films and its history to present the situation.<br>2. To learn about film festivals and major film festivals in India and Abroad.<br>3. To learn about Film awards and its nature, various awards are recognized in India and Abroad. | |

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn Tools of Photoshop.<br>2. Understand effects Sharpen, Blur, Eyedropper and color pick filter.<br>3. Learning to change image background, Layer Masking and gradient.<br>4. Learning Blends modes and advanced blending options.<br>5. Students learn text editing and its selection.<br>6. Learning to create a professional design using all tools. | CO1: To help learners be media industry ready. This will help learners to be aware of the minimum requirement of the software when stepping in the industry.<br><br>CO2: To introduce the media soft wares to make the learner understand what goes behind the scene and help them choose their stream.<br><br>CO3: To prepare learners skilled enough for independence during project papers in TY sem.VI.<br>CO4: To help learners work on small scale projects during the academic period. |
| **Unit-II** | 1. Learning to Adobe Illustrator Illustrator Interface, Tool Box, Panels and Bars Importing files in illustrator, Different file formats.<br>2. Learning text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects.<br>3. Understanding to Create Simple designs Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity.<br>4. Understanding to Apply effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Learning to Export in Illustrator Exporting, Types of export, Exporting for other softwares. | |
| **Unit-III** | 1. Understand to Adobe In Design List the menus, List the tools, Palates Benefits of using In Design, Application of In Design<br>2. Learning Text Edits in InDesign Format of text, Character and Paragraph Bars Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>3. Learning Using palettes for different types of publications made in InDesign, Magazine in InDesign, Paragraph styles Newspaper in InDesign, Paragraphs type palate, Text wrap palate. | |

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| | 4. Learning Colour correction in InDesign Embedding images in proper formats, Colour correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning to Export files Types of files, Exporting for different publications templates, Newspaper, magazine, etc. | |
| **Unit-IV** | 1. Understanding Introduction to editing Editing importance, Great editing examples, Editing for different formats (film/ad/news)<br>2. Understanding the toolbar, Importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/)<br>3. Understanding the Right application of various file formats Understanding different file formats (AVI/MPEG/MOV/H264, etc.) Importing raw footage for edits, Performing video checks while editing Using inbuilt transitions,<br>4. Learning Using color grading What is color grading, Examples of color grading, Using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning Exporting and rendering Exporting in different formats, Choosing right formats for exposing, Managing quality while exporting, Rendering and maintaining file format, Improving quality and time to render techniques. | |
| **Unit-V** | 1. Understanding the Introduction to Dreamweaver Workspace overview Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector Defining website in Dreamweaver.<br>2. Learning and Working with DW Creating Dreamweaver template Page layout in DW CSS layouts: advantages and disadvantages Creating HTML pages, Insert content and form Creating Forms in DW.<br>3. Understanding to Linking pages Using DW to accomplish basic web page development, Page properties Title, Background image, BGcolor, Text color, Links.<br>4. learning for Using Tables Cell padding, cell spacing, Border Table basics: Colour BG in cell, Invisible tables, Changing span, Making image into clickable link.<br>5.Understanding to Typo in DW Changing Font typefaces, size, style, colors Text to hyperlink. | |

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## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multi Media and Mass Communication:**

**Course: Brand Building**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-I | 1. To learn and understand brand and its related concepts<br>2. To study importance of branding and its process<br>3. To distinguish between a brand and a product. | CO1- To understand the awareness and growing importance of brand building<br>CO2- To know how to build, sustain and grow brands<br>CO3- To know the various new ways of building brands.<br>CO4- To know about the global perspective of brand building. |
| Unit-II | 1. To understand the concept of brand identity.<br>2. to learn to connect with brands and match personality.<br>3. To educate students about various CSRs from brands | |
| Unit-III | 1. To understand the concept of positioning and its various types<br>2. To learn about benefits from brands and its attributes | |
| Unit-IV | 1. To understand the brand leveraging and its concepts<br>2. to learn about benefits and various brand related concepts | |
| Unit-V | 1.To understand in detail strategies and equity at various level<br>2. To clear the concepts of branding strategy | |
| Unit-VI | 1.To understand various models and theories<br>2. To create brand awareness and brand loyalty models clear | |
| Unit-VII | 1.To learn about coordination and corporate image in detail<br>2. learning about branding and it uses in various areas of lifestyle | |
| Unit-VIII | 1. To understand about global brands<br>2. To enhance leadership in positioning and Globalization | |
| Unit-IX | 1. To enhance corporate image building<br>2. To learn and compare advertising and corporate image | |

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| **Unit-X** | 1. To understand importance of CSR and its roles<br>2. To learn about CSR and advertising performed by brands | |
| **Unit-XI** | 1. To learn about factors for conception<br>2. To know about stages of growth and case studies | |
| **Unit-XII** | 1. Understanding the various sectors for branding | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multi Media and Mass Communication:**

**Course: Consumer Behavior**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study the components of consumer behavior.<br>2. To study consumer behavior and digital world<br>3. To study VALS in detail<br>4. To study the importance of persuasion. | CO1- To understand the sociological and psychological perspective of consumer behavior.<br>CO2- To introduce students to the complexities of consumer behavior, its importance in marketing and advertising.<br>CO3- To sensitize students to the changing trends in consumer behavior. |
| **Unit-II** | 1. To study the types of motivation and its related theories.<br>2. To study the attitude and multi attitudes<br>3. To study personality and its traits along with consumer behavior<br>4. To study the application of theories in marketing and self-concepts. | |
| **Unit-III** | 1. To learn behavioral and classical theories<br>2. To learn cognitive learning and its use in consumer behavior | |
| **Unit-IV** | 1. To study the family and consumer behavior consumption<br>2. To learn changing core values and Indian culture<br>3. To learn determinants of consumer behavior | |
| **Unit-V** | 1. To study the characteristics of opinion leaders.<br>2. To study the process and models of consumer decisions.<br>3. To study the adoption process. | |

Sayani

**Faculty Name -Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multi Media and Mass Communication:**

**Course: Agency Management**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn about advertising agencies and its functions<br>2. To understand about different types of ad agencies | CO1- To acquaint the students with concepts, techniques and give experience in the application of concepts for developing an effective advertising campaign.<br>CO2- How an ad agency works and what opportunities exist.<br>CO3- To familiarize students with the different aspects of running an ad agency<br>CO4- To inculcate competencies thereby enabling to undertake professional work with the advertising industry. |
| **Unit-II** | 1. To learn about the role of account planner in ad agency<br>2. To understand in depth the account planning process | |
| **Unit-III** | 1. To learn about global advertising and marketing<br>2. To learn to analysis about foreign countries and its usage in global advertising and marketing | |
| **Unit-IV** | 1. To understand about social marketing and its concept<br>2. To understand the difficulties in social marketing<br>3. The effects of social marketing | |
| **Unit-V** | 1. To learn about advertising and its impact on children and various audiences<br>2. To educate students about Controversial ads and gender biases<br>3. To learn about advertising and compare it with the economy. | |
| **Unit-VI** | 1. To learn about various types of advertising<br>2. to learn the scope of advertising for various audiences. | |
| **Unit-VII** | 1. To explore the world of internet and digital marketing<br>2. To learn the swift of offline to online marketing | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelor's of Arts in Multi Media and Mass Communication:**

**Course: CopyWriting**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the role and importance of copywriting.<br>2. Various responsibility of a copywriter | CO1- To familiarize the students with the concept of copywriting as selling through writing<br>CO2- To learn the process of creating original, strategic, compelling copy for various mediums.<br>CO3- To train students to generate, develop and express ideas effectively<br>CO4- To learn the rudimentary techniques of advertising - headline and body copywriting, the economy of words and thought peculiar to this type of writing, and the necessity of creative thinking in written expression.<br>CO5- In an ad agency, as a copywriter, one cannot "just be creative and express self"- here one is in a 'creative professional', and have to be able to use the power of creativity for a commercial/ business reason- as someone is paying you to get a problem solved, using your creativity.<br>CO^-There are two basic disciplines through which we make our communication- verbal / written and visual, and both need different skill |
| **Unit-II** | 1. Developing critical thinking for learning creative writing.<br>2. Understanding the psychology of the brain and its role in developing the skills for writing. | |
| **Unit-III** | 1. Learning idea generation techniques through various prompts which helps in structuring the content. | |
| **Unit-IV** | 1. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source. | |
| **Unit-V** | 1. Learning about the structure and formats of the briefs.<br>2. Understanding the client brief for proper execution of the content. | |
| **Unit-VI** | 1. How to write appealing content by considering various elements and through the art of storytelling. | |
| **Unit-VII** | 1. Learning to write copy for various advertising and marketing media.<br>2. To add various elements to balance a copy and convey the marketing message. | |
| **Unit-VIII** | 1. To explore and learn by real time examples of campaigns by various agencies.<br>2. To understand various appeals and tone of voice | |
| **Unit-IX** | 1. To learn writing the copy for personal medium and mass medium. | |

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| **Unit- X** | 1. Understanding the thought process of different categories of audiences.<br>2. Learning to persuade the audience through the copy. | sets to master them. The structure of the syllabus is designed to hone the necessary skills required for these two diverse disciplines. |
| **Unit- XI** | 1. Understanding the copy writing aspects for offline and online platforms | |
| **Unit-XII** | 1. Understanding various writing appeals to connect a chord with the specific audience through storytelling. | |
| **Unit-XIII** | 1. Evaluating the writings by understanding the reach of the advertising message.<br>2. Learning about campaign objectives.<br>3. Learning the final output of an advertising copy. | |

**Faculty Name - Ms. Charmy S. Shah**

**Program: Bachelor's of Arts in Multi Media and Mass Communication:**

**Course: Advertising and Marketing Research**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn about Research<br>2. To learn the fundamentals of Research<br>3. Aims and objectives research | CO1- The course is designed to indicate the analytical abilities and research skills among the students.<br>CO2- To understand research methodologies- Qualitative vs Quantitative<br>CO3- To discuss the foundation of Research and audience analysis that is imperative to successful advertising.<br>CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility. |
| **Unit-II** | 1. To learn about research design and its concepts<br>2. To learn the types of research | |
| **Unit-III** | 1. To understand the importance of questionnaire in research<br>2. To learn the techniques for qualitative research<br>3. To learn the measuring scale for quantitative using attitudes | |
| **Unit-IV** | 1. To learn the meaning of sample and sampling<br>2. To understand the process and methods of sampling<br>3. To learn the types of sampling and its application | |
| **Unit-V** | 1. To learn preparing sheets and how to process the data<br>2. To learn statistical software and understand its applications for analysis | |
| **Unit-VI** | 1. To understand the methods used for data collection<br>2. To learn and understand how interpretation is done for results and analysis presented via pie charts, histogram and so on. | |
| **Unit-VII** | 1. To learn about data and its interpretation<br>2. To learn various analysis tools | |
| **Unit-VIII** | 1. To understand the prospects of research reports<br>2. To understand in depth how to write and state the hypothesis along with other research components | |
| **Unit-IX** | 1. To learn about advertising research<br>2. To learn the various techniques used by the researcher<br>3. To understand each psychological rating scales in depth and audiences. | |
| **Unit-X** | 1. To learn research and its marketing objectives and types | |

**Faculty Name - Ms. Charmy S. Shah**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Social Media Marketing**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To learn about the swift of online and offline marketing<br>2. To understand the advantages and disadvantages e- business<br>3. To understand the various types of digital marketing | CO1- Students learn real world skills from leading designers, artists, and entrepreneurs<br>CO2- The primary goal is to create problem solvers who strike a balance between traditional art and technology, and between individual vision and teamwork.<br>CO3- With a fundamental understanding of digital tools and their creative applications, graduates meet the demands of a diverse and expanding job market in visual storytelling<br>CO4- Identify and apply strategies to improve and succeed no matter what their initial skills<br>CO5- Solve problems and learn from creative risks by using people skills, design principles, and processes<br>CO6- Build a strong foundation in all aspects of design and production for storytelling in motion.<br>CO7- Use inspiration in fields outside of digital media such as poetry, science, music, astronomy, history, dance and more.<br>CO8- Develop a professional commitment to their field, their work, and themselves; preparing them to be members and leaders in their profession, as well as learning how to act both as individuals and as team members to support the whole. |
| **Unit-II** | 1. To learn about the importance and related myths to social media and marketing<br>2. To learn the importance of content and how to strategize it<br>3. To learn the various online platforms and its concepts | |
| **Unit-III** | 1. To learn in detail social marketing and get explore to know about planning done for marketing<br>2. To understand the importance of Campaigns and how to manage campaigns across various platforms<br>3. To learn about blogs and online opportunities via blogging | |
| **Unit-IV** | 1. To study different ways through which research samples are collected.<br>2. To learn methods of sampling. | |
| **Unit-V** | 1. To understand the basic idea on data collection.<br>2. Understanding the types of data collection. | |
| **Unit-VI** | 1. Learning Basic format of research report writing. | |
| **Unit-VII** | 1. Learning about advertising research in detail.<br>2. To study different other types of copy testing.<br>3. Learning various other steps in pre-testing.<br>4. Briefly understanding the concept of Neuroscience and its applications. | |
| **Unit-VIII** | 1. Learning different marketing processes in detail. | |

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## Unit and Course Outcome A.Y 2023-2024

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Retailing & Merchandising**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study the basics & functioning of Retailing.<br>2. To study through case study on Multi-Channel Retailing.<br>3. To understand the meaning & concept of Merchandising.<br>4. To understand Retail pricing in detail. | CO1-To familiarize the students with retail management concepts and operations.<br>CO2- To explain the understanding of retail management and types of retailers.<br>CO3- To discuss an understanding of retail management terminology including merchandize management, store management and retail strategy.<br>CO4- To acquaint the students with legal and ethical aspects of retail management.<br>CO5- To create awareness about emerging trends in retail management. |
| **Unit-II** | 1. To study the objectives of Retail communication.<br>2. To study the tips for attractive retail graphic design.<br>3. To understand the retail ERP system. | |
| **Unit-III** | 1. To learn the advantages and disadvantages of merchandising.<br>2. To study the process of Merchandising.<br>3. To study the components of Assortment Strategies.<br>4. To study the importance of visual merchandising.<br>5. To study the emergence of retail planograms.<br>6. To study the advantages and disadvantages of specialty stores. | |
| **Unit-IV** | 1. To study the objective of visual merchandising.<br>2. To study the types of Non store retail merchandising. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Brand Management**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the meaning of brand and its related concepts<br>2. To understand various models<br>3. To understand brand positioning and its importance along with related concepts | CO1- To understand the awareness and growing importance of brand management.<br>CO2. To know how to build, sustain and grow brands<br>CO3. To know the various sources of brand equity.<br>CO4. To know about the global perspective of brand management |
| **Unit-II** | 1. To make students understand the brand and its criteria for being chosen.<br>2. To learn about personalizing marketing<br>3. To explore about various marketing marketing aspects, channels and strategies | |
| **Unit-III** | 1. To make students learn about all necessary concepts related to brand equity<br>2. To teach about brand personality and its values<br>3. To learn about various quantitative research techniques in detail | |
| **Unit-IV** | 1. To study about brand performances and the global branding strategies management<br>2. To cultivate the sense of communication as brands do through online promotions, loyalty programs and so on | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Digital Media**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-I | 1. Introduction to Digital media and its key concepts<br>2. To learn about its evolution and principles.<br>3. To differ traditional media and digital media. | CO1- Understand digital marketing platform<br>CO2- Understand the key goals and stages of digital campaigns<br>CO3- Understand the of use key digital marketing tools<br>CO4- Learn to develop digital marketing plans |
| Unit-II | 1. To understand SEO (On-page and Off- page) in detail<br>2. Importance of websites and keywords<br>3. To study the algorithms and its mechanisms. | |
| Unit-III | 1. To study how Google Ads & SEM works for Advertising & Marketing. | |
| Unit-IV | 1. To introduce students to the social world and medium of communication.<br>2. Learning various platforms of social media and its tools used in evaluating campaigns analysis.<br>3. To understand blogging and create blogs, as a tool for communication to the online audiences. | |
| Unit-V | 1. To introduce students to online marketing channels.<br>2. To understand Google Adwords and PPC (Pay per Click)<br>3. Understanding web analytics and its tools. | |
| Unit-VI | 1. To introduce students to websites along with its concepts and how it helps businesses to get business.<br>2. To explain in detail the features of a website.<br>3. HTML & HTTP | |
| Unit-VII | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms. | |
| Unit-VIII | 1. To create appropriate content for utilization on the internet.<br>2. Learning skills and qualities required for content writing on various online sites, applications and websites. | |
| Unit-IX | 1. To learn about cyber laws<br>2. Case studies related to each law so as to better understand the real world.<br>3. Ethics in Digital Media. | |

SIR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Media Planning & Buying**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. Learning the concepts of Media planning.<br>2. Key role of a Media planner. | CO1- To develop knowledge of various characteristics of media.<br>CO2- To understand procedures, requirements, and techniques of media planning and buying.<br>CO3- To learn the various media mix and its implementation<br>CO4- To understand budget allocation for a Media plan |
| **Unit-II** | 1. To study the negotiation skills for proper buying of media.<br>2. To study the various laws for learning consumers perspective in making a purchase. | |
| **Unit-III** | 1. To learn the step by step process for selection of media.<br>2. Understanding different strategies taken for an effective selection of media. | |
| **Unit-IV** | 1. To understand the reasons behind selection of media vehicles. | |
| **Unit-V** | 1. Calculating the revenue expenditure spent on each media cycle and execution of the budget on the right media. | |
| **Unit-VI** | 1. Understanding the individual reach of media through various measurement bodies. | |
| **Unit-VII** | 1. Learning about various media and different mediums for advertising.<br>2. Understanding the pros and cons of each medium. | |
| **Unit-VIII** | 1. To learn how to buy media space for traditional medias | |
| **Unit-IX** | 1. Learning about the IMC and its tools.<br>2. To study innovative ways for advertising and marketing of the product. | |
| **Unit- X** | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms.<br>4. To study about online platforms and available spaces used for advertising.<br>5. Understanding various advertising formats with respect to social media and video advertising. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Advertising Design**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To study about the agency and its departments who handle an advertising campaign of a brand.<br>2. To study about the production stage of the campaign.<br>3. To study the idea generation process for any creative. | CO1- To make students understand the process of planning & production of advertisement<br>CO2- To highlight the importance of visual communication<br>CO3- To provide practical training in the field of advertising |
| **Unit-II** | 1. To learn about the elements of designing.<br>2. To study the Gestalt principle which helps to create perspective through designs.<br>1. Understanding different fonts and typefaces of an ad-copy.<br>2. Learning meaning and tone form the typography.<br>1. To study the focal point of an advertising and using this idea in making the creatives. | |
| **Unit-III** | 1. To learn how negative space in a figure-ground is creative and gives new shapes and vision and adding meaning to the brand.<br>2. Learning about the types of layout used in creating copies.<br>3. Understanding the process of creating layouts. | |
| **Unit-IV** | 1. To learn the shapes and symbols from our surroundings.<br>2. To study the effects and beauty of colors from nature and use it in the creative. | |
| **Unit-V** | 1. To study different types of logos and its meaning.<br>2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelor's of Arts in Multimedia and Mass Communication:**

**Course: Advertising & Sales Promotion**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I** | 1. To understand the process of sales promotion.<br>2. To understand the increased sales promotion activities.<br>3. To learn in detail the Theories of sales promotion. | CO1- Students should be able to demonstrate a thorough understanding of the major sales promotion concepts.<br>CO2- Use a framework to make effective sales promotion decisions.<br>CO3- Adopt the necessary skills and point of view of an effective sales promotion Campaign. |
| **Unit-II** | 1. To study the types of consumer oriented sales promotion.<br>2. To study about cooperative advertising.<br>3. To study the objectives & types of sales force promotions. | |
| **Unit-III** | 1. To study and analyze sales promotion campaigns through various contemporary case studies. | |
| **Unit-IV** | 1. To understand how to retain consumers through value-added promotions.<br>2. To learn how to design a sales promotion campaign.<br>3. To study in detail about the budget allocation for the promotion.<br>4. To study about the sales promotion traps. | |

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**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Fundamentals of Mass Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Introduction and Overview<br>1. Meaning and importance of Mass Communication.<br>2. Forms of Communication: Intra Personal Communication, Interpersonal Communication, Group Communication, Mass Communication: Electronic, Satellite, Interactive, Digital<br>3. Communication etc.<br>4. Models of Communication: Gerber's Model, Sociological Model, Gatekeeping Model, Defleur's Model of the Taste- differentiated Audience Model, Hub Model, Sadharanikaran. | 1. To understand the need of Mass communication<br>2. Learning of various mass communication models.<br>3. Understanding their functions and barriers of mass communication. | CO1 - To introduce students to the history, evolution and the development of mass communication in the world with reference to India.<br>CO2- To study the evolution of mass media as an important social institution.<br>CO3- To understand the development of the mass communication models.<br>CO4- To develop a critical understanding of Mass Media.<br>CO5- To understand the concept of New Media and Media convergence and its implications. |
| **Module II:** History of Mass Communication:<br>1. From Oral to Communication (Kirtan, Davandi, Powada, Nagara)<br>2. From Electric to Electronic communication, From Electric to Digital Communication, Contemporary Scene in Indian Communication Landscape. | 1. Understanding the difference between mass communication and mass media.<br>2. To learn various tools of mass communication.<br>3. Understanding the importance and nature of Audiences. | |
| **Module III:** Major Forms of Mass Media<br>1. Traditional and Folk Media<br>2. Print: Books, Newspapers, Magazines<br>3. Broadcast: Television, Radio<br>4. Films | 1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society.<br>2. Helping students to understand | |

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| 5. Internet | more clearly with the help of case studies.<br>3. Showing the contribution of various religion reformers in saving their valuable literature. | |
| **Module IV**: Impact of Mass Media on Society:<br>A.I. Social Impact (with social reformers who have successfully used mass communication)<br>II. Political impact (with political leaders who have successfully used mass communication)<br>III. Economic Impact (With how economic changes were brought about by mass communication)<br>IV. Development Impact (With how the government has successfully used in mass communication)<br>B. Impact of mass media on:<br>1. Education,<br>2. Children<br>3. Women<br>4. Culture<br>5. Youth<br>6. Development. | 1. Understanding media and its convergence; how new mass media is a back bone to society.<br>2. To understand how the new mass media allows a huge increase in the volume of communication.<br>3. In- depth understanding of social media on mass communication. | |
| **Module V**: The New Media and Media Convergence:<br>1. Elements and features of new media, Technologies used in new media,<br>2. Major Challenges to new media Acquisition- personal, social and national,<br>3. Future prospects. | 1. Creating awareness in the masses due to the emergence of technology.<br>2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom.<br>3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies. | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Current Affairs**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Current National stories:<br>1. Three political stories of national importance.<br>2. Political Leaders: newsmakers of the season (Brief profile of any three)<br>3. One dominating economic / business news<br>4. One dominating environment news stories<br>5. One story of current importance from any other genre. | 1. To learn about political stories of national importance.<br>2. To also know in detail the contributions of political leaders and their history.<br>3. To know the environment more nearly covering genres of news. | CO1- To provide learners with an overview on current developments in various fields.<br>CO2- To generate interest among the learners about burning issues covered in the media.<br>CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news.<br>CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture. |
| **Module 2**: Polity and Governance:<br>1. Ministries of Government of India: Autonomous Government bodies<br>2. Ministry of Home Affairs: Enforcement Organizations, Internal Security, Police<br>3. Communal tensions: Review of latest episodes of communal tensions.<br>4. Tensions in J&K: Background, Political players, Update on the current situation<br>5. Review of any three Central Government projects and Policies. | 1. To introduce and understand the government of India.<br>2. In-depth information about the Home Ministry and its Ministerial Team.<br>3. Covering all the aspects of communalism and communal violence/ tensions.<br>4. To know more about Jammu and Kashmir and its issues.<br>5. Understanding in-depth about Governmental schemes, projects and policies. | |
| **Module 3**: International Affairs:<br>1. Security Council: Structure and role<br>2. Issues that currently engage the SC | 1. To learn about United Nations Systems.<br>2. To highlight the key functions and roles of the United Nations General Assembly.<br>3. To discuss and understand | |



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| 3. Role of United Nations General Assembly, Other main organs of the UNO.<br>4. Issues that currently engage the UNO<br>5. Four conflicts/ issues of international importance. | international issues and conflicts. | |
| **Module 4**: Maharashtra Issues:<br>1. Political parties reach and challenge political leaders.<br>2. An update on the current political dynamics of Maharashtra<br>3. News relating to the marginalized and displaced tribes.<br>4. The latest news on floods and drought, unemployment, health issues, etc<br>5. Update two ongoing state projects | 1. To learn in detail about the history of polity in Maharashtra.<br>2. To also understand past and current situations of politics and their political leaders.<br>3. Introducing students to the marginalized and displaced Tribes.<br>4. Talking about developmental projects of the state. | |
| **Module 5**: Technology<br>1. Mobile Application for Journalists:<br>Mobile apps help in content creation, Examples of Mobile apps used by journalists worldwide<br>2. Artificial Intelligence and Content Automation Tools:<br>Introduction to AI and data science, Introduction to Content Automation tools, Examples of content automation tools in content creation.<br>3. Augmented Reality and Virtual Reality in Media:<br>Introduction to Augmented Reality, Introduction to Virtual Reality, Examples of Augmented Reality games and apps, Examples of Virtual Reality news websites worldwide.<br>4. Digital Gaming Industry:<br>Introduction to Digital Gaming Industry<br>5. Digital Gaming in India:<br>Overview of Indian digital gaming | 1. To highlight the use of mobile applications and strategies to capture the attention of readers.<br>2. To understand the cusp of rapid transformation with digital media.<br>3. To learn some of the content automation tools and its handlings.<br>4. Introducing students to Virtual Reality and Augmented Reality.<br>5. To learn and discuss digital gaming and how it leads to market growth. | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Introduction to Communication<br>1. The concept of communication: Communication, its concepts, process Importance of Communication in Media; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication.<br>2. Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication Advantages of verbal communication- Significance of Non-verbal Communication.<br>3. Oral Communication and Media: Anchoring, voice, modulation, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion.<br>4. Listening Skills: Listening Process, Classification of listening; Purpose of Listening; Common Barriers to the Listening Process; Measures to Improving Listening; Listening as an important Skill in Workplace. | 1. To understand and introduce communication<br>2. To understand the process and types of communication<br>3. To enhance the listening skills required to communicate effectively. | 1. To make students aware of the functional and operational use of language in media. understand each type in detail.<br>2. To equip or enhance students with structural and analytical reading, writing and thinking skills.<br>3. To introduce key concepts of communications. |
| **Module 2**: Reading- English, Hindi or Marathi<br>1. Types of Reading: Types of reading -skimming and scanning Reading- examples newspaper/ Magazine article, TV, feature and documentary, radio bulletins, | 1. Understanding reading and its types.<br>2. Understanding languages and their aspects when communicating through various platforms. | |

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| advertising copy, press release in English, Hindi or Marathi. Recognizing aspects of language particularly in media. Importance of spelling.<br>2. Various aspects of language: Recognizing various aspects of language particularly related to media, Vocabulary 100 media words.<br>3. Grammar and Usage: Grammatical structure- spelling, structure of sentences, Active/ Passive voice, terses, Idioms, Phrases, proper usage of homophones, homonyms etc. | 3. To get deeper and broader knowledge about grammar aspects. | |
| **Module 3**: Thinking and Presentation<br>1. Thinking:<br>1.Types of thinking (rational, logical, critical, lateral, etc.) Errors in thinking, Partialism, Time scale, Egocentricity,<br>2.Prejudices, adversary Thinking.<br><br>2. Presentation: Presentation, its importance, steps in making a presentation; delivering a Presentation. | 1. To make students understand the importance of thinking and its role in communication.<br>2. Understanding types and errors of thinking.<br>3. To understand presentations and the tips on how to deliver and communicate effectively. | |
| **Module 4**: Translation<br>1. Introduction to Translation: Concept, importance, need for translation, challenges in translation, problems and importance of Information and Technology in translation.<br>2. Interpretation: Meaning, Difference between interpretation and translation.<br>3. Role of a translator: Translator and its Role in Media, Qualities, Importance of Translator, Challenges faced by translator. | 1. Understanding the concept, needs, and technologies of translation.<br>2. Understanding the difference between interpretation and translation.<br>3. To understand the translator's perspective for effectively communicating in the media. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>Overview of India Society:<br>Understand the Multi-cultural diversity of Indian Society through its demographic composition.<br>Population distribution according to religion, caste, and gender<br>Appreciate the concept of Linguistic diversity in relation to the Indian situation<br>Understand regional variations according to rural, urban and tribal characteristics<br>Understanding the concept of diversity as difference. | 1. To understand the cultural and religion wise composition.<br>2. To learn the classification of Indian Languages.<br>3. To understand the regional variations in India. | CO- 1 To introduce students to the overview of the Indian Society.<br>CO-2 To help them understand the constitution of India.<br>CO-3 To acquaint them with the socio-political problems of India.<br>CO-4 The student will apprehend regional variations according to rural, urban and tribal characteristics.<br>CO-5 Students will become more aware of the political frameworks.<br>CO-6 Learners will comprehend the multi-cultural diversity of Indian society through its demographic composition. Appreciate the concept of linguistic diversity in relation to the Indian situation |
| **Unit-2**<br>Concept of Disparity-1<br>Understand the concept of disparity as arising out of stratification and inequality.<br>Explore the disparities arising out of gender with special reference to violence against women, female feticide (declining sex ratio), and portrayal of women in Media.<br>Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities. | 1. To learn the meaning of Social Inequality.<br>2. To learn about social stratification, its characteristics and its types.<br>3. To understand the class system.<br>4. To understand the declining sex ratio in India.<br>5. To learn about the status and portrayal of women in each era. | |
| **Unit-3**<br>Concept Disparity-2<br>Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof, | 1. To understand the inequalities of the caste system.<br>2. To learn about the causes of Communalism in India. | |

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| Understand inter-group conflicts arising out of communalism<br>Examine the causes and effects of conflicts arising out of regionalism and linguistic differences. | 3. To learn about the remedial actions to overcome communalism, linguism, regionalism. | |
| **Unit-4**<br>The Indian Constitution;<br>The Structure of the Constitution-the Preamble, Main Body and Schedules<br>Fundamental Duties of the Indian Citizen<br>Tolerance, Peace and Communal harmony as crucial values in strengthening the social fabric of Indian society<br>Basic features of the Constitution. | 1. To understand the meaning of Preamble and its Characteristics.<br>2. To learn the structure of the Indian Constitution.<br>3. To learn about the significance of the Fundamental Duties, its advantages, and disadvantages. | |
| **Unit-5**<br>Significant Aspects of Political Processes:<br>The party system in Indian Politics<br>Local self-government in Urban and Rural areas<br>The 73rd & 74th Amendments and their implications for inclusive politics<br>Role and significance of women in politics. | 1. To learn about the multi-party system of Indian politics and its evolution.<br>2. To understand the working of the local self-government.<br>3. To learn the important features of the Amendments. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: History of Media**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction:<br>Evolution of Press in India-<br>a. Newspaper- The Rise of the Voice of India during British Rule.<br>b. India's Freedom Struggle and role of Media.<br>c. Independence and Rise of Newspapers,<br>d. Newspapers- A Social Aspect for Freedom Struggle,<br>e. Press Acts of India.<br>f. Press during the Emergency Period. | 1. To learn about the pointers in History of Newspapers in India.<br>2. To understand about the factors that added to the boom of newspapers in India.<br>3. To learn the role of the press in India's struggle for freedom.<br>4. To deeply understand the different Press acts of India. | CO1- Learner will be able to understand Media History through key events in the cultural history.<br>CO2- TO enable the learner to understand the major developments in Media History.<br>CO3- To understand the history and role of professionals in shaping communications.<br>CO4- To understand the values that's shaped and continues to influence Indian Mass Media.<br>CO5- Learner will develop the ability to think and analyze about Media.<br>CO6. To sharpen the reading, writing, speaking and listening skills that will help the students to understand the development of Media. |
| **Module-II** Language Press:<br>History of Indian Language Press in India-<br>a. Rise of Hindi Language Newspapers (detailed report on Vernacular Press in India referring to Newspapers).<br>b. Regional press and its popularity of Indian Regional Languages in various regions.<br>c. Vernacular Press Act,1876. | 1. To learn about the diversity and growth of Indian Language Newspapers.<br>2. To understand the effect of the vernacular press act on Indian Publishers.<br>3. To learn the difference between English newspapers and Language Newspapers. | |
| **Module-III** Documentaries and Films:<br>History of Documentaries and Films-<br>a. Genesis of Documentaries and Short Films (Screening of a few documentaries is essential- like Hindustan Hamara, Zalala, The Vanishing Tribe). | 1. To learn about different types of Documentaries.<br>2. To learn how to make documentaries.<br>3. To understand about Indian Documentary and the struggle for Indian Independence. | |

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| Role of Documentarians- P.V.Pathy, D.G.Tendulkar, K.S.Hirlekar, Paul Zils and Fali Billimoria, Anand Patwardhan.<br>b. Evolution of Film Making in India- Brief History, Photography to Moving Films.<br>c. Origin of Hindi Cinema.<br>d. Origin of Short films to what it is today, Role of YouTube and WhatsApp.<br>e. Great Masters of World Cinema. | 4. To learn about the New Media and their roles in Movie making. | |
| **Module-IV** Broadcasting:<br>History of Radio and Television in India:<br>a. Radio and Television as Mass Media.<br>b. Radio and Television Broadcasting-<br>c. The beginning of Radio and Television Shows.<br>• A New Era in Broadcasting in India.<br>• Satellite Television and Privatization in Broadcasting.<br>• Advertising in India.<br>d. Internet Protocol Television. | 1. To study the history of Prasar Bharti Act.<br>2. To study the functions and objectives of Radio.<br>3. To study the Business model of the cable TV industry.<br>4. To understand the key recommendations of TRAI. | |
| **Module- V** Media Icons:<br>Role of Media Icons in the History of Indian Media-<br>1. Raja Rammohan Roy<br>2. Bal Gangadhar Tilak<br>3. M.K.Gandhi<br>4. B.R.Ambedkar<br>5. K.P.Kesava Menon<br>6. K.C.Mammen Mapillai<br>7. Maulana Abul Kalam Azad. | 1. To study about the various movements of history.<br>2. To learn about our Media icons who played important role in marking the change. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Visual Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I**: Development to Visual Communication<br>Introduction to Visual Communication:<br>1. History and Development of Visuals<br>2. Need and Importance of Visual Communication<br>3. Visual Communication as a process and as an Expression, Language and Visual Communication<br>4. Visible Concepts:<br>• Plans and Organizational Charts<br>• Maps<br>• Chronologies<br>5. Invisible Concept:<br>• Generalization Theories<br>• Feelings or attitudes | 1. To understand communication and the aspects.<br>2. To introduce students to VISUAL AIDS and the history of visuals.<br>3. Understanding visual communication in detail with various connections.<br>4. To learn about visible and invisible concepts. | CO1- To provide students with tools that would help them visualize and communicate.<br>CO2- Understanding Visual Communication as part of Mass Communication.<br>CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.<br>CO4- To acquire basic knowledge in theories and languages of Visual Communication.<br>CO5- The ability to understand and analyze visual communication from a critical perspective. |
| **Module II**: Theories of Visual Communication<br>Sensual Theories<br>a. Gestalt<br>b. Construction<br>c. Ecological<br>Perceptual Theories<br>a. Semitics<br>b. Cognitive | 1. To extend the knowledge of the students by discussing theories and case studies.<br>2. To make them understand how the visual cortex works to create unified perception.<br>3. Knowing about complexity and multifaceted cognitive processes. | |
| **Module III**: Impact of Colors<br>Colors and Design in Visual Communication<br>1. Color Theory<br>2. Psychological Implications of color | 1. To understand theories related to color for visuals.<br>2. Understanding the psychological influence of color on perception.<br>3. Understanding in detail | |

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| 3. Colors and Visual Pleasure<br>4. Elements of Design | visual plans and designs. | |
| **Module IV**: Channels of Visual Communication<br>Tools/ Mediums of Visual communication:<br>1. Painting and Photography<br>2. Film and Television, Documentaries, Script Writing an Visualization<br>3. Comics and cartoons, Digital Images, Animation and VFX<br>4. News Papers, Advertisements, Photojournalism<br>5. Folk and Performing Arts, Theatre | 1. Understanding of various tools of visual communication.<br>2. Understanding various styles and types of visual communications.<br>3. To strategize visuals for mass appeals.<br>4. To understand the perception and structure of each platform. | |
| **Module V**: Language and Culture in the age of social media<br>Visual Communication in the Age of social media:<br>1. Ethics<br>2. Impact of Language and Culture, Images and Messages, Signs and Symbols (GIF, etc.)<br>3. Audience Behavior<br>4. Citizen Journalism, Going Viral<br>5. Visual Stereotyping in social media | 1. To adapt to new changes with the advent of technologies.<br>2. Understanding the ethics and audience behavior.<br>3. Understanding the role of stereotyping in social media. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Advertising**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction to Advertising:<br>1. Introduction to Advertising- Evolution, Importance, Features, Benefits, Limitation, Effects and 5 M's of Advertising.<br>2. Types of Advertising- Consumer, Industrial, Retail, Classified, Corporate, Public Service, Generic, National, Global, International, Social (CSR) and Advocacy.<br>3. Ethics and Laws in Advertising- Puffery, Subliminal, Weasel claim, Surrogate, Shocking ads, Controversial, Comparative, Advertising code of ethics, Regulatory bodies, Laws, and regulations.<br>4. Social, Cultural and Economic impact of Advertising- Women and advertising, Children and advertising, Senior citizen and advertising, Pop culture and advertising.<br>5. Theories- Stimulus theory, AIDA, Hierarchy, Means-Ends Theory. | 1. To understand the evolution of advertising<br>2. To relate with the advantages & disadvantages to consumers, traders, manufactures and society.<br>3. To understand advertising laws and ethics<br>4. To understand various types of advertising | CO1- To provide the students with basic understanding of advertising, growth, importance, and types.<br>CO2- To understand effective advertising campaigns, tools, models etc.<br>CO3- To comprehend the role of advertising, various departments, careers, and creativity.<br>CO4- To provide students with various advertising trends, and future. |
| **Module-2** Integrated Marketing Communication and Tools: | 1. To comprehend the concept of IMC<br>2. To understand the role and various tools of IMC | |

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| 1. IMC- Emergence, Role, Tools, Communication process, The IMC Planning Process.<br>2. Print Media and OOH Media- Basic concepts, Types of Newspapers advertising, Advantages and Disadvantages of Newspaper advertising, Magazines, Factors to consider for Magazine advertising, OOH Advertising, On-premise advertising, Transit advertising, Posters, Directory advertising.<br>3. Broadcast Media: Radio advertising Advantages and Disadvantages of Radio advertising, Television advertising and its Advantages and disadvantages, Film advertising and product placement- advantages and disadvantages.<br>4. Public Relation- Meaning of Public Relations, Types of PR, Difference between PR and Advertising, Difference between Publicity and Advertising, advantages and disadvantages of Public Relations, Advantages and Disadvantages of Publicity.<br>5. Sales Promotion and Direct Marketing- Growth and Types of Sales Promotion, Advantages and Disadvantages, Growth of Direct marketing, and its tools Advantages and disadvantages | 3. To be able to understand the difference between print media & Outdoor media<br>4. To get basic knowledge about Radio & Television as a means of mass communication and advertising | |
| **Module-3**<br>1. Introduction to Creativity- Importance of Creative process, Creative strategy development determining message theme, big idea, Positioning strategies, Types of Appeals.<br>2. Role of different elements in ads- Logo, Jingle, Company signature, Slogan Tagline, Illustration, Creating Radio commercial- words, sounds, clarity, coherence, etc. | 1. To make students understand the creative process in advertising industry<br>2. To make students comprehend the different elements in an advertisement<br>1. | |

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| 3. Elements of copy- Headline, Sub headline, Layout, Body copy, Types of copy and slogan, creating storyboard. | | |
| **Module-4** Types of Advertising Agency, Department, Careers and Latest Trends in Advertising.<br>1. Types of Advertising Agency- Full service, Creative Boutique, Media buying agency, In-house agency, Specialized agencies and others.<br>2. Various departments in an agency- Account handling, Production, Art, Copy, Media, Public relation, Human resources, Finance and others.<br>3. Latest Trends- Rural advertising, Ambush advertising, Internet advertising, Email advertising, Advertainment, Advertorial, Mobile Advertising. | 1. To help students understand the different types of ad agencies and their basic difference<br>2. To be able to know the various departments in an ad agency<br>3. To understand the latest trends in career in advertising industry | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Content Writing**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation:<br>1. Grammar Refresher- With special emphasis on use of punctuation, preposition, capital letters and lower case.<br>2. Vocabulary building- Meaning, usage of words, acronyms.<br>3. Common errors- Homophones and common errors in English usage. | 1. To learn and revise English grammar.<br>2. To practice vocabulary building in order to understand its aspects and significance.<br>3. Learning about common errors while communicating in the English language and understanding the requirements for good writing.<br>4. In-depth knowledge of creativity exposure in creating | CO1- To provide students with tools that would help them communicate effectively.<br>CO2- Understanding crisp writing as part of Mass communication.<br>CO3- The ability to draw the essence of situations and develop clarity of thought. |

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| 4. Essentials of Good writing- With emphasis on writing with clarity, logic, and structure. | phrases and idioms. | |
| **Module-2** Editing Skills<br>1. Redundant words- Identifying redundant words and phrases and eliminating these.<br>2. Editing sentences- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>3. Editing captions- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>4. Editing Headlines- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>5. Editing copy- Structuring a story, creating a flow, editing redundant words/ phrases, and replacing wrong words/punctuation/grammatical errors. | 1. To understand some editing tips for better writing and encouraging readers to read which helps in publishing well.<br>2. To boost students to write and edit captions that are catchy and attractive.<br>3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning.<br>4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story. | |
| **Module-3** Writing Tips and Techniques<br>1. Writing tickers/scrolls- For Television news.<br>2. Writing social media post- Twitter and for other social networks.<br>3. Writing briefs/snippets- News briefs, Lifestyle and Entertainment snippets.<br>4. Caption writing- Picture stories, etc.<br>5. Writing Headlines- News headlines and features headlines | 1. To understand how to write tickers for the television medium.<br>2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks.<br>3. Understanding in detail writing methods for writing headlines and content briefs along with its software's and tools. | |
| **Module-4** Presentation Tools and Techniques<br>1. PowerPoint Presentation: | 1. Understanding PowerPoint presentations, their related terms and tools. | |

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| Uses of PowerPoint Tools<br>PowerPoint to Pdf<br>PowerPoint to self-animated presentation<br>Auto-timing of PowerPoint presentation<br>2. Infographic:<br>Color selection<br>Use of Clip art<br>Use of PowerPoint smart Tools<br>Minimalist animation for maximum impact<br>3. Three-minute presentation:<br>Content for single slide<br>Uses of phrases<br>Effective word selection<br>Effective presentation<br>4. Google Advanced search:<br>How to select relevant information<br>Locating authentic information<br>How to gather information for domestic and international websites.<br>5. Plagiarism:<br>How to do a plagiarism check<br>Paraphrasing<br>Citation and referencing style | 2. Understanding in detail infographics and their impact while making presentations.<br>3. Tips on how to make a presentation convincing to listeners and viewers.<br>4. To learn terms and concepts related to Google Advanced Search and Plagiarism in detail. | |
| **Module-5** Writing for the Web<br>1. Content is King- Importance of content<br>2. Less is more- Writing for Print media/social media like Twitter, etc.<br>3. Copywriting- Ad campaigns (Creative, witty and attractive)<br>4. Real Time content- Difference in writing for print vs digital<br>5. Keywords- Designing keywords for Search Engine Optimization. | 1. Understanding content and its essentials.<br>2. To differentiate between print and digital platforms and their content creation.<br>3. To understand the importance of keywords in Digital media. | |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Writing<br>1. Report Writing:<br>Report Writing (English, Hindi, or Marathi)<br>General report and News report writing- Basics and Format (Headlines, Sub-headline, Various type of Report)<br>2. Organizational Writing:<br>(English, Hindi, or Marathi) Internal communication,<br>E-mail- E-mail Etiquette, Overcoming Problems in E-mail Communication, Stakeholder communication, Circulars- Guidelines for writing a circular- language and writing style of a circular- format of a circular; Notices- Purpose- Format- Important points to remember while writing a notice, Letters of complaint, claim and adjustment, Consumer grievance letters, Letters under the Right to Information Act, Press Release, Letter to the Editor.<br>3. Writing for Publicity Materials:<br>Writing for Publicity Materials (English, Hindi, or Marathi)<br>Headline, Sub-headline, Body copy, Slogan, Jingle, Radio spot. | 1. To learn about report writing and its various elements.<br>2. Understanding in-depth headlines and their features.<br>3. To make students understand the need to communicate with internal and external publics of the organization company through types of organizational writing.<br>4. Understanding publicity in detail. | Co1- To make the students aware of the use of language in media and organization.<br>CO2- To equip or enhance students with structural and analytical reading, writing, and thinking skills.<br>CO3- To introduce key concepts of communication. |
| **Module-2** Editing<br>Editing:<br>(English, Hindi, and Marathi)<br>Principles of Editing, Punctuation, Substitution of words, Restructuring of sentences, Re-organizing sentence sequence in a paragraph, Use of link words, | 1. To learn the ability to spot mistakes via editing.<br>2. To understand how editing is different from medium to medium.<br>3. To elaborate on grammar aspects for communicating effectively. | |

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| (Principles of Coherence and Cohesion), Writing Synopsis, Abstracts, Precis writing, Newspaper Editing and Magazine editing. | | |
| **Module-3** Paraphrasing and Summarizing<br>1. Paraphrasing- Meaning, how to use paraphrase in communication, Paraphrase in plagiarism, Translation<br><br>2. Summarization- Summarizing content, the points and sub-points and the logical connection between the points. | 1. To understand paraphrasing in writing communication.<br>2. The role of plagiarism while paraphrasing and translations.<br>3. Understanding summarization. | |
| **Module-4** Interpretation of Technical Data<br>Interpret Technical Data- Read graphs, Maps, Charts, write content based on the data provided. | 1. To learn to interpret data resulting from pies, graphs, maps, and charts. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Unit-I<br>Globalization and Indian Society: Understanding the concepts of Liberalization, privatization & globalization;<br>Growth of Information technology and communication and its impact manifested in everyday life;<br>Impact of globalization on industry-changes in employment and increasing migration;<br>Changes in agrarian sector due to globalization; | 1. To study the elements of liberalization, its advantages, and disadvantages.<br>2. To study the impact of Globalization on Indian Industries.<br>3. To study the role of IT and Communication. | CO-1: To introduce students to the overview of the Indian Society.<br>CO-2: To help them understand the constitution of India.<br>CO-3: To acquaint them with the socio-political problems of India.<br>CO-4: To understand stress and conflicts.<br>CO-5: To manage stress and conflicts in contemporary society.<br>CO-6: To learn about Contemporary Societal Challenges |

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| Rise in Corporate farming and increase in farmer's suicides. | | |
| **Unit-2** Human Rights:<br>Concept of Human Rights; Origin and Evolution of the concept;<br>The Universal Declaration of Human Rights;<br>Human Rights constituents with special reference to Fundamental Rights stated in the Constitution | 1. To study the basic characteristics of Human Rights.<br>2. To understand the evolution of Human rights.<br>3. To study the classification of the provisions of UDHR. | |
| **Unit-3** Ecology:<br>Importance of Environment studies in the current developmental context;<br>Understanding concepts of Environment, Ecology, and their interconnectedness;<br>Environment as natural capital and connection to quality of human life;<br>Environmental Degradation- causes and impact on human life;<br>Sustainable development- concept and components; poverty and environment. | 1. To study the concept and disciplines of Ecology.<br>2. To study the structure of Ecosystem and causes of environmental degradation.<br>3. To learns about Sustainable development and the global need for the Sustainable development | |
| **Unit-4** Understanding Stress and Conflict:<br>Causes of stress and conflict in individuals and society;<br>Agents of socialization and the role played by them in developing the individual;<br>Significance of values, ethics, and prejudices in developing the individual.<br>Stereotyping and prejudice as significant factors in causing conflicts in society.<br>Aggression and violence as the public expression of conflict. | 1. To learn about the levels of Stress.<br>2. To study about the types of Organizational conflict.<br>3. To understand the measures for resolving aggression and violence in society. | |
| **Unit-V**<br>Managing Stress and Conflict in Contemporary Society: | 1. To learn the assumptions & limitations in Hierarchy of Needs Theory.<br>2. To study the need for peace and harmony in India. | |

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| Types of conflicts and use of coping mechanisms for managing individual stress;<br>Maslow's theory of self-actualization;<br>Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society. | | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Journalism**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** History of Journalism in India:<br>Changing face of Journalism from Guttenberg to New Media.<br>Journalism in India- Earliest Publications,<br>The rise of Nationalist Press, Post 1947<br>The Emergency 1975, Post Emergency<br>Post Liberalization of the Economy boom in Magazines, Niche Journalism<br>How Technology Advancement has helped Media<br>New Media with special reference to Rise the citizen Journalism. | 1. To learn the history and eras of journalism along with challenges.<br>2. To understand the new media and technology advances.<br>3. To briefly understand the news transmission and gathering process.<br>4. To discuss and learn about how the internet led to the rise of citizen journalism along with its pros, risks, and nature. | CO1- To help media students to acquaint themselves with an influential medium of journalism that holds the key to opinion formation and to create awareness. |
| **Module-2** News and its Process:<br>Definitions of News,<br>The News Process from the Event to the Reader<br>What makes a good story?<br>Anatomy of a news story | 1. To get knowledge about news and the process of gathering news.<br>2. Elements required for a good news story.<br>3. Understanding the beats and parts of a news story in detail. | |

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| Types of Beats: Crime, Environmental, Entertainment, Educational, Agricultural, Sports, etc. | | |
| **Module-3** Principles and Format:<br>What makes a Great Journalist-Objectivity, Accuracy, Without fear or favor, Balance Proximity<br>Difference between a PR and a Journalist<br>Criteria for Newsworthiness<br>Hard News/Soft News and blend of the two<br>News Reports, Features Editorials | 1. Understanding the avenues to explore in journalism.<br>2. To learn about journalists/ reporters and their practices on various platforms.<br>3. Understanding the types of news.<br>4. To make students understand the difference between PR and journalism. | |
| **Module-4** Career in Journalism-Reporter, Feature Writer, Mojo, Data Journalist, Real Time Journalist, Investigate Journalist, Rural Journalist, In-depth Journalist, Lifestyle Journalist. | 1. To learn and understand career prospects in journalism.<br>2. To encourage students to participate in grabbing opportunities related to the field. | |
| **Module-5** Covering an Event (Flip Class)<br>Background Research<br>Finding a News Angle<br>Capturing the Right Pictures for a Photo Feature<br>Writing Headline, Captions and Lead. | 1. To make students understand the importance of a piece of information to convert it into the news.<br>2. The unbiasedness and impartiality objectives must be cleared among the students.<br>3. To make understanding students to cover news from all angles and the format in writing news. | |

**Faculty Name – Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Gender & Culture**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I Evolution, Need, Concepts and theories**<br>Evolution, features of cultural studies, Need and significance of cultural studies and media<br>Concepts related to culture-<br>Acculturation, enculturation, ethnocentrism, cultural relativism, cultural shock and its relevance in media<br>Theories:<br>• Stuart Hall: encoding and decoding, Circuit of culture<br>• John Fiske: culture and industry<br>• Feminism and Post feminism<br>• Techno culture and risk – Ulrich Beck | 1. To understand the evolution of culture and significance of Cultural studies and media.<br>2. Brief learning on the concepts related to culture.<br>3. To learn and understand the various ideologies and theories reflecting the culture, gender, and media. | CO1- To discuss the significance of culture and the media industry.<br>CO2- To understand the association between the media, gender, and culture in the society.<br>CO3- To stress on the changing perspectives of media, gender, and culture in the globalized era. |
| **Module-II** Culture & Media:<br>Construction, commodification, impact and recent trends<br>Construction of culture- social, economic, political, religion and technology<br>2. Culture, industry and media- commodification, memes, representation, articulation, popular culture, power, cyber culture<br>3. Media and its impact on the cultural aspect of the society.<br>4. Culture industry and communication - with reference, to film, TV, social media, advertisements etc.,<br>5. Recent trends in Culture consumption: Changing values, Ideologies & its Relevance in the Contemporary society. | 1. To understand and discuss social constructionism and its terms.<br>2. To understand culture from various aspects such as politics, religion- technology and media.<br>3. Understanding how power is an integral element of culture and features.<br>4. To learn recent trends in culture consumption. | |
| **Module-III** Gender & Media Culture:<br>Role and influence of media | 1. To have a deeper understanding about | |

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| 1. The influence of the media on views of gender (theme, under representation, Stereotypes, Women & Men, Stereotypes Images, Roles, etc)<br>2. Role of social construction of gender, Changing Attitudes and Behaviour for empowerment of Women: Movements of Change.<br>3.Gender equality and media, Hegemonic masculinity in media.<br>4. Hegemonic Masculinity in Media.<br>5. Gender issues in news media (TV, radio, newspapers & online news). | influences of media on gender and views.<br>2. To discuss and have better understanding on gender equality with reference to the media.<br>3. To relate the gender challenges on various platforms. | |
| **Module-IV** Globalization & Media Culture: Global, Local, Consumer and the recent trends<br>1. Media imperialism<br>2. Globalisation and Local culture- Issues and Perspectives, threat to regional and local identities, Impact of global culture and its relevance in media and gender<br>3. Consumer culture and media in the era of globalisation.<br>4. Digital Media culture: Recent trends and challenges<br>5. Media and Globalisation: Global economic flows, global cultural flows, homogenization & fragmentation, glocalization, creolization, globalization & power. | 1. To know about current trends of globalization.<br>2. To discuss case studies and concepts relation to global culture.<br>3. Understanding about consumer culture and its evolution.<br>4. Elaborating the aspects related to issues and impact of cultures along importance in media and gender. | |

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## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Corporate Communication & Public Relations**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation of Corporate Communication:<br>1. Introduction to Corporate Communication:<br>Meaning, Need and scope of Corporate Communication towards Indian Media Scenario.<br>2. Keys Concept in Corporate Communication:<br>Corporate Identity- Meaning and Features,<br>Corporate Image- Meaning, Factors influencing corporate image,<br>Corporate Image creation sustainability & restoration,<br>Corporate Reputation & Management- Meaning, Advantages of Good Corporate Reputation.<br>3. Ethics and law in Corporate Communication:<br>Importance of Ethics in Corporate Communication,<br>Professional Code of Ethics,<br>Mass Media Laws: Defamation, Invasion of Privacy, Copyright Act, Cyber-crime and RTI. | 1. To study the features of corporate identity.<br>2. To study the advantages of corporate reputation<br>3. To study important code and ethics of corporate communication.<br>4. To study corporate communication and management | CO-1 To provide the students with basic understanding of the concepts of corporate communication and public relations.<br>CO-2 To introduce the various elements of corporate communication and consider their roles in managing media organizations.<br>CO-3 To examine how various elements of corporate communication must be coordinated to communicate effectively in today's competitive world.<br>CO-4 To develop critical understanding of the different practices associated with corporate communication with the latest trends and social media tools.<br>CO-5 Construct effective corporate communication and public relation plans/strategies. |
| **Module-2** Understanding Public Relations:<br>1. Introduction and growth of PR- Indian Scenario: | 1. To study the growth and importance of Public Relations.<br>2. To study the objective and significance of Public Relations in Business. | |

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| Meaning, Definitions, Scope, Objective and Significance of PR in Business.<br>Tracing Growth of PR in India, Internal & External PR,<br>Reasons for Emerging International Public Relations,<br>Mergers/Collaborations/Joint ventures between India and International PR agencies,<br>Advantages & disadvantages of Public Relations.<br>2. Role of PR in various sectors: Healthcare, Entertainment, Banking and Finance, Real Estate, Fashion and Lifestyle and Service.<br>3. Theories and Tools of PR: Grunting, Pseudo-events, Publicity, Propaganda, Persuasion, Situational theory, Diffusion theory and Various tools of Public Relations (Press conference, Press release, Media Dockets, Advertorials, Sponsorship). | 3. To study the key roles of PR in various sectors.<br>4. To study about theories and propagandas from various PR events. | |
| **Module-3** CCPR's Range of functions:<br>1. Media Relations- Importance of Media Relations, Sources of Media Information, Building Effective Media Relations, Principles of Good Media Relations, Media analysis & evaluation.<br>2. Employee Communication: Sources of Employee Communications, Organizing Employee Communications, Benefits of Good Employee Communications, Steps in Implementing an Effective Employee Communications Program, Role of Management in Employee Communications.<br>3. Crisis Communication: Impact of Crisis, Role of Communication in Crisis, Guidelines for Handling Crisis, Trust Building, Case Studies such as | 1. To study the various importance of Media Relations.<br>2. To study the principles and analysis of Media Relations.<br>3. To study effective communication with employees.<br>4. To study on managing the crisis through communication with various examples. | |

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| Nestle, Maggie, Indigo, Cadbury Dairy Milk, Nira Radia, Tylenol, etc. | | |
| **Module-4** Latest Trends, Tools & Technology role of social media in CCPR.<br>1. Emerging trends, tools & technology:<br>Today's Communication Technology, Importance of Technology to Corporate Communication, Pros and cons of technology used in Corporate Communication.<br>2. New Media Tools:<br>Website, Online press Release, Article marketing, Online newsletters, Blogs.<br>3. Role of social media:<br>Role of social media as Influential marketing, identifying brand threats, influencing journalist's stories, swiftly reacting to negative press, Viral Marketing, engaging and interacting, storytelling, E-Public Relations and its importance. | 1. To study how technology plays an important role in corporate communication.<br>2. To study about social media influencers.<br>3. To understand E-Public Relations and its importance. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**<br>**Unit-I**<br>1. Introduction:<br>Introduction to Radio,<br>2. History of Radio-Growth & Development,<br>Radio as a Mass Medium- uses & Characteristics, | 1. To study about the invention of Radio and the beginning of broadcasting<br>2. To study the golden age of American radio<br>3. To study the rise of radio networks and the Radio act of 1927 | CO1- The course is intended to explore the art of audio production.<br>CO2-The students are made familiar with the aesthetics of sound and its application in various radio program formats.<br>CO3-To provide them with the basic knowledge and understanding |

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| 3. Writing for the Radio- Who are you talking to?<br>What do you want to say?<br>4. Structure & Signposting,<br>5. The Script | 4. To understand the script writing style for Radio | of radio business and production |
| **Module 2**<br>The Work of Producer:<br>1. Ideas,<br>2. The Audience, Resource Planning, Preparation of Material,<br>3. The Studio Session,<br>4. Post-Production,<br>5. Technician, Editor, Administrator & Manager. | 1. To learn how to generate ideas for a radio program.<br>2. To study research on different target audience<br>3. To understand the structure of the organization and their roles. | |
| **Module 3**<br>The Radio Studio:<br>1. Studio Layout,<br>2. The studio desk, Mixer, Control Panel console or Board<br>3. Digital Mixers,<br>4. Studio Software,<br>5. Digital Compression and Digital | 1. To understand about various equipment used to broadcast a radio program.<br>2. To learn about digital mixers and its importance.<br>3. To study the history of Sound recording | |
| **Module 4**<br>News-Policy & Practice:<br>1. Interesting<br>2. Nes Values- Accuracy, Realism, & Truth.<br>3. The Newsroom Operation,<br>4. The news conference & press release,<br>5. News reading and presentation: The seven Ps, News Reading, Pronunciation, Vocal Stressing, Errors & Emergencies. | 1. To study the News story material.<br>2. To understand news style for TV and Radio.<br>3. To study about Media Convergence and pragmatism | |
| **Module 5** Interviewing:<br>1. Types of Interviews.<br>2. What the Interviewee should know?<br>3. Preparation before the Interview and the Pre-Interview discussion.<br>4. Devil's Advocate,<br>5. Question Technique: Multiple questions and Leading Questions. | 1. To learn about various questioning techniques.<br>2. To learn about preparation done before the interview. | |

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| Nestle, Maggie, Indigo, Cadbury Dairy Milk, Nira Radia, Tylenol, etc. | | |
| **Module-4** Latest Trends, Tools & Technology role of social media in CCPR.<br>1. Emerging trends, tools & technology:<br>Today's Communication Technology, Importance of Technology to Corporate Communication, Pros and cons of technology used in Corporate Communication.<br>2. New Media Tools:<br>Website, Online press Release, Article marketing, Online newsletters, Blogs.<br>3. Role of social media:<br>Role of social media as Influential marketing, identifying brand threats, influencing journalist's stories, swiftly reacting to negative press, Viral Marketing, engaging and interacting, storytelling, E-Public Relations and its importance. | 1. To study how technology plays an important role in corporate communication.<br>2. To study about social media influencers.<br>3. To understand E-Public Relations and its importance. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**<br>**Unit-I**<br>1. Introduction:<br>Introduction to Radio,<br>2. History of Radio-Growth & Development,<br>Radio as a Mass Medium- uses & Characteristics, | 1. To study about the invention of Radio and the beginning of broadcasting<br>2. To study the golden age of American radio<br>3. To study the rise of radio networks and the Radio act of 1927 | CO1- The course is intended to explore the art of audio production.<br>CO2-The students are made familiar with the aesthetics of sound and its application in various radio program formats.<br>CO3-To provide them with the basic knowledge and understanding |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media Studies**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1 Introduction**<br>Eras, relevance, connection to culture literature:<br>• Era of Mass Society and culture-till 1965,<br>• Normative theories, Social Responsibility Theory<br>• Development media Theory. | 1. To learn various dynamics of culture and the theories.<br>2. To learn and differentiate various eras of Mass society. | CO1- To provide an understanding of media theories<br>CO2- To understand the relationship of media with culture and society<br>CO3- To understand Media Studies in the context of trends in Global Media<br>CO4 - To understand the impact of media on individual attitude, values, behavior, and geopolitics<br>CO5- To study the impact of new media technologies and pop culture in the field of advertising |
| **Module 2 Media Theories**<br>Propaganda and Propaganda Theory-<br>• Origin and meaning of Propaganda<br>• Hypodermic Needle/Magic bullet theory<br>• Harold Laswell<br>Scientific perspectives to limited perspectives:<br>• Paul Lazarfeld- Two-step flow theory<br>• Carl Hovland and Attitude change theory | 1. To understand various theories laid by theorists<br>2. To adapt change in perspective and attitude along with society and mass communication | |
| **Module 3 Cultural Perspectives**<br>Various Schools:<br>• Toronto School (McLuhan)<br>• Schools- Birmingham (Stuart Hall)<br>• Frankfurt- Theodor Andorno and Max Horkheimer. | 1. To understand theorists and their theories related to media and consumption<br>2. to learn about technological advances with eras.<br>3. To formulate and identify biases of communication and get in depth knowledge about | |

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ANDHERI (EAST), MUMBAI

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| • Raymond Williams- Technological Determinism.<br>• Harold Innis- Bias of Communication.<br>Media and Identity:<br>Feminism/ Racism/Ethnicity. Caste/class/tribal/queer representations. (Indian examples) | social issues. | |
| **Module 4 Media Effects**<br>Theories on Media effects:<br>• Media effects and behavior<br>• Media effect theories and the argument against media effect theories<br>• Agenda Setting Theory<br>• Cultivation Theory<br>• Politics and Media studies- media bias, media decency, media consolidation. | 1. To understand the theories on media effects<br>2. To learn about media and its effect on behaviors.<br>3. To get an in-depth idea about the history of politics and current scenario as discussions. | |
| **Module 5 New Media and the Age of Internet**<br>Meaning Making Perspectives:<br>• New media<br>• Henry Jenkins- Participatory culture<br>• Internet as public sphere- Habermas to Twitter<br>• McLuhan's concept of Global Village in the age of Netflix<br>• Uses and Gratification in the age of the Internet. | 1. To learn about new media and its effects<br>2. To understand the new global village concept by theorist<br>3. To understand the evolution of the internet via theory. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: History:**<br>Still pictures to moving images<br>1.1 History of Cinema<br>1.2 Birth of Visual Art.<br>1.3 Understanding the Language of Cinema<br>1.4 Transition from Documentary to Feature Film | 1. To learn about History of cinema, its origin, and various phases of cinema<br>2. To learn about the language and key concepts of cinema<br>3. To understand the transition from documentary to feature films. | C01- To inculcate liking and understanding of good cinema.<br>C02- To make students aware with a brief history of movies; the major cinema movements.<br>C03- Understanding the power of visuals and sound and the ability to make use of them in effective communication.<br>C04- Insight into film techniques and aesthetics. |
| **Module 2. Understanding aspects of film appreciation**<br>2.1 Grammar, Technology and Art<br>Director- the captain<br>Writer- the back-bone.<br>2.2 Aspects of Film-1: Visual Aspects and Editing<br>Mise-en-Scene (Art, Costume, Camera placement)<br>Cinematography<br>Creating Meaning through editing<br>2.3 Aspects of Film-1: Film Sound<br>Three components of Film Sound<br>The relationship between Sound and Image | 1. To learn about techniques and technology in film making<br>2. To learn about film makers<br>3. To learn and understand various aspects of film appreciation and its components | |
| **Module 3: The Early Cinema: 1895-1950**<br>3.1 Early years (1895-1919) World and India<br>The Silent Era (1920-1931)<br>3.2 Early Sound Era (1930-1939)<br>3.3 The development stage (1940-1950) | 1. To learn about early years of world including Indian cinema<br>2. To understand the silent era and its transition till the development stage. | |
| **MODULE 4: Major Film movements and its impact** | 1. To know and introduce students to major cinema | |

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| 4.1 The major cinema movements and their film makers<br>4.2 Hollywood Cinema- Brief history of Hollywood, Star system, academy awards, global audience of Hollywood cinema<br>4.3 Italian neo-realism- Origin and impact on world cinema, work of Roberto Rossellini and Vittorio de sica<br>4.4 Japanese cinema- Work of Yasujiro ozu, Akira Kurosawa, Hayao Miyazaki, etc<br>4.5 Irani cinema: Contribution of Abbas Kiarostami, Majid Majidi, etc. | movements and filmmakers<br>2. To know films from various countries and cultures and learn its concepts used in this industry.<br>3. To know about the contributions of people who got recognized and accredited for their hard work in the respective cinema. | |
| **MODULE 5: Mainstream Indian Cinema and parallel Indian Cinema**<br>5.1 Art v/s Commercial<br>5.2 Indian Meaningful cinema (Commercial)<br>• The Angry Young Man<br>• The Indian Diaspora and Bollywood<br>• Contemporary Bollywood Cinema<br>• Globalization and Indian Cinema, The multiplex Era<br>5.3 Golden era of Indian Cinema- Important work of Bimal Roy, Guru Datt, Raj Kapoor, and V. Shantaram<br>5.4 Indian New Wave cinema: Mrinal Sen, Mani Kaul, Girish Kasaravalli, MS Sathu<br>5.5 Parallel cinema: Contribution of Shyam Benegal, Govind Nihlani, Gulzar, Mani Kaul, Said Mirza, etc. | 1. To understand and have knowledge about art and commercial cinema.<br>2. To understand Indian diaspora and Bollywood<br>3. Learning about the important contributions as directors, producers, actors, actress and so on of persons and learning Indian new wave cinema in detail | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Photography**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**<br>**Camera: The storyteller**<br>**1. The Body:** The faithful middleman<br>• The heart of the system<br>• How the camera sees differently than human eyes.<br>• Limitations and Wonders of camera.<br>• Formats of camera: Small Full frame, Half frame<br>• (APS-C), Medium, Large (camera movements)<br>• Experiencing frame<br>• Types of cameras: DSLR; View; Rangefinder; Mirrorless<br>**2. Aperture:** The iris of the camera<br>• Diaphragm<br>• Controls amount of light entering lens<br>• Factor in Exposure calculation<br>• Active factor of Depth of field and Bokeh (creative)<br>• F'-numbers and aperture scale.<br>• Application of Depth of Field in advertising and<br>• Journalism.<br>3. **Shutter:** The Click magic<br>• Blind between Lens and Image sensor<br>• Controls duration of light<br>• Major factor in Exposure calculation<br>• Main player in controlling action | 1. The understand about the body parts of a basic camera<br>2. To understand the formats and various concepts related to camera<br>3. To learn how a camera is a storyteller by capturing still images. | **C01-** To introduce to media learners the ability of an image into effective communication.<br>2. C02- To help the learner understand that media photography is a language of visual communication and beyond just point and shoot fun moments.<br>C03- To practice how a picture speaks thousand words by enlightening the learner on how.<br>C04- To develop the base of visualization among learners in using pictures in practical projects.<br>C05- To help learners work on a given theme of the subject into making relevant pictures or photo features. |

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| • choosing lens for the purpose.<br>• Main distinguishing factor<br>• Fixed V/s Variable focal length<br>**8. Image size:** See close<br>The magnification ratio of a lens<br>Longer focal length = Bigger image size<br>**9. Coverage angle:** Crop out unwanted<br>• Prime concern in Composition<br>• How much of a scene a lens takes in from a viewpoint?<br>• Safe focusing distance, Distortion: Barrel/ Pincushions<br>**10. Types of lenses:** The right one for the task at hand<br>• Prime Lens v/s Zoom lens<br>• Prime = Fixed focal length<br>• Zoom = Variable focal length<br>• Normal, Wide angle and Telephoto<br>• Special purpose lenses: Macro, Fish eye, Tilt-shift | | |
| **Module 3**<br>**Light: Parameters of Light- The essential raw material**<br>**1. Intensity and Exposure:** Perfect tone<br>• How much light: consideration for exposure<br>• Exposure triangle (A, S, ISO) The model of exposure<br>**2. Direction and Lighting: Lighting for Cinema Television and Advertising**<br>• From where: direction begets shadow<br>• Shadow = Depth<br>• Lighting = Shading<br>• Three-point lighting | 1. To learn about intensity and exposure of light while clicking an image<br>2. To understand in comparison with advertisements and various types of lighting.<br>3. To earn about color and moods in photography<br>4. To learn to be as creative as possible. | |

SHETH L.U.J. & SHRI V. COLLEGE OF SCIENCE & COMMERCE • ANDHERI (EAST) MUMBAI-59

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| • modes<br>• Errors in inbuilt metering>Exposure compensation | | |
| **Module 4**<br>**Composition: Art of Seeing> Way of portraying a subject**<br>**1. Frame and Aspect ratio**<br>• Dimensions of sensor and proportion<br>• Aspect ratio: 2:3/ 4:5/ 16:9 (HD)<br>**2. Visual indicators**<br>• Line, Shape, Size, Tone, Color, Texture, Space and Center of interest; Subject= Aesthetic Assembly of Objects<br>**3. Rules of composition**<br>• Rule of thirds/ Balance/ Leading lines/ Frame within frame, Enhancing depth/ Unusual viewpoint/ Shadow/ Pattern breaking<br>• Cropping, Panorama, Flattening<br>**4. Breaking the Rules**<br>Cropping, Panorama, Flattening<br>**5. Viewpoint and Perspective:**<br>• 1-, 2- and 3-point perspective: Vanishing points and viewpoint<br>• Normal: The way we see<br>• Enhanced: Exaggerated depth<br>• Compressed: Feeling of distance taken away<br>• Forced: Unrealism<br>• Aligned: Back projection and green screen application | 1. To understand concepts related to frame and aspect ratio<br>2. To understand the types under composition<br>3. To understand in detail about viewpoints and perspectives along with types. | |
| **Module 5**<br>**Digital Imaging: Electronic format** | 1. To learn about electronic format<br>2. To learn about pixels and its | |

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| 1. Image sensor<br>Format, 135mm/ APS-C, Medium format, large format<br>2. Megapixel<br>Pixel and its values, Total number of pixels, File size<br>3. Resolution<br>Pixel Per inch: Quality of image, magnification of image<br>4. Image Magnification<br>Viewing distance, Image size and Pixelation<br>How large an image can be forgiven megapixel<br>5. File Format<br>RAW, JPEG, TIFF (Bit and Compression) advantages and limitations of Raw format | values and megapixel<br>3. To understand various types of files saved and limitations of RAW format | |

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1 Photoshop: Pixel based Image editing Software**<br>**1. Introduction to Photoshop**<br>Image editing theory<br>Bitmaps v/s Vectors<br>When to use Photoshop and when to use drawing tools<br>**2. Photoshop Workspace**<br>The tools, Toolbox controls<br>Property bar, Options bar, Floating palettes<br>**3. Working with images**<br>Image mode, Image size, canvas size<br>Image resolution, size and resampling | 1. Learning Introduction to Photoshop Image editing theory Bitmaps v/s Vectors When to use Photoshop and when to use drawing tools.<br>2. Understanding the Photoshop Workspace, The tools, Toolbox controls Property bar, Options bar, Floating palettes.<br>3. Learning and working with images Image mode, Image size, canvas size Image resolution, size and resampling.<br><br>1. learning Image Editing | Co1- To equip the students with an understanding of industry knowledge required to make a career in the field of print and Advertising, Digital Marketing, Television media, Film etc.<br>CO2- To train them with the software knowledge required in the above-mentioned Industries. |

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| **4. Image Editing**<br>Levels, Curves,<br>Contrast adjustment,<br>Color adjustment Photo filters<br>**5. Working with Text**<br>Text layer, Character palate,<br>Paragraph palate<br>Text resizing, Text color, Text attributes<br>Working on simple project/ one page design | Levels, Curves, Contrast adjustment, Color adjustment Photo filters.<br>2. Understanding and Working with Text layer, Character palate, Paragraph palate Text resizing, Text color, Text attributes Working on simple project/ one page design. | |
| **Module 2- CorelDraw: Vector based Drawing software**<br>**1. Introduction to CorelDraw**<br>CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats<br>**2. Using text**<br>Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C:<br>**3. Exploring tools**<br>Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos<br>**4. Applying effects**<br>Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips<br>**5. Exporting in CorelDraw**<br>Exporting, Types of export, Exporting for other software | 1. Understanding the Introduction to CorelDraw, CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats.<br>2. Learning to Using text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C.<br>3. Understanding the Exploring tools Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos.<br>4. Learning how to Applying effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Understanding the Exporting in CorelDraw Exporting, Types of export, Exporting for other software. | |
| **Module 3- Quark Xpress/ InDesign: Layout Software**<br><br>**1. Introduction to QuarkXPress**<br>List the menus, List the tools, Benefits of using Quark, Application of Quark | 1. Understanding of Introduction to QuarkXPress List the menus, List the tools, Benefits of using Quark, Application of Quark.<br>2. Learning to Text Edits in Quark Format of text, Purpose | |

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ANDHERI (EAST)

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| **2. Text Edits in Quark**<br>Format of text. Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>**3. Using palettes**<br>Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark,<br>**4. Color correction in quark**<br>Embedding images in proper formats, Color correction on the images,<br>Adjusting according to the color tone of the publication,<br>**5. Exporting files**<br>Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | of text selection, Aligning text in different design formats, Text alignment with embedded images.<br>3. Learning how to Use palettes Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark.<br>4. Understanding the Color correction in quark Embedding images in proper formats, Color correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning how to Export files Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **Module 4- Premiere Pro: Audio-visual: Video editing software**<br>**1. Introduction to editing**<br>Editing importance, Great editing examples, Editing for different formats (film/ad/news/etc.)<br>**2. Introduction to premiere**<br>How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/etc.)<br>**3. Understanding file formats**<br>Understanding different file formats (AVI/MPEG/MOV/H264, etc.), Importing raw footage for edits, performing video checks while editing<br>**4. Using color grading**<br>What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing<br>**5. Exporting and rendering**<br>Exporting in different formats, choosing right formats for exposing, | 1. Understanding of Introduction to editing importance, Great editing examples, Editing for different formats (film/ad/news.)<br>2. Learning How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows.)<br>3. Understanding file formats Understanding different file formats (AVI/MPEG/MOV/H264), Importing raw footage for edits, performing video checks while editing.<br>4. Learning how to Use color grading What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning to Export and rendering Exporting in different formats, choosing | |

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**LAXMI CHARITABLE TRUST'S**

**SHETH L.U.J. & SIR M.V. COLLEGE OF ARTS, SCIENCE & COMMERCE**

**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1** The Discussion:<br>1. Format,<br>2. Selection of Participants,<br>3. Preparation,<br>4. Speaker Control & Technical Control,<br>5. Ending the Program. | 1. To study various Interview styles.<br>2. To study about different Radio formats.<br>3. To learn techniques for ending a radio program. | CO1. To give learners basic knowledge of radio/audio production theory, techniques, and aesthetics via practical experience in the writing and production of several program formats.<br>CO2. To make them familiar with the art of audio recording, editing, mixing, and aural storytelling techniques. |
| **Module 2 Commentary**<br>1. Preparation work with the Base Studio,<br>2. Different Sports,<br>3. Communicating Mood & Coordinating the images,<br>4. Content & Style,<br>5. News Action & Sports actions. | 1. To understand different Base Stations.<br>2. To learn structure of commentary as the state of art<br>3. To understand the beginning of sports broadcasting<br>4. To learn different types of Commentary. | |
| **Module 3** Using the Internet and social media<br>1. An online presence,<br>2.Internet radio,<br>3. Radio podcasts,<br>4. Internet Research,<br>5. Making the best use of social media | 1. To study the evolution of the Internet.<br>2. To understand the working of Social Networking.<br>3. To briefly understand the making & working of Radio podcasting | |
| **Module 4** Phone-ins<br>1. Technical facilities, Program classification, | 1. To understand how-to pick-up subjects for the phone-in programs.<br>2. To learn the reasons to take | |



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| managing quality while exporting. Rendering and maintain file format, improving quality and time to render techniques | right formats for exposing, managing quality while exporting. Rendering and maintaining file format, improving quality and time to render techniques. | |
| **Module 5- Sound Forge/Sound Booth: Sound Editing Software**<br>**1. Introduction to Digital Audio**<br>Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate<br>**2. Concept of Dolby Digital**<br>Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker<br>**3. Sound Recording**<br>Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software<br>**4. Working with Sound**<br>Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter<br>**5. Advanced Sound Processing**<br>Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters | 1. Learning the Introduction to Digital Audio Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate.<br>2. Understanding the Concept of Dolby Digital Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker.<br>3. Understanding the Sound Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software.<br>4. Learning and Working with Sound Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter.<br>5. Understanding the Advanced Sound Processing Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters. | |



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| Writing for Advertisements | | precisely, and accurately for different types of audiences<br>CO6. Provide basic proficiency in proof-reading and editing. |
| **Module 2: Radio and Television**<br>Writing for Broadcast Media:<br>1. Radio & Television: Challenges & Weakness,<br>2. Writing Script for different Radio Programs,<br>3. Script writing formats<br>4. Writing for Interviews, Live news & daily news,<br>5. Radio jockeying / online radio and new trends<br>Storyboarding for Television commercials. | 1. To study how to write scripts for the Broadcast media.<br>2. To study about the different scripting formats.<br>3. To learn the Rundown sheet for Radio program<br>4. To learn the tips and techniques to write the television commercial | |
| **Module 3: Digital Media**<br>Digital Media: A sunrise opportunity<br>1. Difference between- Newspaper writing & web writing, Headline writing, deck heads, Subheads, Lists & hyperlinked content.<br>2. How to produce well-written webpages<br>Writing content for the web, digital spaces & digitally distributed media,<br>3.Development of Web-specific style guides, convergence of text & video on digital,<br>4. Emerging fields of personal publishing including blogging & micro blogging. (or publishing on LinkedIn)<br>5. Dealing with Breaking news & fake news in real time.<br>6. Writing for Advertisements through emails & SMS.<br>7. Writing Blogs | 1. To study the difference between newspaper writing and writing for the web.<br>2. To learn about Digital Convergence and audience engagement<br>3. To learn how to write blogs and essentials of blogging | |
| **Module 4: Editing**<br>Evaluation of content<br>1. Checking spelling & grammar, Checking news/magazine copies for | 1. To learn how to edit a copy.<br>2. To study the principles of good news editing.<br>3. To learn the general tips for | |

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| 2. The open line & choosing the calls,<br>3. The role of the Host & the Host style,<br>4. Reference Material. Use of Delay.<br>5. Linking Programs together, personal counseling, the Presenter as Listener. | live calls. | |
| **Module 5** Making Commercials:<br>1. Copy Policy,<br>2. The Target Audience,<br>3. The Product or Service 'premise',<br>4. Voicing & Treatment,<br>5. Music and effects. | 1. To understand the subsistence of Copyright.<br>2. To understand the difference between commercials vs. Non-commercial radio<br>3. To learn the tips to mastering Radio voice. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Writing & Editing for Media**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: Print Media**<br>Writing for Print Media:<br>1. What makes news? (Determinants of news),<br>2. Art and basic tools of writing,<br>3. Steps and elements of writing-editorials, features, and review,<br>4. Writing for Newspapers & Magazine,<br>5. Writing a News story/ feature stories/ Article/ Editorials (differences)<br>6. Leads, nut shelling, & story structure,<br>7. Writing style and the storybook<br>8. Public Relations & Corporate Writing- various forms | 1. To learn the art and basic tools of writing.<br>2. To study the elements of News stories.<br>3. To learn the types of Feature stories and how to craft the story.<br>4. To study different writing style guides | CO1. Provide the ability to understand writing styles that fit various media platforms.<br>CO2. It would help the learner acquire information gathering skills and techniques.<br>CO3. On completion of this course, students will be able to understand similarities and differences in writing for all forms of media including the internet and digital.<br>CO4. The learner will gather knowledge of different news and copy formats along with appropriate style-sheets and layout.<br>CO5. The learner will imbibe the importance of writing clearly. |

SHETMULJI & SHRIMATI V. COLLEGE OF SCIENCE & COMMERCE

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| headlines, sub heads, use of graphics & illustrations for construction and information flow in Newspapers.<br>2. Rewriting leads.<br>3. Achieving fitment with spacing requirements at any newspaper, magazine, or webpage.<br>4. Checking Advertising agency copies, checking headlines/sub headline (type appeal) and maintaining sequence and flow in body copy.<br>5. Online editing:<br>editing requirements, content, layout, clarity, style, conciseness, online headlining-website design. | proofing and editing. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Laws & Ethics**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **MODULE 1**: Constitution and Media:<br>1. Core values of the Constitution: Refreshing Preamble, unique features of the Indian Constitution<br>2. Freedom of Expression: Article 19 (1) (a), Article 19(2)<br>3. Judicial Infrastructure: Hierarchy of the Courts, Independency of the Judiciary, Legal terminologies<br>4. Social responsibility of the media: Social Responsibility Theory, Emerging issues in Social Responsibility, Theory in today's era | 1. To learn about preamble and constitution<br>2. To understand about various freedoms like speech and expression<br>3. To develop a sense of social responsibility towards society by understanding they theory<br>4. To learn social media and its related concepts in detail | CO1- To provide the learners with an understanding of laws those impact the media.<br>C02- To sensitize them towards the social and ethical responsibility of the media. |

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| 5. Social media: Threat of Fake news and facts verification social media decorum | | |
| **MODULE 2:** Regulatory Bodies:<br>1. Press Council of India:<br>1. Brief History: Statutory status<br>2. Structure and Importance<br>3. Powers and limitations<br><br>2. TRAI: Role of Telecom Regulatory Authority of India<br><br>3. IBF:<br>1. Indian Broadcasting Foundation<br>2. Broadcasting Content Complaints Council<br>3. Broadcasting Audience Research Council<br><br>4. ASCI:<br>1. Advertising Standard Council of India<br>2. Mission<br>3. Structure<br>4. Consumer Complaint Council<br><br>5. NBA:<br>1. News Broadcasters Association<br>2. Structure<br>3. Mission<br>4. Role | 1. To know about Press Council of India<br>2. Introducing TRAI to students to understand the telecommunication industry<br>3. Understanding about various regulatory bodies related to media and their functions | |
| **MODULE 3:** Media Laws:<br>1. Copyright and IPR:<br>What is copyright, Intellectual Property Rights, Exceptions, Major Amendments, Recent Case Studies<br><br>2. Defamation:<br>1. Definition,<br>2. Civil, Criminal,<br>3. Exceptions,<br>4. Recent Case Studies<br><br>3. IT Act:<br>1. Information Technology Act, 2000 | 1. To know importance related to IPR<br>2. To learn defamation and it laws in India<br>3. To know and understand what is contempt of court and its punishments<br>4. To know prohibition of Drugs and magical Remedies advertisements under act. | |

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| 2. Amendment 2008<br>3. Section 66A<br>4. Section 67<br>5. Case Studies<br><br>4. Contempt:<br>1. Contempt of Court<br>2. Contempt of Parliament<br><br>5. More acts:<br>1. Drugs and Magic Remedies (Objectionable Advertisements) Act<br>2. Emblems and Names (Prevention of improper Use) Act | | |
| **MODULE 4**: Media Laws:<br>1. Right to Privacy:<br>1. Evolution<br>2. Right to Privacy a fundamental Right<br><br>2. Morality and Obscenity:<br>1. Indecent Representation of Women's Act<br>2. 19.2, IPC 292, 293<br>3. Change in perception with time<br><br>3. Unfair Trade Practices:<br>Unfair Trade Practices and the Competition Act,2002<br><br>4. OSA:<br>1. Official Secrets Act<br>2. Controversies<br>3. Case Studies<br><br>5. RTI:<br>1. Right to Information Act, 2005<br>2. Brief History<br>3. Importance and current status | 1. To know and learn about privacy and its conflict to RTI<br>2. To discuss and learn about women in current situation and trends and Indecency Representation on Women's Act<br>3. To understand about various organizations laid by Media bodies underlying certain laws, sections, and its functions. | |
| **MODULE 5:** Media Ethics and Social Responsibility<br>1. Why Ethics:<br>What is ethics, and why do we need ethics?<br>2. Ethical Responsibility of Journalist: | 1. To understand role and concepts related to ethics<br>2. The ethical responsibility as a journalist and conflict of interest | |

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| 1. Code of conduct for journalist<br>2. Conflict of interest<br>3. Misrepresentation<br>4. Shock Value<br><br>3. Fake news<br>1. post-truth and challengers of fighting fake news<br>2. Techniques of fact verification<br><br>4. Ethical responsibility of advertisers:<br>1. Violation of ethical norms by advertisers<br>2. Case studies<br><br>5. Stereotyping:<br>Stereotyping of minorities, women, senior citizens, regions, LGBT | 3. To widening knowledge about stereotypes and its applications on various categories of human and according to age | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Mass Media Research**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Research in Media - Introduction to Mass Media Research:<br>• Relevance, Scope of Mass Media Research and<br>• Role of Research in Media<br>• Steps involved in Research Process<br>• Qualitative and Quantitative Research<br>• Discovery of Research Problem, Identifying Dependent and Independent Variables, Developing Hypothesis. | 1. To introduce students to research and the need for research in society.<br>2. Understanding about research process in detail<br>3. Understanding various types of research and learning about hypotheses and its use in research. | CO1- To introduce students to debates in Research approaches and equip them with tools to carry on research<br>CO2- To understand the scope and techniques of media research, their utility and limitations |

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| **Module II**: Design- Research Design:<br>• Concepts, Types and Uses<br>• Research Designs:<br>a. Exploratory<br>b. Descriptive and<br>c. Causal | 1. To learn about research design and its importance in carrying out research.<br>2. The questions to be solved while preparing an outline of the research or thesis.<br>3. The types of research design. | |
| **Module III**: Data Collection: Data Collection Methodology<br>a. Primary Data Collection Methods:<br>I. Depth Interviews<br>II. Focus Group<br>III. Surveys<br>IV. Observations<br>V. Experimentations<br>b. Secondary Data Collection Methods<br>c. Literature Review<br><br>d. Designing Questionnaire and Measurement Techniques:<br>a. Types and basics of Questionnaire<br>b. Projective Techniques<br>c. Attitude Measurement Scales<br><br>e. Sampling Process<br>f. Data Tabulation and Research Report Format | 1. To learn various data collection methods<br>2. To learn about literature of review<br>3. To know about measurement techniques, tabulation, and Research Format. | |
| **MODULE IV**: Analysis- Content Analysis:<br>a. Definitions and Uses<br>b. Qualitative and Quantitative Approach<br>c. Steps in Content Analysis<br>d. Devising Means of a Quantification System<br>e. Limitations of Content Analysis | 1. To understand about Content analysis and its uses<br>2. To learn steps in content analysis<br>3. 3. To understand the limitations of content analysis in detail | |
| **MODULE V**: Application of Research- Application of Research in Mass Media<br>a. Readership and Circulation Survey<br>b. TRP | 1. Learning about the various applications of Research in Mass Media<br>2. To learn about the effect of media on people.<br>3. To find solutions to media- | |

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| e. RRP<br>d. Audience Research<br>e. Exit Polls<br>f. Advertising Consumer Research | related questions. | |
| **MODULE VI**: The Semiotics- The Semiotics of the Mass Media<br>a. What is Semiotics in Media?<br>b. Why is Semiotics Important?<br>c. What are the Codes in Semiotics?<br>d. Semiotics and Media | 1. To learn about codes of signs, symbols and actions and communicate the same with all masses- Study of signs "Semiotics"<br>2. The importance of semiotics<br>3. Understanding relation of semiotics and media | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Understanding Cinema Regional Cinema:<br>Regional Films and Filmmakers- Marathi (V. Shantaram), Bengali (Satyajit Ray/ Ritwik Ghatak), Malayalam/ Tamil/ Telugu/ Kannada, (Film makers- K. Balachandar, K. Vishwanath, Adoor Gopalkrishan) etc. | 1. To learn about various regional cinema and its contributions to the industry<br>2. To know about social issues, topics and how films evolved by contributions of individuals.<br>3. To know famous personalities and their journey in the industry personal and professional both. | CO-1 Awareness of cinema of different regions.<br>CO-2 Understand the contribution of cinema in society.<br>CO-3 How to make technically and grammatically good films.<br>CO-4 From making to marketing of films.<br>CO-5 Economic aspects of film.<br>CO-6 Careers in films. |
| **Module 2**: Hindi Cinema:<br>2.1 Popular Hindi Commercial Films (Bollywood)<br>2.2 Past to Present<br>2.3 Economic contribution of cinema<br>2.4 Convergence of Art and Commercial<br>2.5 Genres in present (Romcom, Thriller, Biographic, Action, Musical, etc.) | 1. To understand the famous / popular Hindi Commercial films<br>2. To get in-depth knowledge of how cinema has evolved from past to present with movie names. .<br>3. To learn about various economic aspects of cinema along with the genres. | |

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| **Module 3:** Cinema now:<br>Contemporary Era<br>Celluloid to Digital (1990-1999)<br>Digital Explosion (2000) onwards<br>Media Convergence and Film Viewing Culture | 1. Understand about contemporary era of filmmaking<br>2. The conversion from celluloid to Digital cinema<br>3. To learn how people adapted a convergence in viewing culture of cinema<br>4. To learn about OTT platforms. | |
| **Module 4**: Film Making:<br>Film Production to Film Exhibition<br>41. Aspects of Production Systems: Financial, Administrative and Creative<br>4.2 Stages of Filmmaking- 1: Pre-Production<br>4.3 Stages of Filmmaking- 2: Actual Production<br>4.4 Stages of Filmmaking- 2: Post-Production<br>4.5 Film and Censorship<br>4.6 ROI Systems in Film Industry<br>Distribution<br>Promotion<br>Marketing<br>Branding<br>Internet | 1. To learn the process from Film production to Film Exhibition<br>2. To learn the stages of Film Making in brief<br>3. To learn the concepts in detail related to exhibition of movies through various techniques.<br>4. To grow the industry with more competition and creative skills. | |
| **MODULE 5**: Film Culture:<br>5.1 Introduction to Film Institute, Film Bodies and Trade Association such as FTII, NFAI, Films Division, DFF, IFFI, CBFC, IFTDA, SGI, WICA, etc.<br>5.2 Film Festival?<br>What is a Film Festival?<br>Major Film Festivals in India and Abroad<br>5.3 Film Awards:<br>Nature and Types of Film Awards<br>Major Film Awards in India and Abroad | 1. To learn about institutions and Trade associations for Films and its history to present the situation.<br>2. To learn about film festivals and major film festivals in India and Abroad.<br>3. To learn about Film awards and its nature, various awards are recognized in India and Abroad. | |

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**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1- Photoshop: Advanced Image Editing**<br>1. Working with multiple images Mixing<br>Selection marquee, Lasso, Magnetic lasso, feather Slice tool, Erase tool<br>Pen tool and image tracing Clone tool, Stamp tool<br>2. Image Effects Editing<br>Burning, Dodging<br>Smudge, Sharpen, Blur Eyedropper, Choosing color Swatches, Colour pick<br>Filters<br>3. Working with Layers<br>Layer basics<br>Changing background, Gradient<br>Moving linking aligning layers<br>Applying Transformations Masking layers<br>Masts and extractions Layer effects, Adjustment layers<br>4. Wonders of Blend Modes Blend modes<br>Advanced blending options Layer blends<br>5. Fully Editable Text<br>Text as art, Glyphs, Creative text<br>Type mask tool, Image in text Text to path and Direct selection<br>Path selection (black arrow) Creating Professional design using all the tools | 1. To learn Tools of Photoshop.<br>2. Understand effects Sharpen, Blur, Eyedropper and color pick filter.<br>3. Learning to change image background, Layer Masking and gradient.<br>4. Learning Blends modes and advanced blending options.<br>5. Students learn text editing and its selection.<br>6. Learning to create a professional design using all tools. | After completing the course, the learner will be able to:<br><br>CO1: To help learners be media industry ready. This will help learners to be aware of the minimum requirement of the software when stepping in the industry.<br><br>CO2: To introduce the media soft wares to make the learner understand what goes behind the scene and help them choose their stream.<br><br>CO3: To prepare learners skilled enough for independence during project papers in TY sem.VI.<br>CO4: To help learners work on small scale projects during the academic period. |
| **Module 2- Adobe Illustrator: Vector based Drawing software**<br>1. Introduction to Adobe Illustrator Illustrator Interface,<br>Tool Box, Panels and Bars | 1. Learning to Adobe Illustrator, Interface, Tool Box, Panels and Bars Importing files in illustrator, Different file formats. | |

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| Importing files in illustrator, Different file formats<br>2. Using text<br>Artistic and paragraph text, Formatting Text,<br>Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects<br>3. Creating Simple designs<br>Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity<br>4. Applying effects<br>Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips<br>5. Exporting in Illustrator Exporting, Types of export, Exporting for other soft wares | 2. Learning text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects.<br>3. Understanding to Create Simple designs Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity.<br>4. Understanding to Apply effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Learning to Export in Illustrator Exporting, Types of export, Exporting for other software. | |
| **3 InDesign: Layout Software**<br>1. Introduction to Adobe In Design List the menus, List the tools, Palates Benefits of using In Design, Application of In Design<br>2. Text Edits in InDesign Format of text, Character and Paragraph Bars Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>3. Using palettes<br>Using palettes for different types of publications made in InDesign, Magazine in InDesign, Paragraph styles Newspaper in InDesign, Paragraphs type palate, Text wrap palate<br>4. Color correction in InDesign | 1. Understand to Adobe In Design List the menus, List the tools, Palates Benefits of using In Design, Application of In Design<br>2. Learning Text Edits in InDesign Format of text, Character and Paragraph Bars Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>3. Learning Using palettes for different types of publications made in InDesign, Magazine in InDesign, Paragraph styles Newspaper in InDesign, Paragraphs type palate, Text wrap palate.<br>4. Learning Colour correction in InDesign Embedding images in proper formats, Colour correction on the images, | |

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| Embedding images in proper formats, Colour correction on the images, Adjusting according to the color tone of the publication<br>5. Exporting files<br>Types of files,<br>Exporting for different publications/templates,<br>Newspaper, magazine, etc. | Adjusting according to the color tone of the publication.<br>5. Learning to Export files<br>Types of files, Exporting for different publications/templates,<br>Newspaper, magazine, etc. | |
| **4 Premiere Pro: Audio-visual: Advanced application**<br>1. Introduction to editing Editing importance,<br>Great editing examples,<br>Editing for different formats (film/ad/news/etc.)<br>2. Exploring Premiere Pro How premiere helps in editing,<br>Understanding the toolbar,<br>Importing files,<br>Experimenting with video and audio layers,<br>Basics of editing (cut/layers/different windows/etc.)<br>3. Right application of various file formats Understanding different file formats<br>(AVI/MPEG/MOV/H264, etc.)<br>Importing raw footage for edits,<br>Performing video checks while editing<br>Using inbuilt transitions,<br>4. Using color grading<br>What is color grading,<br>Examples of color grading,<br>Using filters and presents in color mixing,<br>Applying presents on layers for editing<br>5. Exporting and rendering Exporting in different formats,<br>Choosing right formats for exposing,<br>Managing quality while exporting,<br>Rendering and maintain file format,<br>Improving quality and time to render techniques | 1. Understanding Introduction to editing Editing importance,<br>Great editing examples,<br>Editing for different formats (film/ad/news/)<br>2. Understanding the toolbar, Importing files, Experimenting with video and audio layers,<br>Basics of editing (cut/layers/different windows/)<br>3. Understanding the Right application of various file formats Understanding different file formats<br>(AVI/MPEG/MOV/H264, etc.)<br>Importing raw footage for edits, Performing video checks while editing Using inbuilt transitions,<br>4. Learning Using color grading What is color grading,<br>Examples of color grading,<br>Using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning Exporting and rendering Exporting in different formats, Choosing right formats for exposing.<br>Managing quality while exporting, Rendering and maintaining file format.<br>Improving quality and time to render techniques. | |

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| **Module 5- Adobe Dreamweaver: Web designing software**<br>1. Introduction to Dreamweaver<br>Workspace overview<br>Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector<br>Defining website in Dreamweaver<br>2. Working with DW<br>Creating Dreamweaver template<br>Page layout in DW<br>CSS layouts: advantages and disadvantages<br>Creating HTML pages, Insert content and form<br>Creating Forms in DW<br>3. Linking pages<br>Using DW to accomplish basic web page development,<br>Page properties<br>Title, Background image, BG colour, Text colour,<br>Links<br>4. Using Tables<br>Cell padding, cell spacing, Border<br>Table basics: Colour BG in cell,<br>Invisible tables,<br>Changing span,<br>Making image into clickable link<br>5. Typo in DW<br>Changing Font typefaces, size, style, colours<br>Text to hyperlink | 1. Understanding the Introduction to Dreamweaver Workspace overview Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector Defining website in Dreamweaver.<br>2. Learning and Working with DW Creating Dreamweaver template Page layout in DW CSS layouts: advantages and disadvantages Creating HTML pages, Insert content and form Creating Forms in DW.<br>3. Understanding to Linking pages Using DW to accomplish basic web page development, Page properties Title, Background image, BGcolor, Text color, Links.<br>4. Learning for Using Tables Cell padding, cell spacing, Border Table basics: Colour BG in cell, Invisible tables, Changing span, Making image into clickable link.<br>5. Understanding to Typo in DW Changing Font typefaces, size, style, colors Text to hyperlink. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Brand Building**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: Introduction to Brand Building, identity, Personality and positioning**<br>1. Introduction to Brand Building<br>Meaning, Product v/s Brand, Why brand matters, Process of Branding, Types of brand- National, Retail, Flanker, Distributor, Luxury, Global brands), Brand building blocks, Guidelines for effective branding, Brand Elements- types of brand elements<br>2. Brand Identity and Brand personality<br>Consumer, Industrial, Retail, Classified, Corporate, Public service, Generic, National, Global, International, Social (CSR) and Advocacy<br>3. Brand Positioning<br>Product class, Consumer segmentation, Perceptual mapping, Brand benefits and attributes, Cornerstones of positioning strategy Basis | 1. To learn and understand brand and its related concepts<br>2. To study importance of branding and its process<br>3. To distinguish between a brand and a product.<br>4. To understand the concept of brand identity.<br>5. to learn to connect with brands and match personality.<br>6. To educate students about various CSRs from brands<br>7. To learn about benefits from brands and its attributes | CO1- To understand the awareness and growing importance of brand building<br>CO2- To know how to build, sustain and grow brands<br>CO3- To know the various new ways of building brands.<br>CO4- To know about the global perspective of brand building. |
| **Module 2: Branding leveraging, strategies, equity, models**<br>1. Brand Leveraging<br>Line, Brand extension, Types of Brand Extensions, their advantages | **1.** To understand the brand leveraging and its concepts<br>2. to learn about benefits and various brand related concepts<br>3. To understand in detail strategies and equity at various | |

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| and disadvantages, Moving up/ down, Co- branding<br>2. Brand Strategies<br>Multi- branding, Mix branding, Hierarchy- Building Equity at Different Hierarchy Levels, Brand Product Matrix, Brand Architecture- Breadth of a Branding Strategy, Depth of a Branding Strategy<br>3. Brand Equity and Models<br>Elements/ Sources, Measurement, (Brand awareness, Brand loyalty)<br>Models: Yand R- Graveyard model Brand Asset Valuator, Brand Equity Ten, Inner brand Equity brand | level<br>4. To clear the concepts of branding strategy<br>5. To understand various models and theories | |
| **Module 3: Brand Building through imperative, Global and corporate image**<br>1. Brand Imperatives<br>Coordination across organization, Coordination across geography, Re-branding, revitalizing, Rural Advertising and brands<br>2. Global Brands<br>Emergence of global brands, Advantages and Disadvantages, Global leadership brands and position, Globalization<br>3. Corporate image Building through brands<br>Corporate Image in Contemporary Management, Advertising and Corporate Image | 1.To learn about coordination and corporate image in detail<br>2. learning about branding and it uses in various areas of lifestyle<br>3. To understand about global brands<br>4. To enhance leadership in positioning and Globalization<br>5. To enhance corporate image building<br>6. To learn and compare advertising and corporate image | |
| **Module 4: Brand Building through CSR, Brands to different sectors, brands life cycle**<br>1. Brand Building through Corporate Social Responsibility<br>CSR as part of business environment management, How CSR activities can be sued for Brand Building, Social activities other than CSR to enhance the brand | 1. To understand importance of CSR and its roles<br>2. To learn about CSR and advertising performed by brands<br>3. To know about stages of growth and case studies<br>4. Understanding the various sectors for branding | |

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| 2. Conception and Growth<br>Important factors in conception and various stages of growth and maturity of brands with various case studies<br>3. Branding in Different Sectors<br>Customer, Industrial, Retail and Service Brands | | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Consumer Behavior**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Module I<br>1. Introduction to Consumer Behaviour<br>1. Need to study Consumer Behaviour<br>2. Psychological and Sociological dynamics of consumptions<br>3. Consumer Behaviour in a dynamic and digital world<br><br>2. Marketing and Consumer Behaviour<br>1. Segmentation Strategies- VALS<br>2. Communication process<br>3. Persuasion- Needs and Importance<br>EL.M. Persuasive advertising appeals. | 1. To study the components of consumer behavior.<br>2. To study consumer behavior and digital world<br>3. To study VALS in detail<br>4. To study the importance of persuasion. | CO1- To understand the sociological and psychological perspective of consumer behavior.<br>CO2- To introduce students to the complexities of consumer behavior, its importance in marketing and advertising.<br>CO3- To sensitize students to the changing trends in consumer behavior. |
| Module II<br>1. Psychological Determinants and Consumer Behaviour<br>1. Motivation- Types and Theories- Maslow<br>2. Attitude- Characteristics- Theories- Tricomponent<br>3. Multi Attitude Model | 1. To study the types of motivation and its related theories,<br>2. To study the attitude and multi attitudes<br>3. To study personality and its traits along with consumer behavior | |

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| 4. Cognitive Dissonance<br>5. Personality - Facets of personality<br>i. Theories- Freud and Jung<br>ii. Personality traits and consumer behavior<br>iii. Self-concept<br>Application of these theories in the marketing and consumer behavior | 4. To study the application of theories in marketing and self-concepts. | |
| Module III<br>1. Relevance of learning in consumer behaviour<br>1. Perception - Elements in perception<br>a. Subliminal Perception<br>b. Perceptual Interpretation-Stereotyping in Advertising<br>2. Learning - Elements in Consumer Learning<br>3. Behavioral and Classical Theory<br>4. Cognitive Learning | 1. To learn behavioral and classical theories<br>2. To learn cognitive learning and its use in consumer behavior | |
| Module IV<br>1. Socio- Economic and Cultural Determinants of Consumer Behaviour<br>1. Family- Role of family in Socialization and Consumption-FLC<br>2. Culture- Role and Dynamics<br>i. Subculture and its influence on consumption<br>ii. Changing Indian core values<br>iii. Cross culture consumer perspective<br>3. Social Group- Primary and secondary and the role of Reference group and Consumer Behaviour<br>4. Economic- social class as the economic<br>5. determinants of consumer behavior | 1. To study the family and consumer behavior consumption<br>2. To learn changing core values and Indian culture<br>3. To learn determinants of consumer behavior | |
| Module V<br>1. Consumer Decision Making<br>a. Process of decision making<br>b. Models of decision making | 1. To study the characteristics of opinion leaders.<br>2. To study the process and models of consumer decisions. | |

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| c. Opinion Leadership<br>2. Diffusion and Adoption Process<br>a. Process of decision making<br>b. Models of decision making<br>c. Opinion Leadership<br>3. Diffusion and Adoption Process | 3. To study the adoption process. | |

**Faculty Name -Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Agency Management**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>1. Advertising Agencies<br>a. Agencies role, Functions, Organisation and Importance<br>b. Different types of ad agencies<br>2. Account Planning<br>a. Role of account planning in advertising<br>b. Role of Account Planner<br>c. Account Planning Process<br>3. Client Servicing<br>a. The Client- Agency Relationship<br>b. 3 P's of Service: Physical evidence, Process and People<br>c. The Gaps Model of service quality<br>d. Stages in the client - agency relationship<br>e. How Agencies Get Clients<br>f. Why Agencies Lose Clients<br>g. The roles of Advertising Account executives<br>4. Advertising campaign Management<br>a. Means- End chaining and the<br>b. Method of Laddering as guides to Creative Advertising Formulation | 1. To learn about advertising agencies and its functions<br>2. To understand about different types of ad agencies<br>3. To understand in depth the account planning process<br>4. To learn P's of service<br>5. To educate students on how to gain client and also on how and why an agency loses a client. | CO1- To acquaint the students with concepts, techniques and give experience in the application of concepts for developing an effective advertising campaign.<br>CO2- How an ad agency works and what opportunities exist.<br>CO3- To familiarize students with the different aspects of running an ad agency<br>CO4- To inculcate competencies thereby enabling to undertake professional work with the advertising industry. |

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| **Module 2**<br>1. Study and Analyze current Advertising campaigns of the best advertising agencies for their clients<br>1. Two current campaigns (Previous two years) for each of the following agencies including TVC, Print, Outdoor and digital should be studied in the classroom.<br>a. JWT<br>b. Ogilvy<br>c. Lowe Lintas<br>d. FCB Ulka<br>e. DDB mudra<br>f. Publicize Worldwide<br>2. At least three international awards winning previous year campaigns (one or two year previous) should be analyzed and discussed in the classroom. The application questions are Expected on the latest campaigns. | 1. To learn current trends of advertising with various organizations as examples<br>2. To know various awards received by the companies | |
| **Module 3**<br>1. Entrepreneurship<br>a. Entrepreneurship Definitions, Meaning Concept, Functions, Need and Importance<br>b. Entrepreneurship- As Innovation, risk taking and problem solving,<br>c. Social Entrepreneurship<br>2. Sources of capital for startup company<br>a. Personal investment<br>b. Family<br>c. Venture capital<br>d. Angels FInance<br>e. Business incubators<br>f. Government grants and subsidies<br>g. Bank loan<br>3. Creating and Starting the Venture<br>a. Sources of new ideas<br>b. Methods of generating ideas, creating problem solving,<br>c. product planning and development process | 1. To evaluate entrepreneurship skills among students.<br>2. To know its importance along with risking factors<br>3. To learn governmental grants and subsidies and bank loans for startup<br>4. To start planning about how to develop the business | |

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| **Module 4:**<br>1. Business Plan for Setting up an Agency<br>a. Business plan introduction,<br>b. Various Stages in setting up a new agency<br>2. Marketing plan of the client<br>a. The Marketing brief<br>b. Marketing Audit<br>c. Marketing Objectives<br>d. Marketing Problems<br>e. STP<br>f. Executing the plan<br>g. Evaluating the plan | 1. To understand various stages while sitting a new agency<br>2. To know in details how to make brief<br>3. To know about objectives behind creating marketing and creative brief<br>4. To introduce the term marketing audit | |
| **Module 5**<br>1. The Response Process<br>a. Traditional Response Hierarchy Models<br>b. Communications objectives<br>c. DAGMAR: An Approach to Setting Objectives<br>2. Agency Compensation<br>a. Various methods of Agency Remunerations<br>3. Growing the Agency<br>a. The Pitch: request for proposal, speculative pitches, Pitch Process<br>b. References, Images and reputation, PR<br>4. Sales Promotion Management<br>a. The Scope and Role of Sales Promotion<br>b. Reasons for the Increase in Sales Promotion<br>c. Objectives of Trade- Oriented Sales Promotion<br>d. Techniques of Trade- Oriented Sales Promotion<br>e. Objectives of Consumer-Oriented Sales Promotion<br>f. Techniques of Consumer-Oriented Sales Promotion | 1. To learn about responsive process<br>2. To know about approaches and their objectives<br>3. Making students understand about how to talk and communicate with clients that helps in gaining more clients<br>4. To learn and understand aspects of sales promotions<br>5. To understand trade-oriented sales techniques as well as its objectives<br>6. To learn about consumer-oriented sales promotions | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Copy Writing**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1:**<br>1. Introduction to Copywriting:<br>a. Basics of Copywriting,<br>b. Responsibility of Copywriter.<br>2. Creative thinking<br>a. How to inculcate a 'creative thinking attitude'<br>b. The idea incubation process<br>c. What's the Big Idea?- How to get to the ONE BIG IDEA that will inspire creative<br>d. Crafting the reasons why consumers should believe your brand and act<br>3. Idea Generation Techniques: Theories of Ideation, Idea generation techniques (Brainstorming, Triggered brain walking, Questioning assumptions, Picture prompts, scamper, Observation, Referencing, Interaction, Imagination, Dreams & Creative Aerobics.)<br>**4.** Transcreativity:<br>a. Introduction,<br>b. Purpose | 1. To understand the role and importance of copywriting.<br>2. Various responsibility of a copywriter<br>3. Understanding the psychology of the brain and its role in developing the skills for writing.<br>4. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source. | CO1- To familiarize the students with the concept of copywriting as selling through writing<br>CO2- To learn the process of creating original, strategic, compelling copy for various mediums.<br>CO3- To train students to generate, develop and express ideas effectively<br>CO4- To learn the rudimentary techniques of advertising - headline and body copywriting, the economy of words and thought peculiar to this type of writing, and the necessity of creative thinking in written expression.<br>CO5- In an ad agency, as a copywriter, one cannot "just be creative and express self"- here one is in a 'creative professional', and have to be able to use the power of creativity for a commercial/ business reason- as someone is paying you to get a problem solved, using your creativity.<br>CO6-There are two basic disciplines through which we make our communication- verbal / written and visual, and both need different skill sets to master them. The structure of the syllabus is designed to hone the necessary skills required for these two diverse disciplines. |

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| **Module 2: Writing for Advertising**<br>1. Briefs:<br>a. Marketing Brief.<br>b. Creative Brief.<br>2. Writing persuasive copy:<br>a. Tone of Voice<br>b. What's the Tone?<br>c. Tonality and character matter.<br>d. How to make your Writing, walk, talk and breathe<br>e. Creating Breakthrough Writing<br>f. How to Control the "Command Centre" in Your<br>g. Prospect's Mind<br>h. How to Change Perception<br>i. Emotionally, Storytelling | 1. Learning about the structure and formats of the briefs.<br>2. Understanding the client brief for proper execution of the content.<br>3. How to write appealing content by considering various elements and through the art of storytelling. | |
| **Module 3: Current Advertising campaigns**<br>Copy writing style of current advertising campaigns of the best advertising agencies for their clients Two current campaigns for each of the following agencies including TVC, Print, Outdoor, and Digital should be studied and analyzed in the classroom<br>a. JWT<br>b. Ogilvy<br>c. Lowe Lintas<br>d. FCB Ulka<br>e. DDB Mudra<br>f. Publicize Worldwide<br>• At least three international awards-winning previous year campaigns (one or two years previous) should be analyzed and discussed in the classroom.<br>• Student must be taught the following when discussions of campaigns:<br>a. Copywriting style<br>b. Idea and concept<br>c. How copy is varied for different media | 1. Learning to write copy for various advertising and marketing media.<br>2. To add various elements to balance a copy and convey the marketing message.<br>3. To explore and learn by real time examples of campaigns by various agencies.<br>4. To understand various appeals and tone of voice | |

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| d. Copy for children, Youth, women, senior citizens, executive's millennials, Baby Boomers, Gen X, Gen Y, Gen Z<br>e. Advertising appeals<br>f. The tone of Voice<br>g. Storytelling | | |
| **Module 4 Media and Audiences**<br>1. Writing for various Media<br>a. Print: Headlines, sub-headlines, captions, body copy, and slogans<br>b. Television: Storyboard, Storyboarding Techniques, Balance between words and visuals, Power of silence, formats of TVS'<br>c. Outdoor posters<br>d. Radio<br>e. Digital copy for social media like Facebook, Instagram, etc<br>f. Copy for web page<br>2. Writing copy for various audiences<br>a. Children<br>b. Youth<br>c. Women<br>d. Senior Citizen and<br>e. Executives<br>f. Baby Boomers, Gen X, Gen Y (Millennials), Gen Z | 1. To learn writing the copy for personal medium and mass medium.<br>2. Understanding the thought process of different categories of audiences.<br>3. Learning to persuade the audience through the copy. | |
| **Module V Writing copies, appeals, execution styles and evaluation**<br>1. How to write copy for<br>a. Direct mailer<br>b. Classified<br>c. Press Release<br>d. B2B<br>e. Email copy<br>f. Advertorial<br>g. Infomercial<br><br>2. Various types of Advertising appeals and execution styles: Rational appeals, Emotional appeal Humor, Fear, Sex appeal, | 1. Understanding the copy writing aspects for offline and online platforms<br>2. Understanding various writing appeals to connect a chord with the specific audience through storytelling<br>3. Evaluating the writings by understanding the reach of the advertising message.<br>4. Learning about campaign objectives.<br>5. Learning the final output of an advertising copy. | |

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| and Various advertising execution techniques.<br>3. The techniques Evaluation of an Ad Campaign:<br>a. Evaluate the ad in terms of its efficacy, i.e. to what extent the campaign has achieved its set objectives,<br>b. Learn to appreciate the aesthetic aspects of the ad, how the ad looks, its layout, color scheme, typography, balance, etc.<br>3.3 Corruption issues faced by the common man<br>3.4 Challenges faced by senior citizens and the physically/ mentally challenged | | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Advertising and Marketing Research**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1**<br>Fundamentals of Research<br>1. What is Literature Review<br>2. Statement of the problem<br>3. Aims and objectives of study<br>4. Relevant Research questions | 1. To learn about Research<br>2. To learn the fundamentals of Research<br>3. Aims and objectives research | CO1- The course is designed to indicate the analytical abilities and research skills among the students.<br>CO2- To understand research methodologies- Qualitative vs Quantitative<br>CO3- To discuss the foundation of Research and audience analysis that is imperative to successful advertising.<br>CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility. |
| **Module-2**<br>Research Design | 1. To learn about research design and its concepts | |

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| 1. Meaning, Definition, Need, and Importance<br>2. Scope of Research Design<br>3. Two types - Descriptive, Exploratory, and Causal | 2. To learn the types of research | |
| **Module -3**<br>Preparing Questionnaire<br>1. Survey instruments<br>2. Designing the questioning using projective<br>3. Technique for Qualitative research<br>4. Designing the Questionnaire using attitude<br>5. Measuring scale for Quantitative using attitude | 1. To understand the importance of questionnaire in research<br>2. To learn the techniques for qualitative research<br>3. To learn the measuring scale for quantitative using attitudes | |
| **Module-4**<br>1. Meaning of Sample and Sampling,<br>2. Process of Sampling<br>3. Methods of Sampling: Non-probability Sampling- Convenient, Judgment, Quota, Snow Ball Probability Sampling- Simple Random, Systematic, Stratified, Cluster, Multi-Stage. | 1. To learn the meaning of sample and sampling<br>2. To understand the process abd methods of sampling<br>3. To learn the types of sampling and its application | |
| **Module-5**<br>Preparing data sheet and data processing<br>Preparation of datasheet in excel format and rearranging the data as per the requirement of the Statistical software such as SPSS and the statistical tool | 1. To learn preparing sheets and how to process the data<br>2. To learn statistical software and understand its applications for analysis | |
| **Module-6**<br>Data Analysis<br>Data collected are to be presented and analyzed. Students will have to choose the methods that best suit the data collected. Data could be presented using tables, pie charts, bar charts, histograms etc. Data presented should be accompanied with the interpretation of the | 1. To understand the methods used for data collection<br>2. To learn and understand how interpretation is done for results and analysis presented via pie charts, histogram and so on. | |

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| associations and relationships among the data groups with the appropriate implication to the study or the unit of study. The summary of interpretation should provide answers to the research Questions. | | |
| **Module -7**<br>Methods of Data Analysis<br>The interpretations based on Descriptive statistics should include Mode, Mean, Median, Range, Variance, Standard deviation, Kurtosis, and Skewness<br>Any of the following multivariate analyses may be used such as Regression, Correlation, Test factor analysis, and discriminant analysis | 1. To learn about data and its interpretation<br>2. To learn various analysis tools | |
| **Module-8**<br>Report Writing<br>Format of the Research Reports<br>The research report shall have the following Components<br>1. Title Page<br>2. Index<br>3. Introduction and Research objective<br>4. Industry Overview<br>5. Literature Review<br>6. Statement of the Problem<br>7. Statement of Hypothesis (Min two Hypothesis)<br>8. Research Methodology and Research Design<br>9. Data Analysis and Interpretations<br>10. Findings<br>11. Conclusion<br>12. Suggestions<br>13. Annexure (questionnaires)<br>14. Bibliography | 1. To understand the prospects of research reports<br>2. To understand in depth how to write and state the hypothesis along with other research components | |
| **Module-9**<br>Advertising Research<br>1. Introduction to Advertising Research | 1. To learn about advertising research<br>2. To learn the various techniques used by the researcher | |

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| associations and relationships among the data groups with the appropriate implication to the study or the unit of study. The summary of interpretation should provide answers to the research Questions. | | |
| **Module -7**<br>Methods of Data Analysis<br>The interpretations based on Descriptive statistics should include Mode, Mean, Median, Range, Variance, Standard deviation, Kurtosis, and Skewness<br>Any of the following multivariate analyses may be used such as Regression, Correlation, Test factor analysis, and discriminant analysis | 1. To learn about data and its interpretation<br>2. To learn various analysis tools | |
| **Module-8**<br>Report Writing<br>Format of the Research Reports<br>The research report shall have the following Components<br>1. Title Page<br>2. Index<br>3. Introduction and Research objective<br>4. Industry Overview<br>5. Literature Review<br>6. Statement of the Problem<br>7. Statement of Hypothesis (Min two Hypothesis)<br>8. Research Methodology and Research Design<br>9. Data Analysis and Interpretations<br>10. Findings<br>11. Conclusion<br>12. Suggestions<br>13. Annexure (questionnaires)<br>14. Bibliography | 1. To understand the prospects of research reports<br>2. To understand in depth how to write and state the hypothesis along with other research components | |
| **Module-9**<br>Advertising Research<br>1. Introduction to Advertising Research | 1. To learn about advertising research<br>2. To learn the various techniques used by the researcher | |

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| 2. Copy Research: a. Concept testing, b: Name testing<br>3. c. Slogan testing<br>4. Copy testing measures and methods: a. Free association,<br>5. b. Direct questioning, c. Direct Mail tests<br>6. d. Statement comparison tests<br>7. e. Qualitative interviews, f. Focus groups<br>8. Pretesting:<br>A. Print Pretesting: a. Consumer Jury Test,<br>B. Portfolio test,<br>C. Paired comparison test<br>D. Order-of-merit test,<br>E. Mock magazine test,<br>F. Direct mail test<br>G. Broad casting Pretesting:<br>a. Trailer tests,<br>b. Theatre tests,<br>c. Live telecast tests, d. Clutter tests<br>H. Challenges to pre-testing.<br>Example: The Halo effect<br>9. Post testing:<br>a. Recall tests,<br>b. Recognition test,<br>c. Triple association test,<br>d. Sales effect tests,<br>e. Sales results tests,<br>f. Enquires test<br>Physiological rating scales<br>1. Pupil metric devices,<br>2. Eye- movement camera,<br>3. Galvanometer,<br>4. Voice pitch analysis<br>5. Brain pattern analysis | 3. To understand each psychological rating scales in depth and audiences. | |
| **Module-10**<br>Marketing Research<br>1. Introduction to Advertising Research<br>2. New product research,<br>3. Branding Research,<br>4. Pricing research,<br>5. Packaging research,<br>6. Product testing | 1. To learn research and its marketing objectives and types | |

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|---|---|---|
| 2. Copy Research: a. Concept testing, b: Name testing<br>3. c. Slogan testing<br>4. Copy testing measures and methods: a. Free association,<br>5. b. Direct questioning, c. Direct Mail tests<br>6. d. Statement comparison tests<br>7. e. Qualitative interviews, f. Focus groups<br>8. Pretesting:<br>A. Print Pretesting: a. Consumer Jury Test,<br>B. Portfolio test,<br>C. Paired comparison test<br>D. Order-of-merit test,<br>E. Mock magazine test,<br>F. Direct mail test<br>G. Broad casting Pretesting:<br>a. Trailer tests,<br>b. Theatre tests,<br>c. Live telecast tests, d. Clutter tests<br>H. Challenges to pre-testing.<br>Example: The Halo effect<br>9. Post testing:<br>a. Recall tests,<br>b. Recognition test,<br>c. Triple association test,<br>d. Sales effect tests,<br>e. Sales results tests,<br>f. Enquires test<br>Physiological rating scales<br>1. Pupil metric devices,<br>2. Eye- movement camera,<br>3. Galvanometer,<br>4. Voice pitch analysis<br>5. Brain pattern analysis | 3. To understand each psychological rating scales in depth and audiences. | |
| **Module-10**<br>Marketing Research<br>1. Introduction to Advertising Research<br>2. New product research,<br>3. Branding Research,<br>4. Pricing research,<br>5. Packaging research,<br>6. Product testing | 1. To learn research and its marketing objectives and types | |

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI

**Faculty Name - Ms. Charmy S. Shah**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Social Media Marketing**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Digital ERA<br>1. Introduction to E-Marketing<br>What is E-marketing? The changing marketing landscape, The internet and business<br>2. E-Marketing<br>E-Marketing strength and application, Communication modes, The behavioral internet (B2C, B2B, C2C and C2B) E-marketing and Online advertising. E-marketing and Consumer segmentation, E-marketing and Consumer segmentation. E-marketing and Sales and Trade promotions<br>3. Types of Digital Marketing<br>Types of E- mail marketing, Types of Internet marketing and Types of Mobile marketing<br>4. Generation Y<br>Expectation and influence, Implication of Digital change, Emerging consumer segmentation in India | 1. To learn about the swift of online and offline marketing<br>2. To understand the advantages and disadvantages e- business<br>3. To understand the various types of digital marketing | CO1- Students learn real world skills from leading designers, artists, and entrepreneurs<br>CO2- The primary goal is to create problem solvers who strike a balance between traditional art and technology, and between individual vision and teamwork.<br>CO3- With a fundamental understanding of digital tools and their creative applications, graduates meet the demands of a diverse and expanding job market in visual storytelling<br>CO4- Identify and apply strategies to improve and succeed no matter what their initial skills.<br>CO5- Solve problems and learn from creative risks by using people skills, design principles, and processes.<br>CO6- Build a strong foundation in all aspects of design and production for storytelling in motion.<br>CO7- Use inspiration in fields outside of digital media such as poetry, science, music, astronomy, history, dance and more.<br>CO8- Develop a professional commitment to their field, their work, and themselves; preparing them to be members and leaders in their profession, as well as learning how to act both as individuals and as team members to support the whole. |
| **Module-II**<br>Social Media Marketing<br>1. Introduction to Social Media Marketing<br>Meaning, Importance, Myths about Social media marketing, brief History | 1. To learn about the importance and related myths to social media and marketing<br>2. To learn the importance of content and how to strategize it<br>3. To learn the various online | |

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| Characteristics of Social Media marketer and Careers in Social media marketing<br>2. Content Strategy for Social Media Marketing<br>10-step framework for creating successful SMM strategy. Building content for sharing. Generating Ideas. Creating content for Multiple platforms<br>3. Facebook Marketing<br>Facebook - the origin and Eight different versions of Facebook, What is Facebook marketing? Facebook page best practices, KPI and insights. How does Facebook advertising work- Facebook ad Campaign Objectives and Targeting and Content creation and sharing<br>4. Instagram Marketing<br>Optimizing Instagram profile, Creating content strategy, Influencer marketing and Instagram Ads<br>5. Linked In Marketing<br>LinkedIn for personal branding, LinkedIn for Company pages. Brand marketing for LinkedIn, Ads on LinkedIn<br>6. Pinterest Marketing<br>Pinterest for business, Marketing on Pinterest, Leveraging Rich Pins<br>7. YouTube Marketing<br>How to build foundation for your YouTube channel, Usage of free resource,<br>Optimize organic traffic by selecting keywords for videos, Optimization of advertisements | platforms and its concepts | |
| **Module -III**<br>Social Media Marketing Plan, and Campaign management<br>1. Social Media Marketing Plan<br>What is the SMM plan? Social Media Marketing cycle. Listen and Observe - 5 stages, Setting Social Media Marketing goals and objectives (Exposure, Engagement, Influence, Impact and Advocacy), Eight C's Strategy development, Uses of | 1. To learn in detail social marketing and get explore to know about planning done for marketing<br>2. To understand the importance of Campaigns and how to manage campaigns across various platforms<br>3. To learn about blogs and online opportunities via blogging | |

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| keywords, hashtags and emoji in targeting branded post, Evaluating Social media marketing success<br>2. Campaign Marketing<br>What is campaign management? Solutions, How to use campaign management for Facebook, Twitter etc, Sentiment mining, Using Corporate blog as a CRM tool. How Companies Use Blogs for Effective Campaign management? | | |
| **Module 4- Social Media Marketing Plan, and Campaign management**<br>1.Social Media Marketing Plan<br>What is SMM plan? Social Media Marketing cycle,<br>Listen and observe -5 stages, Setting Social Media<br>Marketing goals and objectives (Exposure, Engagement, Influence, Impact and advocacy).<br>Eight C's of strategy development<br>Uses of keywords, hashtags, and emoji in targeting branded posts, Evaluating Social media marketing success<br>2. Campaign Marketing<br>What is campaign management? Solutions, how to use campaign management for Facebook, Twitter etc, Sentiment mining, Using Corporate blog as a CRM tool. How Companies use blogs for effective campaign management? | 1. To understanding about SMM planning and its cycle-stages<br>2. To learn how to use hashtags, keywords and insights about post while campaigning. | |
| **5 Ethics and Careers**<br>1.Ethics<br>Code of ethics, 9 Rules of engagement for Social Media Marketing<br>2.Careers Careers in Social media marketing | 1. To learn the ethics and rules of SMM<br>2. To explore and fit in careers related to social media | |

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**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2022-2023

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Retailing & Merchandising**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- About Features**<br>1. Introduction to the World of Retailing<br>Introduction to the World of Retailing<br>2. Types of Retailers<br>Multichannel Retailing, Customer Buying Behaviour, Retail Market Strategy, Overview of Merchandising<br>3. Identifying and Understanding Retail Consumer:<br>Factors affecting retail strategies, Consumer Demographic and lifestyles,<br>4. Social Factor<br>Social factors, Consumer needs and desires,<br>Shopping attitudes and behavior, Consumer decision making process, Retailers' action<br>5. Formats based on Pricing<br>Pricing as a competitive advantage, Discount retailing, Super Store retailing, Off Price retailing | 1. To study the basics & functioning of Retailing.<br>2. To study through case study on Multi-Channel Retailing.<br>3. To understand the meaning & concept of Merchandising.<br>4. To understand Retail pricing in detail. | CO1-To familiarize the students with retail management concepts and operations.<br>CO2- To explain the understanding of retail management and types of retailers.<br>CO3- To discuss an understanding of retail management terminology including merchandize management, store management and retail strategy.<br>CO4- To acquaint the students with legal and ethical aspects of retail management.<br>CO5- To create awareness about emerging trends in retail management. |
| **Module II- Retail Communication And IT**<br>1. Managing Communication for a Retail Store Offering: | 1. To study the objectives of Retail communication.<br>2. To study the tips for attractive retail graphic design.<br>3. To understand the retail ERP system. | |

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| Introduction, Objectives, Marketing Communication, Thematic Communication,<br>2. Methods of Communication<br>Methods of Communication, Graphics, Signage<br>3. IT for Retailing:<br>Information Systems, Barcoding, Retail ERP<br>4. Trends & Innovation<br>Analytics & Tools | | |
| **Module III- Introduction to Merchandising**<br>1. Concept of Retail Merchandising<br>Meaning of Merchandising, Major Areas of Merchandise Management, Role and Responsibilities of Merchandisers<br>2. Merchandise Mix<br>Merchandise Mix, Concept of Assortment Management, Merchandise Mix of Show off<br>3. Merchandise Displays<br>Concept of Merchandise Displays, Importance of Merchandise Displays<br>4. Space Management<br>Concept of Space Management, Role of IT in Space Management, Concept of Planogram<br>5. Formats based on Merchandise selection:<br>Merchandise selection as a competitive advantage, Specialty store retailing, Department store retailing, Super specialist, Niche specialist | 1. To learn the advantages and disadvantages of merchandising.<br>2. To study the process of Merchandising.<br>3. To study the components of Assortment Strategies.<br>4. To study the importance of visual merchandising.<br>5. To study the emergence of retail planograms.<br>6. To study the advantages and disadvantages of specialty stores. | |
| **Module IV- Visual and On-line Merchandising**<br>1. Visual Merchandising<br>Merchandising: Meaning of Visual Merchandising, Objectives of Visual Merchandising, Growth of Visual Merchandising<br>2. Visual Merchandising in India | 1. To study the objective of visual merchandising.<br>2. To study the types of Non store retail merchandising. | |



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| Visual Merchandising in India, Product Positioning and Visual Merchandising<br>3. Non- Store Merchandising<br>Introduction, Objectives, Non-Store Retail Merchandising, Television retailing/ home shopping, Product presentation in Non- Store Retail Merchandising<br>4. Online Merchandising<br>Internet retailing/ online shopping, Catalog Management<br>5. Trends & Innovation<br>Analytics and Tools | | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Brand Management**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1. Introduction to Brand Management**<br>1.Introduction to Brand Management:<br>Meaning of Brand, Branding, Brand Management,<br>Importance of Branding to Consumers, Firms,<br>Brands v/s Products, Scope of Branding,<br>Branding Challenges and Opportunities,<br>2.Models<br>Strategic Brand Management Process, Customer<br>Based Brand Equity model (CBBE)<br>3.Brand Positioning:<br>Meaning, Importance, Objectives, Scope Basis of Brand Positioning, Brand Mantras Brand | 1. To understand the meaning of brand and its related concepts<br>2. To understand various models<br>3. To understand brand positioning and its importance along with related concepts | CO1- To understand the awareness and growing importance of brand management.<br>CO2. To know how to build, sustain and grow brands<br>CO3. To know the various sources of brand equity.<br>CO4. To know about the global perspective of brand management |

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| Repositioning and its characteristics, Point of Parity and Point of Differences | | |
| **Module 2- Planning and Implementing brand marketing programs**<br>1. Brand Elements<br>Meaning, Criteria for choosing Brand Elements, Types of Brand Elements, Integrating Marketing Programs and Activities<br>2.Personalising Marketing<br>Experiential Marketing, One to One Marketing,<br>Permission Marketing. Product Strategy:<br>Perceived Quality and Relationship Marketing,<br>Pricing Strategy: Setting Prices to Build Brand<br>Equity Channel Strategy: Direct, Indirect<br>Channels, Web Strategy<br>3.Cause Marketing to Build Brand Equity<br>Meaning of Cause Marketing, Advantages, Green Marketing Building Global Customer Based Brand Equity | 1. To make students understand the brand and its criteria for being chosen.<br>2. To learn about personalizing marketing<br>3. To explore about various marketing aspects, channels and strategies | |
| **Module 3- Growing and sustaining brand equity**<br>1.The Brand Value Chain- Model Value stages and implication, What to track,<br>designing brand tracking studies<br>2.Brand Equity<br>Meaning , Importance , Objectives, Sources of<br>Brand Equity, Steps of Brand Building including Brand Building, Blocks, Leveraging Secondary Brand Associations to Build Brand Equity<br>3.Measuring | 1. To make students learn about all necessary concepts related to brand equity<br>2. To teach about brand personality and its values<br>3. To learn about various quantitative research techniques in detail | |

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| Sources of Brand Equity<br>Qualitative Research Techniques: Projective<br>Techniques: Completion, Comparison, Brand<br>Personality and Values: The Big Five, Free<br>Association<br>Quantitative Research Techniques: Brand<br>Awareness: Recognition, Recall, Brand Image,<br>Brand Responses. | | |
| **Module 4- Measuring and interpreting brand performance ,**<br>1.Brand Performance and Management<br>Global Branding<br>Strategies, Brand Audit, Role of Brand Managers<br>2.Brand Communication<br>Online Brand Promotions, Role of Brand Ambassadors, Celebrities, Loyalty Program<br>3.Managing Brands<br>over Geographical<br>Boundaries<br>Global Marketing Program, advantages and<br>disadvantages, Cultivate Brand Partnership | 1. To study about brand performances and the global branding strategies management<br>2. To cultivate the sense of communication as brands do through online promotions, loyalty programs and so on | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Digital Media**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1- About features**<br>1. Introduction to Digital Marketing<br>a. Understanding Digital Media<br>b. Advantages of Digital Media<br>c. Principles of Digital Media Marketing<br>d. Key Concepts in Digital media<br>e. Traditional Vs Digital Media | 1. Introduction to Digital media and its key concepts<br>2. To learn about its evolution and principles<br>3. To differ traditional media and digital media. | CO1- Understand digital marketing platform<br>CO2- Understand the key goals and stages of digital campaigns<br>CO3- Understand the of use key digital marketing tools<br>CO4- Learn to develop digital marketing plans |
| **Module 2-**<br>**2. Search Engine Optimization (SEO):**<br>a. How search Engine works<br>b. Introduction to SEO<br>c. On Page Optimisation<br>d. Off Page Optimisation<br>e. SEO Audit, Tools and Measurement<br>f. SEO resources, Careers in SEO | 1. To understand SEO (On-page and Off- page) in detail<br>2. Importance of websites and keywords<br>3. To study the algorithms and its mechanisms. | |
| **Module 3-**<br>**3. Search Engine Marketing (SEM)**<br>a. What is SEM?<br>b. Why SEM<br>c. What is Google AdWords? Why Google AdWords<br>d. Google network<br>e. AdWords terminologies<br>f. Campaign types<br>g. Creation of Google Display NETWORK (GDN)<br>h. Display Ads format<br>i. Conversion tracking<br>j. GDN Campaign creation (DEMO)<br>k. Remarking<br>l. What are Google shopping Ads | 1. To study how Google Ads & SEM works for Advertising & Marketing. | |

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| **Module 4**<br>**4. Social Media Marketing (SMM)**<br>a. Introduction to Social Media<br>b. Facebook Marketing<br>c. Instagram Marketing<br>d. LinkedIn Marketing<br>e. Twitter Marketing<br>f. SMM Tools<br>g. Creating a successful social media strategy | 1. To introduce students to the social world and medium of communication.<br>2. Learning various platforms of social media and its tools used in evaluating campaigns analysis.<br>3. To understand blogging and create blogs, as a tool for communication to the online audiences. | |
| **Module 5**<br>**5. Email Marketing**<br>1. Key terms and concepts<br>2. Customer acquisition strategies<br>3. Best Practices: CRABS<br>4. Tools to enhance lead nurturing<br>5. Enhance better reach | 1. To introduce students to online marketing channels.<br>2. To understand Google Adwords and PPC (Pay per Click)<br>3. Understanding web analytics and its tools. | |
| **Module 6**<br>**6. Web Analytics**<br>a. Introduction to analytics<br>b. Social CRM and analysis<br>c. Google Analytics<br>d. Digital Analytics<br>e. Content performance analytics<br>f. Visitor analysis<br>g. Social media analytics | 1. To introduce students to websites along with its concepts and how it helps businesses to get business.<br>2. To explain in detail the features of a website.<br>3. HTML & HTTP | |
| **Module 7**<br>**7. Affiliate Marketing and Programmatic Marketing**<br>a. Affiliate Marketing<br>b. Definition, Purpose, Resources required, Top Players in Affiliate marketing, Segregation of Affiliate marketing<br>c. Programmatic Marketing<br>d. Evolution and growth of programmatic Marketing<br>e. Real Time bidding<br>f. Types of Programmatic Advertising, Advantages and Challenges, Myths of Programmatic Marketing | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms. | |
| **Module 8** | 1. To create appropriate | |

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| **8. Content writing**<br>a. Intro to content writing<br>b. Core Principles of Content writing<br>c. Why blogs matter<br>d. Principles of writing blogs<br>e. How to write content for Twitter and Mobile | content for utilization on the internet.<br>2. Learning skills and qualities required for content writing on various online sites, applications and websites. | |
| **Module 9**<br>**9. Cyber laws**<br>a. Information Technology Act<br>b. Copyright Act<br>c. Cyber ethics<br>d. Digital Security | 1. To learn about cyber laws<br>2. Case studies related to each law so as to better understand the real world.<br>3. Ethics in Digital Media. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Media Planning & Buying**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction to Media Planning**<br>1. Introduction to Media Planning<br>a. Basic Terms and Concepts<br>b. The function of Media<br>c. Objectives of MP<br>d. Role of Media Planner<br>e. Challenges in Media planning<br>f. BARC and NCCS grid<br>g. Factors influencing media<br>h. The criterion for selection of media vehicles | 1. Learning the concepts of Media planning.<br>2. Key role of a Media planner. | CO1- To develop knowledge of various characteristics of media.<br>CO2- To understand procedures, requirements, and techniques of media planning and buying.<br>CO3- To learn the various media mix and its implementation<br>CO4- To understand budget allocation for a Media plan |
| **2. Negotiation Skills in Media Buying:**<br>a. Negotiation Strategies,<br>b. Laws of Persuasion. | 1. To study the negotiation skills for proper buying of media.<br>2. To study the various laws for learning consumers perspective in making a purchase. | |

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| **3. Media Planning Process:**<br>a. Situation analysis & Marketing Strategy plan,<br>b. Media Briefing<br>c. Setting Media Objectives, and target audiences analysis<br>d. Media selection and strategy<br>e. Media Budgeting<br>f. Media Buying<br>g. Evaluation. | 1. To learn the step-by-step process for selection of media.<br>2. Understanding different strategies taken for an effective selection of media. | |
| **4. Media Mix**<br>Factors affecting Media Mix Decision | 1. To understand the reasons behind selection of media vehicles. | |
| **5. Media Measurement**<br>a. Reach<br>b. Frequency<br>c. Grps/ GVT Ratings<br>d. TRP/ TVT rating<br>e. Impressions<br>f. Cost efficiency<br>g. Cost per thousand<br>h. Cost per rating<br>i. Circulation/ Readership/ AIR<br>j. Selectivity Index<br>k. Share of Voice | 1. Calculating the revenue expenditure spent on each media cycle and execution of the budget on the right media. | |
| **6. Sources of Media Research:**<br>a. Nielsen Clear Decision,<br>b. Broadcast Audience Research Council,<br>c. Audit Bureau of Circulation,<br>d. RAM,<br>e. Comscore- Digital,<br>f. Alexa | 1. Understanding the individual reach of media through various measurement bodies. | |
| **7. Selecting suitable Media options**<br>(Advantages and disadvantages)<br>a. Newspapers,<br>b. magazines,<br>c. Television,<br>d. Radio,<br>e. Outdoor and OOH,<br>f. Transit<br>g. Cinema Advertising. | 1. Learning about various media and different mediums for advertising.<br>2. Understanding the pros and cons of each medium. | |

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| **8. Media Buying**<br>a. Newspapers<br>b. Magazine<br>c. Television<br>d. Radio | 1. To learn how to buy media space for traditional medias | |
| **9. Communication Mix:**<br>Communication Mix | 1. Learning about the IMC and its tools.<br>2. To study innovative ways for advertising and marketing of the product. | |
| **10. Digital Media Buying**<br>1. Buying Digital Advertising; An Overview Paid media, Owned media and Earned media<br>2. Digital Sales Funnel<br>3. Direct buys from the websites/ Impact buy<br>4. Programmatic Buying: [DSP (Demand-side Platform) or RTB (Real-Time bidding)]<br>5. Advertising via Premium Publishers<br>6. Advertising via Networks and exchanges<br>7. Affiliate Network (Click bank, Commission junction, adfuncky, 7search.com)<br>8. The Local Publishing Market<br>9. OTT platform<br>10. Influencers Marketing or social media influencers<br>11. Content advertising<br>12. Native advertising<br>13. App installed campaign<br>14. Push notification<br>15. Google ads<br>16. Bing ads<br>17. Lead Progression<br>a. Cost per impression<br>b. Cost per click (CPC)<br>c. Cost per lead (CPL) Cost per action (CPA) or pay per action ( PPA)<br>d. cost per conversion or Revenue sharing or cost per sale. | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms.<br>4. To study about online platforms and available spaces used for advertising.<br>5. Understanding various advertising formats with respect to social media and video advertising. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Advertising Design**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction:**<br>**Advertising Design -**<br>Communication Design<br>1. Project Paper<br>Introduction to Project paper & Campaign<br>Campaign outline, Elements to be produced, Viva-voce<br><br>2. Role of Agency Departments<br>1. Accounts dept: Client handling, Strategy planning<br>2. Media dept: Media research, Media planning, Buying & billing<br>3. Creative dept: Prime caliber, All of the visualization, Creative thinking, Execution,<br>4. Production dept: (in-house or outsource) Photography, TVC, Print of promotional material.<br><br>3. Process of Design<br>Research of:<br>1. Product (features & benefits)<br>2. Market: (TA) Psycho & Demography<br>3. Message Strategy: What to say & How<br>4. Competition & claim<br>5. Visualisation & Copy<br>6. Illustration: Choosing one among<br>7. Execution: Graphic design<br><br>4. Art Direction<br>Role of art director in various media<br>Detailing in illustration<br>Detailing in TVC- Location, Models, Costume, Working on storyboard | 1. To study about the agency and its departments who handle an advertising campaign of a brand.<br>2. To study about the production stage of the campaign.<br>3. To study the idea generation process for any creative. | CO1- To make students understand the process of planning & production of advertisement<br>CO2- To highlight the importance of visual communication<br>CO3- To provide practical training in the field of advertising |

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| 5. Analyzing Ads & Logos<br>Discussion of existing ads:<br>Prints ads: For layout, Colors, Message<br>TVCs: AV, Pace, Tne, etc<br>Innovative, Ambient, Transit for relevance<br>PoS: For size, Place, Consumer psychology | | |
| **Module II- Design Basics: Language of Visuals**<br>1. Elements of Design- Vocabulary: Point, Line, Shape, Size, Tone, Colors, Texture, Space<br>2. Principles of Design- Grammar: Proportions, Contrast, Harmony, Balance, Rhythm, Unity<br>3. Rules of Design- Rules/ Guides: Emphasis, Proximity, Alignment, Visual path, Syntax Gestalt: Completion, Closure, Invariance, Multi-stability, Figure & ground etc<br>4. Optical illusions- Visual Influence:<br>Shapes & proportions, Tones & contrast, Lines & length<br>5. Typography- Type as a Design element:<br>Classification: Serif, Sans serif, Decorative, Trendy etc.<br>Measurement: size, weight, Kern, Track, leading, baseline etc.<br>Word Expression, Meaning expressed by appearance | 1. To learn about the elements of designing.<br>2. To study the Gestalt principle which helps to create perspective through designs.<br>1. Understanding different fonts and typefaces of an ad-copy.<br>2. Learning meaning and tone form the typography.<br>1. To study the focal point of an advertising and using this idea in making the creatives. | |
| **Module III- Layout: The Blue Print**<br>1. Types of Layout-<br>Mondrian, Picture window, Split, Big type, All text, All art, Circus etc.<br>2. Stages of Layout-<br>Thumbnail sketches, Rough layout, Finished layout, Comprehensive<br>3. Choosing Picture- | 1. To learn how negative space in a figure-ground is creative and gives new shapes and vision and adding meaning to the brand.<br>2. Learning about the types of layouts used in creating copies.<br>3. Understanding the process of creating layouts. | |

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| Strong visual capable of selecting Target Group, Suitable with headline, Trail close<br>4. Choosing Typo-<br>Sorting text into parts of copy.<br>Choosing appropriate typeface for Headline, Subheads Slogan, Body etc.<br>5. Putting all Together-<br>Choosing canvas size, Trying formats, orientations, Various proportions of verbal & Visual | | |
| **Module IV- Planning A Campaign: Working on Final Project**<br>1. Choosing a product<br>Finalizing what to sell.<br>Designing a Logo: Type based, Shape based, Combo, Symbolic etc.2. Research<br>Product/ Service (feature & benefits)<br>Market: Wants & Needs, Psycho & Demography, What words may click their minds.<br>Tone & Voice<br>3. Idea generation<br>Coming to big idea, Trying various idea generation techniques<br>4. Visualizing Layout<br>Choosing appropriate image/ s & working on rough layout<br>Finalizing layout for highest effectiveness. | 1. To learn the shapes and symbols from our surroundings.<br>2. To study the effects and beauty of colors from nature and use it in the creative. | |
| **Module V- Execution: On system work (Faculty to Guide & Instruct)**<br>1. Logo Design<br>Working on system: Corel Draw/ Illustrator<br>Designing Logo, Deciding color scheme<br>(Logo is vector based)<br>Modifying Typo, Using glyphs, Considering shape as identity<br>2. Logo Manual | 1. To study different types of logos and its meaning.<br>2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience. | |

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| Creating a Logo design Philosophy<br>Explaining the logic behind choice of Type, Choice of color, Reason for shape, Tagline as brand promise.<br>Making everything compact.<br>Creating 4 diff sizes & also reverse<br>3. Print Ads/ Press ads<br>Press: Using finalized layout for creating series of three ads (Synergy maintained)<br>Diff image same typo OR<br>Diff expressions same model-(brand ambassador) & same typo Creating headlines suitable to image (syntax)<br>4. Outdoor ad, Innovative/ Transit /Ambient Point of purchase<br>Outdoor: Deciding location, Format, Spotting frequency, Advantage of location, Advantage of local surroundings, Spotability, Appropriate headlines<br>5. TVC or Web Ads<br>TVC: Story line, Script, Floor plan, Camera plot,<br>Storyboard with, VFX, OSD, SFX, VO<br>Web ad: Pop up, Scroll, Banner etc<br>Printing, Mounting & Preparing for viva | | |



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**Faculty Name - Ms. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Advertising & Sales Promotion**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction**<br>1. Introduction-<br>a. Nature and importance of sales promotion,<br>b. Role of Promotion in the Marketing Mix<br>c. The Scope and Role of Sales Promotion<br>d. Reasons for the Increase in Sales Promotion<br>e. Consumer franchise building versus non franchise building promotions<br>2. Theories in Sales Promotion<br>a. Push promotion<br>b. Pull Promotion<br>c. Combination theory<br>3. The psychological theories behind sales promotion<br>a. Reciprocation<br>b. Social Proof<br>c. Foot-in-the Door Technique<br>d. Door- in-the-Face Technique<br>e. Loss Aversion<br>f. Social Norms Marketing<br>g. High, Medium, low | 1. To understand the process of sales promotion.<br>2. To understand the increased sales promotion activities.<br>3. To learn in detail the Theories of sales promotion. | CO1- Students should be able to demonstrate a thorough understanding of the major sales promotion concepts.<br>CO2- Use a framework to make effective sales promotion decisions.<br>CO3- Adopt the necessary skills and point of view of an effective sales promotion Campaign. |
| **Module II**<br>1. Methods of consumer- oriented sales promotion<br>a. Sampling<br>b. Coupons<br>c. Premiums<br>d. Refund, rebates, cash backs<br>e. Contests and Sweepstakes<br>f. Bonus pack<br>g. Price off<br>h. Exchange offers | 1. To study the types of consumer-oriented sales promotion.<br>2. To study about cooperative advertising.<br>3. To study the objectives & types of sales force promotions. | |

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| i. EMI<br>j. Demonstration of product<br>k. After Sale Service<br>2. Methods of Trade oriented sales promotion<br>a. Contest & Incentives for dealers<br>b. Trade allowances (Buying allowances, slotting allowances, promotional allowances)<br>c. Point of purchase displays<br>d. Sales training programs<br>e. Trade shows and dealer conferences<br>f. Stock return<br>g. Credit terms<br>h. Dealer trophies<br>3. Methods of sales force oriented sales promotion<br>a. Bonus and incentives to Sales Force<br>b. Sales Promotion Contest<br>c. Sales Meetings and Conferences:<br>d. Free travel<br>e. Sales literature<br>f. Demonstration kits<br>g. Honor or recognition | | |
| **Module III**<br>1. Study and analyze sales promotion campaign on the major brands<br>a. Three loyalty programs. (One each of FMCG, Consumer durable and service)<br>b. Three Consumers oriented sales promotion program. (One each of FMCG, Consumer durable and service)<br>c. Three trade oriented sales promotion programs. (One each of FMCG, Consumer durable and service)<br>d. Three sales force oriented sales promotion programs. (One each of FMCG, Consumer durable and service) | 1. To study and analyze sales promotion campaigns through various contemporary case studies. | |

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| e. Two sales promotion of any luxury brands | | |
| **Module IV**<br>1. Predicting Sales Promotion Effects<br>a. Evaluation Methods of sales promotion<br>b. Short term and long term effects of sales promotions<br>c. Long-term impact of sales promotion on brand image<br>d. Influence of Sales Promotion on Customer Purchasing Behaviour<br>2. Steps in Designing of sales promotion campaign<br>a. Designing Loyalty, continuity and frequency program<br>b. Big Data and Loyalty<br>c. Gratification and Loyalty<br>3. Coordination sales promotion & Advertising<br>a. Budget allocation<br>b. Coordination of Ad and Promotion Themes<br>c. Media Support and Timing<br>4. Sales promotion Abuse<br>a. Over use<br>b. Sales promotion trap | 1. To understand how to retain consumers through value-added promotions.<br>2. To learn how to design a sales promotion campaign.<br>3. To study in detail about the budget allocation for the promotion.<br>4. To study about the sales promotion traps. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Fundamentals of Mass Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Introduction and Overview<br>1. Meaning and importance of Mass Communication<br>2. Forms of Communication: Intra Personal Communication, Interpersonal Communication, Group Communication, Mass Communication: Electronic, Satellite, Interactive, Digital<br>3. Communication etc.<br>4. Models of Communication: Gerber's Model, Sociological Model, Gatekeeping Model, Defleur's Model of the Taste- differentiated Audience Model, Hub Model, Sadharanikaran. | 1. To understand the need of Mass communication<br>2. Learning of various mass communication models.<br>3. Understanding their functions and barriers of mass communication. | CO1- To introduce students to the history, evolution and the development of mass communication in the world with reference to India.<br>CO2- To study the evolution of mass media as an important social institution.<br>CO3- To understand the development of the mass communication models.<br>CO4- To develop a critical understanding of Mass Media.<br>CO5- To understand the concept of New Media and Media convergence and its implications. |
| **Module II:** History of Mass Communication:<br>1. From Oral to Communication (Kirtan, Davandi, Powada, Nagara)<br>2. From Electric to Electronic communication, From Electric to Digital Communication, Contemporary Scene in Indian Communication Landscape. | 1. Understanding the difference between mass communication and mass media.<br>2. To learn various tools of mass communication.<br>3. Understanding the importance and nature of Audiences. | |
| **Module III:** Major Forms of Mass Media<br>1. Traditional and Folk Media<br>2. Print: Books, Newspapers, Magazines<br>3. Broadcast: Television, Radio<br>4. Films | 1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society.<br>2. Helping students to understand | |

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| 5. Internet | more clearly with the help of case studies.<br>3. Showing the contribution of various religion reformers in saving their valuable literature. | |
| **Module IV**: Impact of Mass Media on Society:<br>A.I. Social Impact (with social reformers who have successfully used mass communication)<br>II. Political impact (with political leaders who have successfully used mass communication)<br>III. Economic Impact (With how economic changes were brought about by mass communication)<br>IV. Development Impact (With how the government has successfully used in mass communication)<br>B. Impact of mass media on:<br>1. Education,<br>2. Children<br>3. Women<br>4. Culture<br>5. Youth<br>6. Development. | 1. Understanding media and its convergence; how new mass media is a back bone to society.<br>2. To understand how the new mass media allows a huge increase in the volume of communication.<br>3. In- depth understanding of social media on mass communication. | |
| **Module V**: The New Media and Media Convergence:<br>1. Elements and features of new media, Technologies used in new media,<br>2. Major Challenges to new media Acquisition- personal, social and national,<br>3. Future prospects. | 1. Creating awareness in the masses due to the emergence of technology.<br>2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom.<br>3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies. | |



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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Current Affairs**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module 1**: Current National stories:<br>1. Three political stories of national importance.<br>2. Political Leaders: newsmakers of the season (Brief profile of any three)<br>3. One dominating economic / business news<br>4. One dominating environment news stories<br>5. One story of current importance from any other genre. | 1. To learn about political stories of national importance.<br>2. To also know in detail the contributions of political leaders and their history.<br>3. To know the environment more nearly covering genres of news. | CO1- To provide learners with an overview on current developments in various fields.<br>CO2- To generate interest among the learners about burning issues covered in the media.<br>CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news.<br>CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture. |
| **Module 2**: Polity and Governance:<br>1. Ministries of Government of India: Autonomous Government bodies<br>2. Ministry of Home Affairs: Enforcement Organizations, Internal Security, Police<br>3. Communal tensions: Review of latest episodes of communal tensions.<br>4. Tensions in J&K: Background, Political players, Update on the current situation<br>5. Review of any three Central Government projects and Policies. | 1. To introduce and understand the government of India.<br>2. In-depth information about the Home Ministry and its Ministerial Team.<br>3. Covering all the aspects of communalism and communal violence/ tensions.<br>4. To know more about Jammu and Kashmir and its issues.<br>5. Understanding in-depth about Governmental schemes, projects and policies. | |
| **Module 3**: International Affairs:<br>1. Security Council: Structure and role<br>2. Issues that currently engage the SC | 1. To learn about United Nations Systems.<br>2. To highlight the key functions and roles of the United Nations General Assembly.<br>3. To discuss and understand | |



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| 3. Role of United Nations General Assembly, Other main organs of the UNO.<br>4. Issues that currently engage the UNO<br>5. Four conflicts/ issues of international importance. | international issues and conflicts. | |
| **Module 4:** Maharashtra Issues:<br>1. Political parties reach and challenge political leaders.<br>2. An update on the current political dynamics of Maharashtra<br>3. News relating to the marginalized and displaced tribes.<br>4. The latest news on floods and drought, unemployment, health issues, etc<br>5. Update two ongoing state projects | 1. To learn in detail about the history of polity in Maharashtra.<br>2. To also understand past and current situations of politics and their political leaders.<br>3. Introducing students to the marginalized and displaced Tribes.<br>4. Talking about developmental projects of the state. | |
| **Module 5:** Technology<br>1. Mobile Application for Journalists:<br>Mobile apps help in content creation, Examples of Mobile apps used by journalists worldwide<br>2. Artificial Intelligence and Content Automation Tools:<br>Introduction to AI and data science, Introduction to Content Automation tools, Examples of content automation tools in content creation.<br>3. Augmented Reality and Virtual Reality in Media:<br>Introduction to Augmented Reality, Introduction to Virtual Reality, Examples of Augmented Reality games and apps, Examples of Virtual Reality news websites worldwide.<br>4. Digital Gaming Industry:<br>Introduction to Digital Gaming Industry<br>5. Digital Gaming in India:<br>Overview of Indian digital gaming | 1. To highlight the use of mobile applications and strategies to capture the attention of readers.<br>2. To understand the cusp of rapid transformation with digital media.<br>3. To learn some of the content automation tools and its handlings.<br>4. Introducing students to Virtual Reality and Augmented Reality.<br>5. To learn and discuss digital gaming and how it leads to market growth. | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Introduction to Communication<br>1. The concept of communication: Communication, its concepts, process Importance of Communication in Media; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication.<br>2. Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication Advantages of verbal communication- Significance of Non-verbal Communication.<br>3. Oral Communication and Media: Anchoring, voice, modulation, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion.<br>4. Listening Skills: Listening Process, Classification of listening; Purpose of Listening; Common Barriers to the Listening Process; Measures to Improving Listening; Listening as an important Skill in Workplace. | 1. To understand and introduce communication<br>2. To understand the process and types of communication<br>3. To enhance the listening skills required to communicate effectively. | 1. To make students aware of the functional and operational use of language in media.<br>understand each type in detail.<br>2. To equip or enhance students with structural and analytical reading, writing and thinking skills.<br>3. To introduce key concepts of communications. |
| **Module 2**: Reading- English, Hindi or Marathi<br>1. Types of Reading: Types of reading -skimming and scanning Reading- examples newspaper/ Magazine article, TV, feature and documentary, radio bulletins, | 1. Understanding reading and its types.<br>2. Understanding languages and their aspects when communicating through various platforms. | |

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| advertising copy, press release in English, Hindi or Marathi. Recognizing aspects of language particularly in media. Importance of spelling.<br>2. Various aspects of language: Recognizing various aspects of language particularly related to media, Vocabulary 100 media words.<br>3. Grammar and Usage: Grammatical structure- spelling, structure of sentences, Active/ Passive voice, tenses, Idioms, Phrases, proper usage of homophones, homonyms etc. | 3. To get deeper and broader knowledge about grammar aspects. | |
| **Module 3**: Thinking and Presentation<br>1. Thinking:<br>1.Types of thinking (rational, logical, critical, lateral, etc.) Errors in thinking, Partialism, Time scale, Egocentricity,<br>2.Prejudices, adversary Thinking.<br><br>2. Presentation: Presentation, its importance, steps in making a presentation; delivering a Presentation. | 1. To make students understand the importance of thinking and its role in communication.<br>2. Understanding types and errors of thinking.<br>3. To understand presentations and the tips on how to deliver and communicate effectively. | |
| **Module 4**: Translation<br>1. Introduction to Translation: Concept, importance, need for translation, challenges in translation, problems and importance of Information and Technology in translation.<br>2. Interpretation: Meaning, Difference between interpretation and translation.<br>3. Role of a translator: Translator and its Role in Media, Qualities, Importance of Translator, Challenges faced by translator. | 1. Understanding the concept, needs, and technologies of translation.<br>2. Understanding the difference between interpretation and translation.<br>3. To understand the translator's perspective for effectively communicating in the media. | |



SHETHMLV COLLEGE OF SCIENCE & COMMERCE
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MUMBAI-69.

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Overview of India Society:<br>Understand the Multi-cultural diversity of Indian Society through its demographic composition.<br>Population distribution according to religion, caste, and gender<br>Appreciate the concept of Linguistic diversity in relation to the Indian situation<br>Understand regional variations according to rural, urban and tribal characteristics<br>Understanding the concept of diversity as difference. | 1. To understand the cultural and religion wise composition.<br>2. To learn the classification of Indian Languages.<br>3. To understand the regional variations in India. | CO- 1 To introduce students to the overview of the Indian Society.<br>CO-2 To help them understand the constitution of India.<br>CO-3 To acquaint them with the socio-political problems of India.<br>CO-4 The student will apprehend regional variations according to rural, urban and tribal characteristics.<br>CO-5 Students will become more aware of the political frameworks.<br>CO-6 Learners will comprehend the multi-cultural diversity of Indian society through its demographic composition. Appreciate the concept of linguistic diversity in relation to the Indian situation |
| **Unit-2**<br>Concept of Disparity-1<br>Understand the concept of disparity as arising out of stratification and inequality.<br>Explore the disparities arising out of gender with special reference to violence against women, female feticide (declining sex ratio), and portrayal of women in Media.<br>Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities. | 1. To learn the meaning of Social Inequality.<br>2. To learn about social stratification, its characteristics and its types.<br>3. To understand the class system.<br>4. To understand the declining sex ratio in India.<br>5. To learn about the status and portrayal of women in each era. | |
| **Unit-3**<br>Concept Disparity-2<br>Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof. | 1. To understand the inequalities of the caste system.<br>2. To learn about the causes of Communalism in India. | |

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ANDHERI (EAST)
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| Understand inter-group conflicts arising out of communalism<br>Examine the causes and effects of conflicts arising out of regionalism and linguistic differences. | 3. To learn about the remedial actions to overcome communalism, linguism, regionalism. | |
| **Unit-4**<br>The Indian Constitution;<br>The Structure of the Constitution- the Preamble, Main Body and Schedules<br>Fundamental Duties of the Indian Citizen<br>Tolerance, Peace and Communal harmony as crucial values in strengthening the social fabric of Indian society<br>Basic features of the Constitution. | 1. To understand the meaning of Preamble and its Characteristics.<br>2. To learn the structure of the Indian Constitution.<br>3. To learn about the significance of the Fundamental Duties, its advantages, and disadvantages. | |
| **Unit-5**<br>Significant Aspects of Political Processes:<br>The party system in Indian Politics<br>Local self-government in Urban and Rural areas<br>The 73rd & 74th Amendments and their implications for inclusive politics<br>Role and significance of women in politics. | 1. To learn about the multi-party system of Indian politics and its evolution.<br>2. To understand the working of the local self-government.<br>3. To learn the important features of the Amendments. | |



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ANDHERI (EAST)
MUMBAI-69.

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: History of Media**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction:<br>Evolution of Press in India-<br>a. Newspaper- The Rise of the Voice of India during British Rule.<br>b. India's Freedom Struggle and role of Media.<br>c. Independence and Rise of Newspapers,<br>d. Newspapers- A Social Aspect for Freedom Struggle,<br>e. Press Acts of India.<br>f. Press during the Emergency Period. | 1. To learn about the pointers in History of Newspapers in India.<br>2. To understand about the factors that added to the boom of newspapers in India.<br>3. To learn the role of the press in India's struggle for freedom.<br>4. To deeply understand the different Press acts of India. | CO1- Learner will be able to understand Media History through key events in the cultural history.<br>CO2- TO enable the learner to understand the major developments in Media History.<br>CO3- To understand the history and role of professionals in shaping communications.<br>CO4- To understand the values that's shaped and continues to influence Indian Mass Media.<br>CO5- Learner will develop the ability to think and analyze about Media.<br>CO6. To sharpen the reading, writing, speaking and listening skills that will help the students to understand the development of Media. |
| **Module-II** Language Press:<br>History of Indian Language Press in India-<br>a. Rise of Hindi Language Newspapers (detailed report on Vernacular Press in India referring to Newspapers).<br>b. Regional press and its popularity of Indian Regional Languages in various regions.<br>c. Vernacular Press Act,1876. | 1. To learn about the diversity and growth of Indian Language Newspapers.<br>2. To understand the effect of the vernacular press act on Indian Publishers.<br>3. To learn the difference between English newspapers and Language Newspapers. | |
| **Module-III** Documentaries and Films:<br>History of Documentaries and Films-<br>a. Genesis of Documentaries and Short Films (Screening of a few documentaries is essential- like Hindustan Hamara, Zalala, The Vanishing Tribe). | 1. To learn about different types of Documentaries.<br>2. To learn how to make documentaries.<br>3. To understand about Indian Documentary and the struggle for Indian Independence. | |

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| Role of Documentarians- P.V.Pathy, D.G.Tendulkar, K.S.Hirlekar, Paul Zils and Fali Billimoria, Anand Patwardhan.<br>b. Evolution of Film Making in India- Brief History, Photography to Moving Films.<br>c. Origin of Hindi Cinema.<br>d. Origin of Short films to what it is today, Role of YouTube and WhatsApp.<br>e. Great Masters of World Cinema. | 4. To learn about the New Media and their roles in Movie making. | |
| **Module-IV** Broadcasting: History of Radio and Television in India:<br>a. Radio and Television as Mass Media.<br>b. Radio and Television Broadcasting-<br>c. The beginning of Radio and Television Shows.<br>• A New Era in Broadcasting in India.<br>• Satellite Television and Privatization in Broadcasting.<br>• Advertising in India.<br>d. Internet Protocol Television. | 1. To study the history of Prasar Bharti Act.<br>2. To study the functions and objectives of Radio.<br>3. To study the Business model of the cable TV industry.<br>4. To understand the key recommendations of TRAI. | |
| **Module-** V Media Icons: Role of Media Icons in the History of Indian Media-<br>1. Raja Rammohan Roy<br>2. Bal Gangadhar Tilak<br>3. M.K.Gandhi<br>4. B.R.Ambedkar<br>5. K.P.Kesava Menon<br>6. K.C.Mammen Mapillai<br>7. Maulana Abul Kalam Azad. | 1. To study about the various movements of history.<br>2. To learn about our Media icons who played important role in marking the change. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Visual Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I**: Development to Visual Communication<br>Introduction to Visual Communication:<br>1. History and Development of Visuals<br>2. Need and Importance of Visual Communication<br>3. Visual Communication as a process and as an Expression, Language and Visual Communication<br>4. Visible Concepts:<br>• Plans and Organizational Charts<br>• Maps<br>• Chronologies<br>5. Invisible Concept:<br>• Generalization Theories<br>• Feelings or attitudes | 1. To understand communication and the aspects.<br>2. To introduce students to VISUAL AIDS and the history of visuals.<br>3. Understanding visual communication in detail with various connections.<br>4. To learn about visible and invisible concepts. | CO1- To provide students with tools that would help them visualize and communicate.<br>CO2- Understanding Visual Communication as part of Mass Communication.<br>CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.<br>CO4- To acquire basic knowledge in theories and languages of Visual Communication.<br>CO5- The ability to understand and analyze visual communication from a critical perspective. |
| **Module II**: Theories of Visual Communication<br>Sensual Theories<br>a. Gestalt<br>b. Construction<br>c. Ecological<br>Perceptual Theories<br>a. Semitics<br>b. Cognitive | 1. To extend the knowledge of the students by discussing theories and case studies.<br>2. To make them understand how the visual cortex works to create unified perception.<br>3. Knowing about complexity and multifaceted cognitive processes. | |
| **Module III**: Impact of Colors<br>Colors and Design in Visual Communication<br>1. Color Theory<br>2. Psychological Implications of color | 1. To understand theories related to color for visuals.<br>2. Understanding the psychological influence of color on perception.<br>3. Understanding in detail | |

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| 3. Colors and Visual Pleasure<br>4. Elements of Design | visual plans and designs. | |
| **Module IV:** Channels of Visual Communication<br>Tools/ Mediums of Visual communication:<br>1. Painting and Photography<br>2. Film and Television, Documentaries, Script Writing an Visualization<br>3. Comics and cartoons, Digital Images, Animation and VFX<br>4. News Papers, Advertisements, Photojournalism<br>5. Folk and Performing Arts, Theatre | 1. Understanding of various tools of visual communication.<br>2. Understanding various styles and types of visual communications.<br>3. To strategize visuals for mass appeals.<br>4. To understand the perception and structure of each platform. | |
| **Module V:** Language and Culture in the age of social media<br>Visual Communication in the Age of social media:<br>1. Ethics<br>2. Impact of Language and Culture, Images and Messages, Signs and Symbols (GIF, etc.)<br>3. Audience Behavior<br>4. Citizen Journalism, Going Viral<br>5. Visual Stereotyping in social media | 1. To adapt to new changes with the advent of technologies.<br>2. Understanding the ethics and audience behavior.<br>3. Understanding the role of stereotyping in social media. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Advertising**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction to Advertising:<br>1. Introduction to Advertising- Evolution, Importance, Features, Benefits, Limitation, Effects and 5 M's of Advertising.<br>2. Types of Advertising- Consumer, Industrial, Retail, Classified, Corporate, Public Service, Generic, National, Global, International, Social (CSR) and Advocacy.<br>3. Ethics and Laws in Advertising- Puffery, Subliminal, Weasel claim, Surrogate, Shocking ads, Controversial, Comparative, Advertising code of ethics, Regulatory bodies, Laws, and regulations.<br>4. Social, Cultural and Economic impact of Advertising- Women and advertising, Children and advertising, Senior citizen and advertising, Pop culture and advertising.<br>5. Theories- Stimulus theory, AIDA, Hierarchy, Means-Ends Theory. | 1. To understand the evolution of advertising<br>2. To relate with the advantages & disadvantages to consumers, traders, manufactures and society.<br>3. To understand advertising laws and ethics<br>4. To understand various types of advertising | CO1- To provide the students with basic understanding of advertising, growth, importance, and types.<br>CO2- To understand effective advertising campaigns, tools, models etc.<br>CO3- To comprehend the role of advertising, various departments, careers, and creativity.<br>CO4- To provide students with various advertising trends, and future. |
| **Module-2** Integrated Marketing Communication and Tools: | 1. To comprehend the concept of IMC<br>2. To understand the role and various tools of IMC | |

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| 1. IMC- Emergence, Role, Tools, Communication process, The IMC Planning Process.<br>2. Print Media and OOH Media- Basic concepts, Types of Newspapers advertising, Advantages and Disadvantages of Newspaper advertising, Magazines, Factors to consider for Magazine advertising, OOH Advertising, On-premise advertising, Transit advertising, Posters, Directory advertising.<br>3. Broadcast Media: Radio advertising Advantages and Disadvantages of Radio advertising, Television advertising and its Advantages and disadvantages, Film advertising and product placement- advantages and disadvantages.<br>4. Public Relation- Meaning of Public Relations, Types of PR, Difference between PR and Advertising, Difference between Publicity and Advertising, advantages and disadvantages of Public Relations, Advantages and Disadvantages of Publicity.<br>5. Sales Promotion and Direct Marketing- Growth and Types of Sales Promotion, Advantages and Disadvantages, Growth of Direct marketing, and its tools Advantages and disadvantages | 3. To be able to understand the difference between print media & Outdoor media<br>4. To get basic knowledge about Radio & Television as a means of mass communication and advertising | |
| **Module-3**<br>1. Introduction to Creativity- Importance of Creative process, Creative strategy development determining message theme, big idea, Positioning strategies, Types of Appeals.<br>2. Role of different elements in ads- Logo, Jingle, Company signature, Slogan Tagline, Illustration, Creating Radio commercial- words, sounds, clarity, coherence, etc. | 1. To make students understand the creative process in advertising industry<br>2. To make students comprehend the different elements in an advertisement<br>1. | |

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| 3. Elements of copy- Hendline, Sub headline, Layout, Body copy, Types of copy and slogan, creating storyboard. | | |
| **Module-4** Types of Advertising Agency, Department, Careers and Latest Trends in Advertising.<br>1. Types of Advertising Agency- Full service, Creative Boutique, Media buying agency, In-house agency, Specialized agencies and others.<br>2. Various departments in an agency- Account handling, Production, Art, Copy, Media, Public relation, Human resources, Finance and others.<br>3. Latest Trends- Rural advertising, Ambush advertising, Internet advertising, Email advertising, Advertainment, Advertorial, Mobile Advertising. | 1. To help students understand the different types of ad agencies and their basic difference<br>2. To be able to know the various departments in an ad agency<br>3. To understand the latest trends in career in advertising industry | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Content Writing**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation:<br>1. Grammar Refresher- With special emphasis on use of punctuation, preposition, capital letters and lower case.<br>2. Vocabulary building- Meaning, usage of words, acronyms.<br>3. Common errors- Homophones and common errors in English usage. | 1. To learn and revise English grammar.<br>2. To practice vocabulary building in order to understand its aspects and significance.<br>3. Learning about common errors while communicating in the English language and understanding the requirements for good writing.<br>4. In-depth knowledge of creativity exposure in creating | CO1- To provide students with tools that would help them communicate effectively.<br>CO2- Understanding crisp writing as part of Mass communication.<br>CO3- The ability to draw the essence of situations and develop clarity of thought. |

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| 4. Essentials of Good writing- With emphasis on writing with clarity, logic, and structure. | phrases and idioms. | |
| **Module-2** Editing Skills<br>1. Redundant words- Identifying redundant words and phrases and eliminating these.<br>2. Editing sentences- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>3. Editing captions- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>4. Editing Headlines- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>5. Editing copy- Structuring a story, creating a flow, editing redundant words/ phrases, and replacing wrong words/punctuation/grammatical errors. | 1. To understand some editing tips for better writing and encouraging readers to read which helps in publishing well.<br>2. To boost students to write and edit captions that are catchy and attractive.<br>3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning.<br>4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story. | |
| **Module-3** Writing Tips and Techniques<br>1. Writing tickers/scrolls- For Television news.<br>2. Writing social media post- Twitter and for other social networks.<br>3. Writing briefs/snippets- News briefs, Lifestyle and Entertainment snippets.<br>4. Caption writing- Picture stories, etc.<br>5. Writing Headlines- News headlines and features headlines | 1. To understand how to write tickers for the television medium.<br>2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks.<br>3. Understanding in detail writing methods for writing headlines and content briefs along with its software's and tools. | |
| **Module-4** Presentation Tools and Techniques<br>1. PowerPoint Presentation: | 1. Understanding PowerPoint presentations, their related terms and tools. | |

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| Uses of PowerPoint Tools<br>PowerPoint to Pdf<br>PowerPoint to self-animated presentation<br>Auto-timing of PowerPoint presentation<br>2. Infographic:<br>Color selection<br>Use of Clip art<br>Use of PowerPoint smart Tools<br>Minimalist animation for maximum impact<br>3. Three-minute presentation:<br>Content for single slide<br>Uses of phrases<br>Effective word selection<br>Effective presentation<br>4. Google Advanced search:<br>How to select relevant information<br>Locating authentic information<br>How to gather information for domestic and international websites.<br>5. Plagiarism:<br>How to do a plagiarism check<br>Paraphrasing<br>Citation and referencing style | 2. Understanding in detail infographics and their impact while making presentations.<br>3. Tips on how to make a presentation convincing to listeners and viewers.<br>4. To learn terms and concepts related to Google Advanced Search and Plagiarism in detail. | |
| **Module-5** Writing for the Web<br>1. Content is King- Importance of content<br>2. Less is more- Writing for Print media/social media like Twitter, etc.<br>3. Copywriting- Ad campaigns (Creative, witty and attractive)<br>4. Real Time content- Difference in writing for print vs digital<br>5. Keywords- Designing keywords for Search Engine Optimization. | 1. Understanding content and its essentials.<br>2. To differentiate between print and digital platforms and their content creation.<br>3. To understand the importance of keywords in Digital media. | |



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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Writing<br>1. Report Writing:<br>Report Writing (English, Hindi, or Marathi)<br>General report and News report writing- Basics and Format (Headlines, Sub-headline, Various type of Report)<br>2. Organizational Writing:<br>(English, Hindi, or Marathi) Internal communication,<br>E-mail- E-mail Etiquette, Overcoming Problems in E-mail Communication, Stakeholder communication, Circulars- Guidelines for writing a circular- language and writing style of a circular- format of a circular; Notices- Purpose- Format- Important points to remember while writing a notice, Letters of complaint, claim and adjustment, Consumer grievance letters, Letters under the Right to Information Act, Press Release, Letter to the Editor.<br>3. Writing for Publicity Materials:<br>Writing for Publicity Materials (English, Hindi, or Marathi)<br>Headline, Sub-headline, Body copy, Slogan, Jingle, Radio spot. | 1. To learn about report writing and its various elements.<br>2. Understanding in-depth headlines and their features.<br>3. To make students understand the need to communicate with internal and external publics of the organization company through types of organizational writing.<br>4. Understanding publicity in detail. | Co1- To make the students aware of the use of language in media and organization.<br>CO2- To equip or enhance students with structural and analytical reading, writing, and thinking skills.<br>CO3- To introduce key concepts of communication. |
| **Module-2** Editing<br>Editing:<br>(English, Hindi, and Marathi)<br>Principles of Editing,<br>Punctuation, Substitution of words, Restructuring of sentences, Re-organizing sentence sequence in a paragraph, Use of link words, | 1. To learn the ability to spot mistakes via editing.<br>2. To understand how editing is different from medium to medium.<br>3. To elaborate on grammar aspects for communicating effectively. | |

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| (Principles of Coherence and Cohesion), Writing Synopsis, Abstracts, Precis writing, Newspaper Editing and Magazine editing. | | |
| **Module-3** Paraphrasing and Summarizing<br>1. Paraphrasing- Meaning, how to use paraphrase in communication, Paraphrase in plagiarism, Translation<br><br>2. Summarization- Summarizing content, the points and sub-points and the logical connection between the points. | 1. To understand paraphrasing in writing communication.<br>2. The role of plagiarism while paraphrasing and translations.<br>3. Understanding summarization. | |
| **Module-4** Interpretation of Technical Data<br>Interpret Technical Data- Read graphs, Maps, Charts, write content based on the data provided | 1. To learn to interpret data resulting from pies, graphs, maps, and charts. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Globalization and Indian Society:<br>Understanding the concepts of Liberalization, privatization & globalization;<br>Growth of Information technology and communication and its impact manifested in everyday life;<br>Impact of globalization on industry- changes in employment and increasing migration;<br>Changes in agrarian sector due to globalization; | 1. To study the elements of liberalization, its advantages, and disadvantages.<br>2. To study the impact of Globalization on Indian Industries.<br>3. To study the role of IT and Communication. | CO-1: To introduce students to the overview of the Indian Society.<br>CO-2: To help them understand the constitution of India.<br>CO-3: To acquaint them with the socio-political problems of India.<br>CO-4: To understand stress and conflicts.<br>CO-5: To manage stress and conflicts in contemporary society.<br>CO-6: To learn about Contemporary Societal Challenges |

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| Rise in Corporate farming and increase in farmer's suicides. | | |
| **Unit-2** Human Rights:<br>Concept of Human Rights; Origin and Evolution of the concept;<br>The Universal Declaration of Human Rights;<br>Human Rights constituents with special reference to Fundamental Rights stated in the Constitution | 1. To study the basic characteristics of Human Rights.<br>2. To understand the evolution of Human rights.<br>3. To study the classification of the provisions of UDHR. | |
| **Unit-3** Ecology:<br>Importance of Environment studies in the current developmental context;<br>Understanding concepts of Environment, Ecology, and their interconnectedness;<br>Environment as natural capital and connection to quality of human life;<br>Environmental Degradation- causes and impact on human life;<br>Sustainable development- concept and components; poverty and environment. | 1. To study the concept and disciplines of Ecology.<br>2. To study the structure of Ecosystem and causes of environmental degradation.<br>3. To learns about Sustainable development and the global need for the Sustainable development | |
| **Unit-4** Understanding Stress and Conflict:<br>Causes of stress and conflict in individuals and society;<br>Agents of socialization and the role played by them in developing the individual;<br>Significance of values, ethics, and prejudices in developing the individual.<br>Stereotyping and prejudice as significant factors in causing conflicts in society.<br>Aggression and violence as the public expression of conflict. | 1. To learn about the levels of Stress.<br>2. To study about the types of Organizational conflict.<br>3. To understand the measures for resolving aggression and violence in society. | |
| **Unit-V**<br>Managing Stress and Conflict in Contemporary Society: | 1. To learn the assumptions & limitations in Hierarchy of Needs Theory.<br>2. To study the need for peace and harmony in India. | |



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| Types of conflicts and use of coping mechanisms for managing individual stress;<br>Maslow's theory of self-actualization;<br>Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society. | | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Journalism**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** History of Journalism in India:<br>Changing face of Journalism from Guttenberg to New Media.<br>Journalism in India- Earliest Publications,<br>The rise of Nationalist Press, Post 1947<br>The Emergency 1975, Post Emergency<br>Post Liberalization of the Economy boom in Magazines, Niche Journalism<br>How Technology Advancement has helped Media<br>New Media with special reference to Rise the citizen Journalism. | 1. To learn the history and eras of journalism along with challenges.<br>2. To understand the new media and technology advances.<br>3. To briefly understand the news transmission and gathering process.<br>4. To discuss and learn about how the internet led to the rise of citizen journalism along with its pros, risks, and nature. | CO1- To help media students to acquaint themselves with an influential medium of journalism that holds the key to opinion formation and to create awareness. |
| **Module-2** News and its Process:<br>Definitions of News,<br>The News Process from the Event to the Reader<br>What makes a good story?<br>Anatomy of a news story | 1. To get knowledge about news and the process of gathering news.<br>2. Elements required for a good news story.<br>3. Understanding the beats and parts of a news story in detail. | |

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| Types of Beats: Crime, Environmental, Entertainment, Educational, Agricultural, Sports, etc. | | |
| **Module-3** Principles and Format: What makes a Great Journalist- Objectivity, Accuracy, Without fear or favor, Balance Proximity<br>Difference between a PR and a Journalist<br>Criteria for Newsworthiness<br>Hard News/Soft News and blend of the two<br>News Reports, Features Editorials | 1. Understanding the avenues to explore in journalism.<br>2. To learn about journalists/ reporters and their practices on various platforms.<br>3. Understanding the types of news.<br>4. To make students understand the difference between PR and journalism. | |
| **Module-4** Career in Journalism- Reporter, Feature Writer, Mojo, Data Journalist, Real Time Journalist, Investigate Journalist, Rural Journalist, In-depth Journalist, Lifestyle Journalist. | 1. To learn and understand career prospects in journalism.<br>2. To encourage students to participate in grabbing opportunities related to the field. | |
| **Module-5** Covering an Event (Flip Class)<br>Background Research<br>Finding a News Angle<br>Capturing the Right Pictures for a Photo Feature<br>Writing Headline, Captions and Lead. | 1. To make students understand the importance of a piece of information to convert it into the news.<br>2. The unbiasedness and impartiality objectives must be cleared among the students.<br>3. To make understanding students to cover news from all angles and the format in writing news. | |

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**Faculty Name – Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Gender & Culture**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I Evolution, Need, Concepts and theories**<br>Evolution, features of cultural studies, Need and significance of cultural studies and media<br>Concepts related to culture- Acculturation, enculturation, ethnocentrism, cultural relativism, cultural shock and its relevance in media<br>Theories:<br>• Stuart Hall: encoding and decoding, Circuit of culture<br>• John Fiske: culture and industry<br>• Feminism and Post feminism<br>• Techno culture and risk – Ulrich Beck | 1. To understand the evolution of culture and significance of Cultural studies and media.<br>2. Brief learning on the concepts related to culture.<br>3. To learn and understand the various ideologies and theories reflecting the culture, gender, and media. | CO1- To discuss the significance of culture and the media industry.<br>CO2- To understand the association between the media, gender, and culture in the society.<br>CO3- To stress on the changing perspectives of media, gender, and culture in the globalized era. |
| **Module-II** Culture & Media:<br>Construction, commodification, impact and recent trends<br>Construction of culture- social, economic, political, religion and technology<br>2. Culture, industry and media- commodification, memes, representation, articulation, popular culture, power, cyber culture<br>3. Media and its impact on the cultural aspect of the society.<br>4. Culture industry and communication - with reference, to film, TV, social media, advertisements etc.,<br>5. Recent trends in Culture consumption: Changing values, Ideologies & its Relevance in the Contemporary society. | 1. To understand and discuss social constructionism and its terms.<br>2. To understand culture from various aspects such as politics, religion- technology and media.<br>3. Understanding how power is an integral element of culture and features.<br>4. To learn recent trends in culture consumption. | |
| **Module-III** Gender & Media Culture:<br>Role and influence of media | 1. To have a deeper understanding about | |

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| 1. The influence of the media on views of gender (theme, under representation, Stereotypes, Women & Men, Stereotypes Images, Roles, etc)<br>2. Role of social construction of gender, Changing Attitudes and Behaviour for empowernment of Women: Movements of Change.<br>3.Gender equality and media, Hegemonic masculinity in media.<br>4. Hegemonic Masculinity in Media.<br>5. Gender issues in news media (TV, radio, newspapers & online news). | influences of media on gender and views.<br>2. To discuss and have better understanding on gender equality with reference to the media.<br>3. To relate the gender challenges on various platforms. | |
| **Module-IV** Globalization & Media Culture: Global, Local, Consumer and the recent trends<br>1. Media imperialism<br>2. Globalisation and Local culture- Issues and Perspectives, threat to regional and local identities, Impact of global culture and its relevance in media and gender<br>3. Consumer culture and media in the era of globalisation.<br>4. Digital Media culture: Recent trends and challenges<br>5. Media and Globalisation: Global economic flows, global cultural flows, homogenization & fragmentation, glocalization, creolization, globalization & power. | 1. To know about current trends of globalization.<br>2. To discuss case studies and concepts relation to global culture.<br>3. Understanding about consumer culture and its evolution.<br>4. Elaborating the aspects related to issues and impact of cultures along importance in media and gender. | |

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## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Corporate Communication & Public Relations**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation of Corporate Communication:<br>1. Introduction to Corporate Communication:<br>Meaning, Need and scope of Corporate Communication towards Indian Media Scenario.<br>2. Keys Concept in Corporate Communication:<br>Corporate Identity- Meaning and Features,<br>Corporate Image- Meaning, Factors influencing corporate image,<br>Corporate Image creation sustainability & restoration,<br>Corporate Reputation & Management- Meaning, Advantages of Good Corporate Reputation.<br>3. Ethics and law in Corporate Communication:<br>Importance of Ethics in Corporate Communication,<br>Professional Code of Ethics,<br>Mass Media Laws: Defamation, Invasion of Privacy, Copyright Act, Cyber-crime and RTI. | 1. To study the features of corporate identity.<br>2. To study the advantages of corporate reputation<br>3. To study important code and ethics of corporate communication.<br>4. To study corporate communication and management | CO-1 To provide the students with basic understanding of the concepts of corporate communication and public relations.<br>CO-2 To introduce the various elements of corporate communication and consider their roles in managing media organizations.<br>CO-3 To examine how various elements of corporate communication must be coordinated to communicate effectively in today's competitive world.<br>CO-4 To develop critical understanding of the different practices associated with corporate communication with the latest trends and social media tools.<br>CO-5 Construct effective corporate communication and public relation plans/strategies. |
| **Module-2** Understanding Public Relations:<br>1. Introduction and growth of PR- Indian Scenario: | 1. To study the growth and importance of Public Relations.<br>2. To study the objective and significance of Public Relations in Business. | |

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| Meaning, Definitions, Scope, Objective and Significance of PR in Business.<br>Tracing Growth of PR in India, Internal & External PR,<br>Reasons for Emerging International Public Relations,<br>Mergers/Collaborations/Joint ventures between India and International PR agencies,<br>Advantages & disadvantages of Public Relations.<br>2. Role of PR in various sectors: Healthcare, Entertainment, Banking and Finance, Real Estate, Fashion and Lifestyle and Service.<br>3. Theories and Tools of PR: Grunting, Pseudo-events, Publicity, Propaganda, Persuasion, Situational theory, Diffusion theory and Various tools of Public Relations (Press conference, Press release, Media Dockets, Advertorials, Sponsorship). | 3. To study the key roles of PR in various sectors.<br>4. To study about theories and propagandas from various PR events. | |
| **Module-3** CCPR's Range of functions:<br>1. Media Relations- Importance of Media Relations, Sources of Media Information, Building Effective Media Relations, Principles of Good Media Relations, Media analysis & evaluation.<br>2. Employee Communication: Sources of Employee Communications, Organizing Employee Communications, Benefits of Good Employee Communications, Steps in Implementing an Effective Employee Communications Program, Role of Management in Employee Communications.<br>3. Crisis Communication: Impact of Crisis, Role of Communication in Crisis, Guidelines for Handling Crisis, Trust Building, Case Studies such as | 1. To study the various importance of Media Relations.<br>2. To study the principles and analysis of Media Relations.<br>3. To study effective communication with employees.<br>4. To study on managing the crisis through communication with various examples. | |

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| Nestle, Maggie, Indigo, Cadbury Dairy Milk, Nira Radia, Tylenol, etc. | | |
| **Module-4** Latest Trends, Tools & Technology role of social media in CCPR.<br>1. Emerging trends, tools & technology:<br>Today's Communication Technology, Importance of Technology to Corporate Communication, Pros and cons of technology used in Corporate Communication.<br>2. New Media Tools:<br>Website, Online press Release, Article marketing, Online newsletters, Blogs.<br>3. Role of social media:<br>Role of social media as Influential marketing, identifying brand threats, influencing journalist's stories, swiftly reacting to negative press, Viral Marketing, engaging and interacting, storytelling, E-Public Relations and its importance. | 1. To study how technology plays an important role in corporate communication.<br>2. To study about social media influencers.<br>3. To understand E-Public Relations and its importance. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**<br>**Unit-I**<br>1. Introduction:<br>Introduction to Radio,<br>2. History of Radio-Growth & Development,<br>Radio as a Mass Medium- uses & Characteristics, | 1. To study about the invention of Radio and the beginning of broadcasting<br>2. To study the golden age of American radio<br>3. To study the rise of radio networks and the Radio act of 1927 | CO1- The course is intended to explore the art of audio production.<br>CO2-The students are made familiar with the aesthetics of sound and its application in various radio program formats.<br>CO3-To provide them with the basic knowledge and understanding |

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| 3. Writing for the Radio- Who are you talking to?<br>What do you want to say?<br>4. Structure & Signposting,<br>5. The Script | 4. To understand the script writing style for Radio | of radio business and production. |
| **Module 2**<br>The Work of Producer:<br>1. Ideas,<br>2. The Audience, Resource Planning, Preparation of Material,<br>3. The Studio Session,<br>4. Post-Production,<br>5. Technician, Editor, Administrator & Manager. | 1. To learn how to generate ideas for a radio program.<br>2. To study research on different target audience<br>3. To understand the structure of the organization and their roles. | |
| **Module 3**<br>The Radio Studio:<br>1. Studio Layout,<br>2. The studio desk, Mixer, Control Panel console or Board<br>3. Digital Mixers,<br>4. Studio Software,<br>5. Digital Compression and Digital | 1. To understand about various equipment used to broadcast a radio program.<br>2. To learn about digital mixers and its importance.<br>3. To study the history of Sound recording | |
| **Module 4**<br>News-Policy & Practice:<br>1. Interesting<br>2. Nes Values- Accuracy, Realism, & Truth.<br>3. The Newsroom Operation,<br>4, The news conference & press release,<br>5. News reading and presentation: The seven Ps, News Reading, Pronunciation, Vocal Stressing, Errors & Emergencies. | 1. To study the News story material.<br>2. To understand news style for TV and Radio,<br>3. To study about Media Convergence and pragmatism | |
| **Module 5** Interviewing:<br>1. Types of Interviews,<br>2. What the Interviewee should know?<br>3. Preparation before the Interview and the Pre-Interview discussion,<br>4. Devil's Advocate,<br>5. Question Technique: Multiple questions and Leading Questions. | 1. To learn about various questioning techniques.<br>2. To learn about preparation done before the interview. | |



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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media Studies**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1 Introduction**<br>Eras, relevance, connection to culture literature:<br>• Era of Mass Society and culture-till 1965,<br>• Normative theories, Social Responsibility Theory<br>• Development media Theory. | 1. To learn various dynamics of culture and the theories.<br>2. To learn and differentiate various eras of Mass society. | CO1- To provide an understanding of media theories<br>CO2- To understand the relationship of media with culture and society<br>CO3- To understand Media Studies in the context of trends in Global Media<br>CO4 - To understand the impact of media on individual attitude, values, behavior, and geopolitics<br>CO5- To study the impact of new media technologies and pop culture in the field of advertising |
| **Module 2 Media Theories**<br>Propaganda and Propaganda Theory-<br>• Origin and meaning of Propaganda<br>• Hypodermic Needle/Magic bullet theory<br>• Harold Laswell<br>Scientific perspectives to limited perspectives:<br>• Paul Lazarfeld- Two-step flow theory<br>• Carl Hovland and Attitude change theory | 1. To understand various theories laid by theorists<br>2. To adapt change in perspective and attitude along with society and mass communication | |
| **Module 3 Cultural Perspectives**<br>Various Schools:<br>• Toronto School (McLuhan)<br>• Schools- Birmingham (Stuart Hall)<br>• Frankfurt- Theodor Andorno and Max Horkheimer. | 1. To understand theorists and their theories related to media and consumption<br>2. to learn about technological advances with eras.<br>3. To formulate and identify biases of communication and get in depth knowledge about | |

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| • Raymond Williams- Technological Determinism.<br>• Harold Innis- Bias of Communication.<br>Media and Identity:<br>Feminism/ Racism/Ethnicity. Caste/class/tribal/queer representations. (Indian examples) | social issues. | |
| **Module 4 Media Effects**<br>Theories on Media effects:<br>• Media effects and behavior<br>• Media effect theories and the argument against media effect theories<br>• Agenda Setting Theory<br>• Cultivation Theory<br>• Politics and Media studies- media bias, media decency, media consolidation. | 1. To understand the theories on media effects<br>2. To learn about media and its effect on behaviors.<br>3. To get an in-depth idea about the history of politics and current scenario as discussions. | |
| **Module 5 New Media and the Age of Internet**<br>Meaning Making Perspectives:<br>• New media<br>• Henry Jenkins- Participatory culture<br>• Internet as public sphere- Habermas to Twitter<br>• McLuhan's concept of Global Village in the age of Netflix<br>• Uses and Gratification in the age of the Internet. | 1. To learn about new media and its effects<br>2. To understand the new global village concept by theorist<br>3. To understand the evolution of the internet via theory. | |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: History:**<br>Still pictures to moving images<br>1.1 History of Cinema<br>1.2 Birth of Visual Art.<br>1.3 Understanding the Language of Cinema<br>1.4 Transition from Documentary to Feature Film | 1. To learn about History of cinema, its origin, and various phases of cinema<br>2. To learn about the language and key concepts of cinema<br>3. To understand the transition from documentary to feature films. | C01- To inculcate liking and understanding of good cinema.<br>C02- To make students aware with a brief history of movies; the major cinema movements.<br>C03- Understanding the power of visuals and sound and the ability to make use of them in effective communication.<br>C04- Insight into film techniques and aesthetics. |
| **Module 2. Understanding aspects of film appreciation**<br>2.1 Grammar, Technology and Art<br>Director- the captain<br>Writer- the back-bone.<br>2.2 Aspects of Film-1: Visual Aspects and Editing<br>Mise-en-Scene (Art, Costume, Camera placement)<br>Cinematography<br>Creating Meaning through editing<br>2.3 Aspects of Film-1: Film Sound<br>Three components of Film Sound<br>The relationship between Sound and Image | 1. To learn about techniques and technology in film making<br>2. To learn about film makers<br>3. To learn and understand various aspects of film appreciation and its components | |
| **Module 3: The Early Cinema: 1895-1950**<br>3.1 Early years (1895-1919) World and India<br>The Silent Era (1920-1931)<br>3.2 Early Sound Era (1930-1939)<br>3.3 The development stage (1940-1950) | 1. To learn about early years of world including Indian cinema<br>2. To understand the silent era and its transition till the development stage. | |
| **MODULE 4: Major Film movements and its impact** | 1. To know and introduce students to major cinema | |

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| 4.1 The major cinema movements and their film makers<br>4.2 Hollywood Cinema- Brief history of Hollywood, Star system, academy awards, global audience of Hollywood cinema<br>4.3 Italian neo-realism- Origin and impact on world cinema, work of Roberto Rossellini and Vittorio de sica<br>4.4 Japanese cinema- Work of Yasujiro ozu, Akira Kurosawa, Hayao Miyazaki, etc<br>4.5 Irani cinema: Contribution of Abbas Kiarostami, Majid Majidi, etc. | movements and filmmakers.<br>2. To know films from various countries and cultures and learn its concepts used in this industry.<br>3. To know about the contributions of people who got recognized and accredited for their hard work in the respective cinema. | |
| **MODULE 5: Mainstream Indian Cinema and parallel Indian Cinema**<br>5.1 Art v/s Commercial<br>5.2 Indian Meaningful cinema (Commercial)<br>• The Angry Young Man<br>• The Indian Diaspora and Bollywood<br>• Contemporary Bollywood Cinema<br>• Globalization and Indian Cinema, The multiplex Era<br>5.3 Golden era of Indian Cinema- Important work of Bimal Roy, Guru Datt, Raj Kapoor, and V. Shantaram<br>5.4 Indian New Wave cinema: Mrinal Sen, Mani Kaul, Girish Kasaravalli, MS Sathu<br>5.5 Parallel cinema: Contribution of Shyam Benegal, Govind Nihlani, Gulzar, Mani Kaul, Said Mirza, etc. | 1. To understand and have knowledge about art and commercial cinema.<br>2. To understand Indian diaspora and Bollywood<br>3. Learning about the important contributions as directors, producers, actors, actress and so on of persons and learning Indian new wave cinema in detail | |

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**Faculty Name – Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Photography**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module 1**<br>**Camera: The storyteller**<br>**1. The Body:** The faithful middleman<br>• The heart of the system<br>• How the camera sees differently than human eyes.<br>• Limitations and Wonders of camera.<br>• Formats of camera: Small Full frame, Half frame<br>• (APS-C), Medium, Large (camera movements)<br>• Experiencing frame<br>• Types of cameras: DSLR; View; Rangefinder; Mirrorless<br>**2. Aperture:** The iris of the camera<br>• Diaphragm<br>• Controls amount of light entering lens<br>• Factor in Exposure calculation<br>• Active factor of Depth of field and Bokeh (creative)<br>• F'-numbers and aperture scale.<br>• Application of Depth of Field in advertising and<br>• Journalism.<br>**3. Shutter:** The Click magic<br>• Blind between Lens and Image sensor<br>• Controls duration of light<br>• Major factor in Exposure calculation<br>• Main player in controlling action | 1. The understand about the body parts of a basic camera<br>2. To understand the formats and various concepts related to camera<br>3. To learn how a camera is a storyteller by capturing still images. | **C01-** To introduce to media learners the ability of an image into effective communication.<br>2. C02- To help the learner understand that media photography is a language of visual communication and beyond just point and shoot fun moments.<br>C03- To practice how a picture speaks thousand words by enlightening the learner on how.<br>C04- To develop the base of visualization among learners in using pictures in practical projects.<br>C05- To help learners work on a given theme of the subject into making relevant pictures or photo features. |

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| • Motion blur, Motion freeze and long exposure effects<br>• Application of motion blur/freeze in Advertising and<br>• journalism.<br>• Synchronization with Flash, Creative Slow sync<br>**4. Image sensor:** The retina that sees<br>• The image maker or recorder<br>• Film v/s digital<br>• Film: Photochemistry<br>• Digital: Photo-electronics<br>• Types of Sensors: CCD and CMOS<br>• ISO: Photosensitivity (Sensor/Film Speed)<br>**5. Viewfinder:** The interactive monitor<br>• The control room cum monitor<br>• Displays camera settings<br>• Aperture, Shutter and ISO<br>• Metering modes, Focusing modes, Exposure modes,<br>• Frame count, File format etc | | |
| **Module 2**<br>**Lens: Imaging device**<br>**6. The eye of camera:** Learning to see<br>• Main player in image formation, Focusing the object<br>• (Sharpening the image)<br>• Speed of the Lens (light intake ability)<br>• Numbers and Markings on the Lens<br>• AF, ED, IF, IS, SW, ASP etc.<br>**7. Focal length:** Which lens is suitable | 1. To understand techniques of how to capture images.<br>2. To understand various techniques and understand focal length.<br>3. To learn in detail the various types of lenses and its uses. | |

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| • The factor to consider for Type of Photography and<br>• choosing lens for the purpose.<br>• Main distinguishing factor<br>• Fixed V/s Variable focal length<br>**8. Image size:** See close<br>The magnification ratio of a lens<br>Longer focal length = Bigger image size<br>**9. Coverage angle:** Crop out unwanted<br>• Prime concern in Composition<br>• How much of a scene a lens takes in from a viewpoint?<br>• Safe focusing distance, Distortion: Barrel/ Pincushions<br>**10. Types of lenses:** The right one for the task at hand<br>• Prime Lens v/s Zoom lens<br>• Prime = Fixed focal length<br>• Zoom = Variable focal length<br>• Normal, Wide angle and Telephoto<br>• Special purpose lenses: Macro, Fish eye, Tilt-shift | | |
| **Module 3**<br>**Light: Parameters of Light- The essential raw material**<br>**1. Intensity and Exposure:**<br>Perfect tone<br>• How much light: consideration for exposure<br>• Exposure triangle (A, S, ISO) The model of exposure<br>**2. Direction and Lighting: Lighting for Cinema Television and Advertising**<br>• From where: direction begets shadow<br>• Shadow = Depth | 1. To learn about intensity and exposure of light while clicking an image<br>2. To understand in comparison with advertisements and various types of lighting.<br>3. To earn about color and moods in photography<br>4. To learn to be as creative as possible. | |



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- Lighting = Shading
- Three-point lighting
- Key: Main
- Fill: Contrast level (lighting ratio)
- Kicker: Separation or background light
- Types of lighting:
- Portrait, Effect, Ambient and Mood or drama

3. Quality and Ambience: Why there are umbrellas and reflectors

- How soft or how hard:
- Effective size of light source
- Small: Hard, Contrast, Sharp
- Medium: Mid soft, moderate contrast, soft shadow
- Large: Extra soft, low contrast, shadowless
- Modifiers: Umbrella, Soft-box, Reflector, Diffuser,
- Grid, Gobos

**4. Color and Mood: What tells Cozy or Cool**

- Color of light concept: Main distinguishing factor
- Kelvin: Color temperature Pure light>True colors
- White balance: Neutralizing
- Preset white balance and AWB
- Color and Mood (warm/cool)

**5. Measure: The Director in you is the King**

- Light meter: Main input of exposure
- Incident v/s Reflective (advantage / disadvantage)
- In built meter and Metering modes:
- Average, Center weighted, Spot, Matrix, Focus

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| • priority<br>• Exposure Modes: M, A, S, P, and Smart program modes<br>• Errors in inbuilt metering>Exposure compensation | | |
| **Module 4**<br>**Composition: Art of Seeing> Way of portraying a subject**<br>**1. Frame and Aspect ratio**<br>• Dimensions of sensor and proportion<br>• Aspect ratio: 2:3/ 4:5/ 16:9 (HD)<br>**2. Visual indicators**<br>• Line, Shape, Size, Tone, Color, Texture, Space and Center of interest; Subject= Aesthetic Assembly of Objects<br>**3. Rules of composition**<br>• Rule of thirds/ Balance/ Leading lines/ Frame within frame, Enhancing depth/ Unusual viewpoint/ Shadow/ Pattern breaking<br>• Cropping, Panorama, Flattening<br>**4. Breaking the Rules**<br>Cropping, Panorama, Flattening<br>**5. Viewpoint and Perspective:**<br>• 1-, 2- and 3-point perspective: Vanishing points and viewpoint<br>• Normal: The way we see<br>• Enhanced: Exaggerated depth<br>• Compressed: Feeling of distance taken away<br>• Forced: Unrealism<br>• Aligned: Back projection and green screen application | 1. To understand concepts related to frame and aspect ratio<br>2. To understand the types under composition<br>3. To understand in detail about viewpoints and perspectives along with types. | |

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| **Module 5**<br>**Digital Imaging: Electronic format**<br>1. Image sensor<br>Format, 135mm/ APS-C, Medium format, large format<br>2. Megapixel<br>Pixel and its values, Total number of pixels, File size<br>3. Resolution<br>Pixel Per inch: Quality of image, magnification of image<br>4. Image Magnification<br>Viewing distance, Image size and Pixelation<br>How large an image can be forgiven megapixel<br>5. File Format<br>RAW, JPEG, TIFF (Bit and Compression) advantages and limitations of Raw format | 1. To learn about electronic format<br>2. To learn about pixels and its values and megapixel<br>3. To understand various types of files saved and limitations of RAW format | |

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1 Photoshop: Pixel based Image editing Software**<br>**1. Introduction to Photoshop**<br>Image editing theory<br>Bitmaps v/s Vectors<br>When to use Photoshop and when to use drawing tools<br>**2. Photoshop Workspace**<br>The tools, Toolbox controls<br>Property bar, Options bar, Floating palettes<br>**3. Working with images**<br>Image mode, Image size, canvas size | 1. Learning Introduction to Photoshop Image editing theory Bitmaps v/s Vectors When to use Photoshop and when to use drawing tools.<br>2. Understanding the Photoshop Workspace, The tools, Toolbox controls Property bar, Options bar, Floating palettes.<br>3. Learning and working with images Image mode, Image size, canvas size Image resolution, size and resampling. | Co1- To equip the students with an understanding of industry knowledge required to make a career in the field of print and Advertising, Digital Marketing, Television media, Film etc.<br>CO2- To train them with the software knowledge required in the above-mentioned Industries. |

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| Image resolution, size and resampling<br>**4. Image Editing**<br>Levels, Curves,<br>Contrast adjustment,<br>Color adjustment Photo filters<br>**5. Working with Text**<br>Text layer, Character palate, Paragraph palate<br>Text resizing, Text color, Text attributes<br>Working on simple project/ one page design | 1. learning Image Editing Levels, Curves, Contrast adjustment, Color adjustment Photo filters.<br>2. Understanding and Working with Text layer, Character palate, Paragraph palate Text resizing, Text color, Text attributes Working on simple project/ one page design. | |
| **Module 2- CorelDraw: Vector based Drawing software**<br>**1. Introduction to CorelDraw**<br>CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats<br>**2. Using text**<br>Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C:<br>**3. Exploring tools**<br>Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos<br>**4. Applying effects**<br>Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips<br>**5. Exporting in CorelDraw**<br>Exporting, Types of export, Exporting for other software | 1. Understanding the Introduction to CorelDraw. CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats.<br>2. Learning to Using text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C.<br>3. Understanding the Exploring tools Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos.<br>4. Learning how to Applying effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Understanding the Exporting in CorelDraw Exporting, Types of export, Exporting for other software. | |
| **Module 3- Quark Xpress/ InDesign: Layout Software**<br><br>**1. Introduction to QuarkXPress**<br>List the menus, List the tools, | 1. Understanding of Introduction to QuarkXPress List the menus, List the tools, Benefits of using Quark, Application of Quark. | |

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| Benefits of using Quark, Application of Quark<br>**2. Text Edits in Quark**<br>Format of text, Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>**3. Using palettes**<br>Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark,<br>**4. Color correction in quark**<br>Embedding images in proper formats, Color correction on the images,<br>Adjusting according to the color tone of the publication,<br>**5. Exporting files**<br>Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | 2. Learning to Text Edits in Quark Format of text, Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images.<br>3. Learning how to Use palettes Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark.<br>4. Understanding the Color correction in quark Embedding images in proper formats, Color correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning how to Export files Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **Module 4- Premiere Pro: Audio-visual: Video editing software**<br>**1. Introduction to editing**<br>Editing importance, Great editing examples, Editing for different formats (film/ad/news/etc.)<br>**2. Introduction to premiere**<br>How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/etc.)<br>**3. Understanding file formats**<br>Understanding different file formats (AVI/MPEG/MOV/H264, etc.), Importing raw footage for edits, performing video checks while editing<br>**4. Using color grading**<br>What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing<br>**5. Exporting and rendering** | 1. Understanding of Introduction to editing importance, Great editing examples, Editing for different formats (film/ad/news.)<br>2. Learning How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows.)<br>3. Understanding file formats Understanding different file formats (AVI/MPEG/MOV/H264), Importing raw footage for edits, performing video checks while editing.<br>4. Learning how to Use color grading What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning to Export and | |

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| Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintain file format, improving quality and time to render techniques | rendering Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintaining file format, improving quality and time to render techniques. | |
| **Module 5- Sound Forge/Sound Booth: Sound Editing Software**<br>**1. Introduction to Digital Audio**<br>Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate<br>**2. Concept of Dolby Digital**<br>Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker<br>**3. Sound Recording**<br>Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software<br>**4. Working with Sound**<br>Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter<br>**5. Advanced Sound Processing**<br>Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters | 1. Learning the Introduction to Digital Audio Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate.<br>2. Understanding the Concept of Dolby Digital Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker.<br>3. Understanding the Sound Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software.<br>4. Learning and Working with Sound Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter.<br>5. Understanding the Advanced Sound Processing Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1** The Discussion:<br>1. Format,<br>2. Selection of Participants,<br>3. Preparation,<br>4. Speaker Control & Technical Control,<br>5. Ending the Program. | 1. To study various Interview styles.<br>2. To study about different Radio formats.<br>3. To learn techniques for ending a radio program. | CO1. To give learners basic knowledge of radio/audio production theory, techniques, and aesthetics via practical experience in the writing and production of several program formats.<br>CO2. To make them familiar with the art of audio recording, editing, mixing, and aural storytelling techniques. |
| **Module 2 Commentary**<br>1. Preparation work with the Base Studio,<br>2. Different Sports,<br>3. Communicating Mood & Coordinating the images,<br>4. Content & Style,<br>5. News Action & Sports actions. | 1. To understand different Base Stations.<br>2. To learn structure of commentary as the state of art<br>3. To understand the beginning of sports broadcasting<br>4. To learn different types of Commentary. | |
| **Module 3** Using the Internet and social media<br>1. An online presence,<br>2.Internet radio,<br>3. Radio podcasts,<br>4. Internet Research,<br>5. Making the best use of social media | 1. To study the evolution of the Internet.<br>2. To understand the working of Social Networking.<br>3. To briefly understand the making & working of Radio podcasting | |
| **Module 4** Phone-ins | 1. To understand how-to pick-up subjects for the phone-in | |

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| 1. Technical facilities, Program classification,<br>2. The open line & choosing the calls,<br>3. The role of the Host & the Host style,<br>4. Reference Material, Use of Delay,<br>5. Linking Programs together, personal counseling, the Presenter as Listener. | programs.<br>2. To learn the reasons to take live calls. | |
| **Module 5** Making Commercials:<br>1. Copy Policy,<br>2. The Target Audience,<br>3. The Product or Service 'premise',<br>4. Voicing & Treatment,<br>5. Music and effects. | 1. To understand the subsistence of Copyright.<br>2. To understand the difference between commercials vs. Non-commercial radio<br>3. To learn the tips to mastering Radio voice. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Writing & Editing for Media**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: Print Media**<br>Writing for Print Media:<br>1. What makes news? (Determinants of news),<br>2. Art and basic tools of writing,<br>3. Steps and elements of writing-editorials, features, and review,<br>4. Writing for Newspapers & Magazine,<br>5. Writing a News story/ feature stories/ Article/ Editorials (differences)<br>6. Leads, nut shelling, & story structure,<br>7. Writing style and the storybook | 1. To learn the art and basic tools of writing.<br>2. To study the elements of News stories.<br>3. To learn the types of Feature stories and how to craft the story.<br>4. To study different writing style guides | CO1. Provide the ability to understand writing styles that fit various media platforms.<br>CO2. It would help the learner acquire information gathering skills and techniques.<br>CO3. On completion of this course, students will be able to understand similarities and differences in writing for all forms of media including the internet and digital.<br>CO4. The learner will gather knowledge of different news and copy formats along with appropriate style-sheets and layout. |

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| 8. Public Relations & Corporate Writing- various forms<br>Writing for Advertisements | | CO5. The learner will imbibe the importance of writing clearly, precisely, and accurately for different types of audiences<br>CO6. Provide basic proficiency in proof-reading and editing. |
| **Module 2: Radio and Television**<br>Writing for Broadcast Media:<br>1. Radio & Television: Challenges & Weakness,<br>2. Writing Script for different Radio Programs,<br>3. Script writing formats<br>4. Writing for Interviews, Live news & daily news,<br>5. Radio jockeying / online radio and new trends<br>Storyboarding for Television commercials. | 1. To study how to write scripts for the Broadcast media.<br>2. To study about the different scripting formats.<br>3. To learn the Rundown sheet for Radio program<br>4. To learn the tips and techniques to write the television commercial | |
| **Module 3: Digital Media**<br>Digital Media: A sunrise opportunity<br>1. Difference between- Newspaper writing & web writing, Headline writing, deck heads, Subheads, Lists & hyperlinked content.<br>2. How to produce well-written webpages<br>Writing content for the web, digital spaces & digitally distributed media,<br>3.Development of Web-specific style guides, convergence of text & video on digital,<br>4. Emerging fields of personal publishing including blogging & micro blogging. (or publishing on LinkedIn)<br>5. Dealing with Breaking news & fake news in real time.<br>6. Writing for Advertisements through emails & SMS.<br>7. Writing Blogs | 1. To study the difference between newspaper writing and writing for the web.<br>2. To learn about Digital Convergence and audience engagement<br>3. To learn how to write blogs and essentials of blogging | |
| **Module 4: Editing**<br>Evaluation of content | 1. To learn how to edit a copy.<br>2. To study the principles of | |

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| 1. Checking spelling & grammar, Checking news/magazine copies for headlines, sub heads, use of graphics & illustrations for construction and information flow in Newspapers.<br>2. Rewriting leads.<br>3. Achieving fitment with spacing requirements at any newspaper, magazine, or webpage.<br>4. Checking Advertising agency copies, checking headlines/sub headline (type appeal) and maintaining sequence and flow in body copy.<br>5. Online editing:<br>editing requirements, content, layout, clarity, style, conciseness, online headlining-website design. | good news editing.<br>3. To learn the general tips for proofing and editing. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Laws & Ethics**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE 1:** Constitution and Media:<br>1. Core values of the Constitution: Refreshing Preamble, unique features of the Indian Constitution<br>2. Freedom of Expression: Article 19 (1) (a), Article 19(2)<br>3. Judicial Infrastructure: Hierarchy of the Courts, Independency of the Judiciary, Legal terminologies<br>4. Social responsibility of the media: Social Responsibility Theory, Emerging issues in Social Responsibility, Theory in today's era | 1. To learn about preamble and constitution<br>2. To understand about various freedoms like speech and expression<br>3. To develop a sense of social responsibility towards society by understanding they theory<br>4. To learn social media and its related concepts in detail | CO1- To provide the learners with an understanding of laws those impact the media.<br>C02- To sensitize them towards the social and ethical responsibility of the media. |

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| 5. Social media: Threat of Fake news and facts verification social media decorum | | |
| **MODULE 2:** Regulatory Bodies:<br>1. Press Council of India:<br>1. Brief History: Statutory status<br>2. Structure and Importance<br>3. Powers and limitations<br><br>2. TRAI: Role of Telecom Regulatory Authority of India<br><br>3. IBF:<br>1. Indian Broadcasting Foundation<br>2. Broadcasting Content Complaints Council<br>3. Broadcasting Audience Research Council<br><br>4. ASCI:<br>1. Advertising Standard Council of India<br>2. Mission<br>3. Structure<br>4. Consumer Complaint Council<br><br>5. NBA:<br>1. News Broadcasters Association<br>2. Structure<br>3. Mission<br>4. Role | 1. To know about Press Council of India<br>2. Introducing TRAI to students to understand the telecommunication industry<br>3. Understanding about various regulatory bodies related to media and their functions | |
| **MODULE 3:** Media Laws:<br>1. Copyright and IPR:<br>What is copyright, Intellectual Property Rights, Exceptions, Major Amendments, Recent Case Studies<br><br>2. Defamation:<br>1. Definition,<br>2. Civil, Criminal,<br>3. Exceptions,<br>4. Recent Case Studies<br><br>3. IT Act:<br>1. Information Technology Act, 2000 | 1. To know importance related to IPR<br>2. To learn defamation and it laws in India<br>3. To know and understand what is contempt of court and its punishments<br>4. To know prohibition of Drugs and magical Remedies advertisements under act. | |

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| 2. Amendment 2008<br>3. Section 66A<br>4. Section 67<br>5. Case Studies<br><br>4. Contempt:<br>1. Contempt of Court<br>2. Contempt of Parliament<br><br>5. More acts:<br>1. Drugs and Magic Remedies (Objectionable Advertisements) Act<br>2. Emblems and Names (Prevention of improper Use) Act | | |
| **MODULE** 4: Media Laws:<br>1. Right to Privacy:<br>1. Evolution<br>2. Right to Privacy a fundamental Right<br><br>2. Morality and Obscenity:<br>1. Indecent Representation of Women's Act<br>2. 19.2, IPC 292, 293<br>3. Change in perception with time<br><br>3. Unfair Trade Practices:<br>Unfair Trade Practices and the Competition Act,2002<br><br>4. OSA:<br>1. Official Secrets Act<br>2. Controversies<br>3. Case Studies<br><br>5. RTI:<br>1. Right to Information Act, 2005<br>2. Brief History<br>3. Importance and current status | 1. To know and learn about privacy and its conflict to RTI<br>2. To discuss and learn about women in current situation and trends and Indecency Representation on Women's Act<br>3. To understand about various organizations laid by Media bodies underlying certain laws, sections, and its functions. | |
| **MODULE 5:** Media Ethics and Social Responsibility<br>1. Why Ethics:<br>What is ethics, and why do we need ethics?<br>2. Ethical Responsibility of Journalist: | 1. To understand role and concepts related to ethics<br>2. The ethical responsibility as a journalist and conflict of interest | |

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| 1. Code of conduct for journalist<br>2. Conflict of interest<br>3. Misrepresentation<br>4. Shock Value<br><br>3. Fake news<br>1. post-truth and challengers of fighting fake news<br>2. Techniques of fact verification<br><br>4. Ethical responsibility of advertisers:<br>1. Violation of ethical norms by advertisers<br>2. Case studies<br><br>5. Stereotyping:<br>Stereotyping of minorities, women, senior citizens, regions, LGBT | 3. To widening knowledge about stereotypes and its applications on various categories of human and according to age | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Mass Media Research**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Research in Media - Introduction to Mass Media Research:<br>• Relevance, Scope of Mass Media Research and<br>• Role of Research in Media<br>• Steps involved in Research Process<br>• Qualitative and Quantitative Research<br>• Discovery of Research Problem, Identifying Dependent and Independent Variables, Developing Hypothesis. | 1. To introduce students to research and the need for research in society.<br>2. Understanding about research process in detail<br>3. Understanding various types of research and learning about hypotheses and its use in research. | CO1- To introduce students to debates in Research approaches and equip them with tools<br>to carry on research<br>CO2- To understand the scope and techniques of media research, their utility and limitations |

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| **Module II**: Design- Research Design:<br>• Concepts, Types and Uses<br>• Research Designs:<br>a. Exploratory<br>b. Descriptive and<br>c. Causal | 1. To learn about research design and its importance in carrying out research.<br>2. The questions to be solved while preparing an outline of the research or thesis.<br>3. The types of research design. | |
| **Module III**: Data Collection: Data Collection Methodology<br>a. Primary Data Collection Methods:<br>I. Depth Interviews<br>II. Focus Group<br>III. Surveys<br>IV. Observations<br>V. Experimentations<br>b. Secondary Data Collection Methods<br>c. Literature Review<br><br>d. Designing Questionnaire and Measurement Techniques:<br>a. Types and basics of Questionnaire<br>b. Projective Techniques<br>c. Attitude Measurement Scales<br><br>e. Sampling Process<br>f. Data Tabulation and Research Report Format | 1. To learn various data collection methods<br>2. To learn about literature of review<br>3. To know about measurement techniques, tabulation, and Research Format. | |
| **MODULE IV**: Analysis- Content Analysis:<br>a. Definitions and Uses<br>b. Qualitative and Quantitative Approach<br>c. Steps in Content Analysis<br>d. Devising Means of a Quantification System<br>e. Limitations of Content Analysis | 1. To understand about Content analysis and its uses<br>2. To learn steps in content analysis<br>3. 3. To understand the limitations of content analysis in detail | |
| **MODULE V**: Application of Research- Application of Research in Mass Media<br>a. Readership and Circulation Survey<br>b. TRP | 1. Learning about the various applications of Research in Mass Media<br>2. To learn about the effect of media on people.<br>3. To find solutions to media- | |

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| c. RRP<br>d. Audience Research<br>e. Exit Polls<br>f. Advertising Consumer Research | related questions | |
| **MODULE VI**: The Semiotics- The Semiotics of the Mass Media<br>a. What is Semiotics in Media?<br>b. Why is Semiotics Important?<br>c. What are the Codes in Semiotics?<br>d. Semiotics and Media | 1. To learn about codes of signs, symbols and actions and communicate the same with all masses- Study of signs "Semiotics"<br>2. The importance of semiotics<br>3. Understanding relation of semiotics and media | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Understanding Cinema<br>Regional Cinema:<br>Regional Films and Filmmakers- Marathi (V. Shantaram), Bengali (Satyajit Ray/ Ritwik Ghatak), Malayalam/ Tamil/ Telugu/ Kannada, (Film makers- K. Balachandar, K. Vishwanath, Adoor Gopalkrishan) etc. | 1. To learn about various regional cinema and its contributions to the industry<br>2. To know about social issues, topics and how films evolved by contributions of individuals.<br>3. To know famous personalities and their journey in the industry personal and professional both. | CO-1 Awareness of cinema of different regions.<br>CO-2 Understand the contribution of cinema in society.<br>CO-3 How to make technically and grammatically good films.<br>CO-4 From making to marketing of films.<br>CO-5 Economic aspects of film.<br>CO-6 Careers in films. |
| **Module 2**: Hindi Cinema:<br>2.1 Popular Hindi Commercial Films (Bollywood)<br>2.2 Past to Present<br>2.3 Economic contribution of cinema<br>2.4 Convergence of Art and Commercial<br>2.5 Genres in present (Romcom, Thriller, Biographic, Action, Musical, etc.) | 1. To understand the famous / popular Hindi Commercial films<br>2. To get in-depth knowledge of how cinema has evolved from past to present with movie names. .<br>3. To learn about various economic aspects of cinema along with the genres. | |

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| **Module 3:** Cinema now:<br>Contemporary Era<br>Celluloid to Digital (1990-1999)<br>Digital Explosion (2000) onwards<br>Media Convergence and Film Viewing Culture | 1. Understand about contemporary era of filmmaking<br>2. The conversion from celluloid to Digital cinema<br>3. To learn how people adapted a convergence in viewing culture of cinema<br>4. To learn about OTT platforms. | |
| **Module 4**: Film Making:<br>Film Production to Film Exhibition<br>41. Aspects of Production Systems: Financial, Administrative and Creative<br>4.2 Stages of Filmmaking- 1: Pre-Production<br>4.3 Stages of Filmmaking- 2: Actual Production<br>4.4 Stages of Filmmaking- 2: Post-Production<br>4.5 Film and Censorship<br>4.6 ROI Systems in Film Industry<br>Distribution<br>Promotion<br>Marketing<br>Branding<br>Internet | 1. To learn the process from Film production to Film Exhibition<br>2. To learn the stages of Film Making in brief<br>3. To learn the concepts in detail related to exhibition of movies through various techniques.<br>4. To grow the industry with more competition and creative skills. | |
| **MODULE 5**: Film Culture:<br>5.1 Introduction to Film Institute, Film Bodies and Trade Association such as FTII, NFAI, Films Division, DFF, IFFI, CBFC, IFTDA, SGI, WICA, etc.<br>5.2 Film Festival?<br>What is a Film Festival?<br>Major Film Festivals in India and Abroad<br>5.3 Film Awards:<br>Nature and Types of Film Awards<br>Major Film Awards in India and Abroad | 1. To learn about institutions and Trade associations for Films and its history to present the situation.<br>2. To learn about film festivals and major film festivals in India and Abroad.<br>3. To learn about Film awards and its nature, various awards are recognized in India and Abroad. | |

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**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module 1- Photoshop: Advanced Image Editing**<br>1. Working with multiple images<br>Mixing<br>Selection marquee, Lasso, Magnetic lasso, feather Slice tool, Erase tool<br>Pen tool and image tracing Clone tool, Stamp tool<br>2. Image Effects<br>Editing<br>Burning. Dodging<br>Smudge, Sharpen, Blur Eyedropper, Choosing color Swatches, Colour pick<br>Filters<br>3. Working with Layers<br>Layer basics<br>Changing background, Gradient<br>Moving linking aligning layers<br>Applying Transformations Masking layers<br>Masts and extractions Layer effects, Adjustment layers<br>4. Wonders of Blend Modes Blend modes<br>Advanced blending options Layer blends<br>5. Fully Editable Text<br>Text as art, Glyphs, Creative text<br>Type mask tool, Image in text Text to path and Direct selection<br>Path selection (black arrow) Creating Professional design using all the tools | 1. To learn Tools of Photoshop.<br>2. Understand effects Sharpen, Blur, Eyedropper and color pick filter.<br>3. Learning to change image background, Layer Masking and gradient.<br>4. Learning Blends modes and advanced blending options.<br>5. Students learn text editing and its selection.<br>6. Learning to create a professional design using all tools. | After completing the course, the learner will be able to:<br><br>CO1: To help learners be media industry ready. This will help learners to be aware of the minimum requirement of the software when stepping in the industry.<br><br>CO2: To introduce the media soft wares to make the learner understand what goes behind the scene and help them choose their stream.<br><br>CO3: To prepare learners skilled enough for independence during project papers in TY sem.VI.<br>CO4: To help learners work on small scale projects during the academic period. |
| **Module 2- Adobe Illustrator: Vector based Drawing software**<br>1. Introduction to Adobe Illustrator<br>Illustrator Interface,<br>Tool Box, Panels and Bars | 1. Learning to Adobe Illustrator, Interface, Tool Box, Panels and Bars Importing files in illustrator, Different file formats. | |

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| Importing files in illustrator, Different file formats<br>2. Using text<br>Artistic and paragraph text, Formatting Text,<br>Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects<br>3. Creating Simple designs<br>Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity<br>4. Applying effects<br>Power of Blends,<br>Distortion and contour Effects, Envelopes,<br>Lens effects, Transparency, Creating Depth Effects and Power Clips<br>5. Exporting in Illustrator Exporting, Types of export,<br>Exporting for other soft wares | 2. Learning text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects.<br>3. Understanding to Create Simple designs Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity.<br>4. Understanding to Apply effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Learning to Export in Illustrator Exporting, Types of export, Exporting for other software. | |
| **3 InDesign: Layout Software**<br>1. Introduction to Adobe In Design<br>List the menus,<br>List the tools, Palates<br>Benefits of using In Design,<br>Application of In Design<br>2. Text Edits in InDesign Format of text,<br>Character and Paragraph Bars<br>Purpose of text selection,<br>Aligning text in different design formats,<br>Text alignment with embedded images<br>3. Using palettes<br>Using palettes for different types of publications made in InDesign,<br>Magazine in InDesign, Paragraph styles<br>Newspaper in InDesign,<br>Paragraphs type palate, Text wrap palate<br>4. Color correction in InDesign | 1. Understand to Adobe In Design List the menus, List the tools, Palates Benefits of using In Design, Application of In Design<br>2. Learning Text Edits in InDesign Format of text, Character and Paragraph Bars Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>3. Learning Using palettes for different types of publications made in InDesign, Magazine in InDesign, Paragraph styles Newspaper in InDesign, Paragraphs type palate, Text wrap palate.<br>4. Learning Colour correction in InDesign Embedding images in proper formats, Colour correction on the images. | |

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| Embedding images in proper formats, Colour correction on the images, Adjusting according to the color tone of the publication<br>5. Exporting files<br>Types of files,<br>Exporting for different publications/templates,<br>Newspaper, magazine, etc. | Adjusting according to the color tone of the publication.<br>5. Learning to Export files<br>Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **4 Premiere Pro: Audio-visual: Advanced application**<br>1. Introduction to editing Editing importance,<br>Great editing examples,<br>Editing for different formats (film/ad/news/etc.)<br>2. Exploring Premiere Pro How premiere helps in editing,<br>Understanding the toolbar,<br>Importing files,<br>Experimenting with video and audio layers,<br>Basics of editing (cut/layers/different windows/etc.)<br>3. Right application of various file formats Understanding different file formats<br>(AVI/MPEG/MOV/H264, etc.)<br>Importing raw footage for edits,<br>Performing video checks while editing<br>Using inbuilt transitions,<br>4. Using color grading<br>What is color grading,<br>Examples of color grading,<br>Using filters and presents in color mixing,<br>Applying presents on layers for editing<br>5. Exporting and rendering Exporting in different formats,<br>Choosing right formats for exposing,<br>Managing quality while exporting,<br>Rendering and maintain file format,<br>Improving quality and time to render techniques | 1. Understanding Introduction to editing Editing importance, Great editing examples, Editing for different formats (film/ad/news/)<br>2. Understanding the toolbar, Importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/)<br>3. Understanding the Right application of various file formats Understanding different file formats (AVI/MPEG/MOV/H264, etc.) Importing raw footage for edits, Performing video checks while editing Using inbuilt transitions,<br>4. Learning Using color grading What is color grading, Examples of color grading, Using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning Exporting and rendering Exporting in different formats, Choosing right formats for exposing, Managing quality while exporting, Rendering and maintaining file format, Improving quality and time to render techniques. | |

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| **Module 5- Adobe Dreamweaver: Web designing software**<br>1. Introduction to Dreamweaver<br>Workspace overview<br>Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector<br>Defining website in Dreamweaver<br>2. Working with DW<br>Creating Dreamweaver template<br>Page layout in DW<br>CSS layouts: advantages and disadvantages<br>Creating HTML pages, Insert content and form<br>Creating Forms in DW<br>3. Linking pages<br>Using DW to accomplish basic web page development,<br>Page properties<br>Title, Background image, BG colour, Text colour,<br>Links<br>4. Using Tables<br>Cell padding, cell spacing, Border<br>Table basics: Colour BG in cell, Invisible tables,<br>Changing span,<br>Making image into clickable link<br>5. Typo in DW<br>Changing Font typefaces, size, style, colours<br>Text to hyperlink | 1. Understanding the Introduction to Dreamweaver Workspace overview Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector Defining website in Dreamweaver.<br>2. Learning and Working with DW Creating Dreamweaver template Page layout in DW CSS layouts: advantages and disadvantages Creating HTML pages, Insert content and form Creating Forms in DW.<br>3. Understanding to Linking pages Using DW to accomplish basic web page development, Page properties Title, Background image, BGcolor, Text color, Links.<br>4. Learning for Using Tables Cell padding, cell spacing, Border Table basics: Colour BG in cell, Invisible tables, Changing span, Making image into clickable link.<br>5. Understanding to Typo in DW Changing Font typefaces, size, style, colors Text to hyperlink. | |

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## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Brand Building**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1: Introduction to Brand Building, identity, Personality and positioning**<br>1. Introduction to Brand Building<br>Meaning, Product v/s Brand, Why brand matters, Process of Branding, Types of brand- National, Retail, Flanker, Distributor, Luxury, Global brands), Brand building blocks, Guidelines for effective branding, Brand Elements- types of brand elements<br>2. Brand Identity and Brand personality<br>Consumer, Industrial, Retail, Classified, Corporate, Public service, Generic, National, Global, International, Social (CSR) and Advocacy<br>3. Brand Positioning<br>Product class, Consumer segmentation, Perceptual mapping, Brand benefits and attributes, Cornerstones of positioning strategy Basis | 1. To learn and understand brand and its related concepts<br>2. To study importance of branding and its process<br>3. To distinguish between a brand and a product.<br>4. To understand the concept of brand identity.<br>5. to learn to connect with brands and match personality.<br>6. To educate students about various CSRs from brands<br>7. To learn about benefits from brands and its attributes | CO1- To understand the awareness and growing importance of brand building<br>CO2- To know how to build, sustain and grow brands<br>CO3- To know the various new ways of building brands.<br>CO4- To know about the global perspective of brand building. |
| **Module 2: Branding leveraging, strategies, equity, models**<br>1. Brand Leveraging<br>Line, Brand extension, Types of Brand Extensions, their advantages | 1. To understand the brand leveraging and its concepts<br>2. to learn about benefits and various brand related concepts<br>3. To understand in detail strategies and equity at various | |

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| and disadvantages, Moving up/ down, Co- branding<br>2. Brand Strategies<br>Multi- branding, Mix branding, Hierarchy- Building Equity at Different Hierarchy Levels, Brand Product Matrix, Brand Architecture- Breadth of a Branding Strategy, Depth of a Branding Strategy<br>3. Brand Equity and Models<br>Elements/ Sources, Measurement, (Brand awareness, Brand loyalty)<br>Models: Yand R- Graveyard model Brand Asset Valuator, Brand Equity Ten, Inner brand Equity brand | level<br>4. To clear the concepts of branding strategy<br>5. To understand various models and theories | |
| **Module 3: Brand Building through imperative, Global and corporate image**<br>1. Brand Imperatives<br>Coordination across organization. Coordination across geography, Re-branding, revitalizing, Rural Advertising and brands<br>2. Global Brands<br>Emergence of global brands, Advantages and Disadvantages, Global leadership brands and position, Globalization<br>3. Corporate image Building through brands<br>Corporate Image in Contemporary Management, Advertising and Corporate Image | 1.To learn about coordination and corporate image in detail<br>2. learning about branding and it uses in various areas of lifestyle<br>3. To understand about global brands<br>4. To enhance leadership in positioning and Globalization<br>5. To enhance corporate image building<br>6. To learn and compare advertising and corporate image | |
| **Module 4: Brand Building through CSR, Brands to different sectors, brands life cycle**<br>1. Brand Building through Corporate Social Responsibility<br>CSR as part of business environment management, How CSR activities can be sued for Brand Building, Social activities other than CSR to enhance the brand | 1. To understand importance of CSR and its roles<br>2. To learn about CSR and advertising performed by brands<br>3. To know about stages of growth and case studies<br>4. Understanding the various sectors for branding | |

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| 2. Conception and Growth<br>Important factors in conception and various stages of growth and maturity of brands with various case studies<br>3. Branding in Different Sectors<br>Customer, Industrial, Retail and Service Brands | | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Consumer Behavior**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Module I<br>1. Introduction to Consumer Behaviour<br>1. Need to study Consumer Behaviour<br>2. Psychological and Sociological dynamics of consumptions<br>3. Consumer Behaviour in a dynamic and digital world<br><br>2. Marketing and Consumer Behaviour<br>1. Segmentation Strategies- VALS<br>2. Communication process<br>3. Persuasion- Needs and Importance<br>EL.M. Persuasive advertising appeals. | 1. To study the components of consumer behavior.<br>2. To study consumer behavior and digital world<br>3. To study VALS in detail<br>4. To study the importance of persuasion. | CO1- To understand the sociological and psychological perspective of consumer behavior.<br>CO2- To introduce students to the complexities of consumer behavior, its importance in marketing and advertising.<br>CO3- To sensitize students to the changing trends in consumer behavior. |
| Module II<br>1. Psychological Determinants and Consumer Behaviour<br>1. Motivation- Types and Theories- Maslow<br>2. Attitude- Characteristics- Theories- Tricomponent<br>3. Multi Attitude Model | 1. To study the types of motivation and its related theories,<br>2. To study the attitude and multi attitudes<br>3. To study personality and its traits along with consumer behavior | |

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| 4. Cognitive Dissonance<br>5. Personality - Facets of personality<br>i. Theories- Freud and Jung<br>ii. Personality traits and consumer behavior<br>iii. Self-concept<br>Application of these theories in the marketing and consumer behavior | 4. To study the application of theories in marketing and self-concepts. | |
| Module III<br>1. Relevance of learning in consumer behaviour<br>1. Perception - Elements in perception<br>a. Subliminal Perception<br>b. Perceptual Interpretation-Stereotyping in Advertising<br>2. Learning - Elements in Consumer Learning<br>3. Behavioral and Classical Theory<br>4. Cognitive Learning | 1. To learn behavioral and classical theories<br>2. To learn cognitive learning and its use in consumer behavior | |
| Module IV<br>1. Socio- Economic and Cultural Determinants of Consumer Behaviour<br>1. Family- Role of family in Socialization and Consumption-FLC<br>2. Culture- Role and Dynamics<br>i. Subculture and its influence on consumption<br>ii. Changing Indian core values<br>iii. Cross culture consumer perspective<br>3. Social Group- Primary and secondary and the role of Reference group and Consumer Behaviour<br>4. Economic- social class as the economic<br>5. determinants of consumer behavior | 1. To study the family and consumer behavior consumption<br>2. To learn changing core values and Indian culture<br>3. To learn determinants of consumer behavior | |
| Module V<br>1. Consumer Decision Making<br>a. Process of decision making<br>b. Models of decision making | 1. To study the characteristics of opinion leaders.<br>2. To study the process and models of consumer decisions. | |

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| c. Opinion Leadership<br>2. Diffusion and Adoption Process<br>a. Process of decision making<br>b. Models of decision making<br>c. Opinion Leadership<br>3. Diffusion and Adoption Process | 3. To study the adoption process. | |

**Faculty Name -Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Agency Management**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>1. Advertising Agencies<br>a. Agencies role, Functions, Organisation and Importance<br>b. Different types of ad agencies<br>2. Account Planning<br>a. Role of account planning in advertising<br>b. Role of Account Planner<br>c. Account Planning Process<br>3. Client Servicing<br>a. The Client- Agency Relationship<br>b. 3 P's of Service: Physical evidence, Process and People<br>c. The Gaps Model of service quality<br>d. Stages in the client - agency relationship<br>e. How Agencies Get Clients<br>f. Why Agencies Lose Clients<br>g. The roles of Advertising Account executives<br>4. Advertising campaign Management<br>a. Means- End chaining and the<br>b. Method of Laddering as guides to Creative Advertising Formulation | 1. To learn about advertising agencies and its functions<br>2. To understand about different types of ad agencies<br>3. To understand in depth the account planning process<br>4. To learn P's of service<br>5. To educate students on how to gain client and also on how and why an agency loses a client. | CO1- To acquaint the students with concepts, techniques and give experience in the application of concepts for developing an effective advertising campaign.<br>CO2- How an ad agency works and what opportunities exist.<br>CO3- To familiarize students with the different aspects of running an ad agency<br>CO4- To inculcate competencies thereby enabling to undertake professional work with the advertising industry. |

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| **Module 2**<br>1. Study and Analyze current Advertising campaigns of the best advertising agencies for their clients<br>1. Two current campaigns (Previous two years) for each of the following agencies including TVC, Print, Outdoor and digital should be studied in the classroom.<br>a. JWT<br>b. Ogilvy<br>c. Lowe Lintas<br>d. FCB Ulka<br>e. DDB mudra<br>f. Publicize Worldwide<br>2. At least three international awards winning previous year campaigns (one or two year previous) should be analyzed and discussed in the classroom. The application questions are Expected on the latest campaigns. | 1. To learn current trends of advertising with various organizations as examples<br>2. To know various awards received by the companies | |
| **Module 3**<br>1. Entrepreneurship<br>a. Entrepreneurship Definitions, Meaning Concept, Functions, Need and Importance<br>b. Entrepreneurship- As Innovation, risk taking and problem solving,<br>c. Social Entrepreneurship<br>2. Sources of capital for startup company<br>a. Personal investment<br>b. Family<br>c. Venture capital<br>d. Angels FInance<br>e. Business incubators<br>f. Government grants and subsidies<br>g. Bank loan<br>3. Creating and Starting the Venture<br>a. Sources of new ideas<br>b. Methods of generating ideas, creating problem solving,<br>c. product planning and development process | 1. To evaluate entrepreneurship skills among students.<br>2. To know its importance along with risking factors<br>3. To learn governmental grants and subsidies and bank loans for startup<br>4. To start planning about how to develop the business | |

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| **Module 4:**<br>1. Business Plan for Setting up an Agency<br>a. Business plan introduction,<br>b. Various Stages in setting up a new agency<br>2. Marketing plan of the client<br>a. The Marketing brief<br>b. Marketing Audit<br>c. Marketing Objectives<br>d. Marketing Problems<br>e. STP<br>f. Executing the plan<br>g. Evaluating the plan | 1. To understand various stages while sitting a new agency<br>2. To know in details how to make brief<br>3. To know about objectives behind creating marketing and creative brief<br>4. To introduce the term marketing audit | |
| **Module 5**<br>1. The Response Process<br>a Traditional Response Hierarchy Models<br>b. Communications objectives<br>c. DAGMAR: An Approach to Setting Objectives<br>2. Agency Compensation<br>a. Various methods of Agency Remunerations<br>3. Growing the Agency<br>a. The Pitch: request for proposal, speculative pitches, Pitch Process<br>b. References, Images and reputation, PR<br>4. Sales Promotion Management<br>a. The Scope and Role of Sales Promotion<br>b. Reasons for the Increase in Sales Promotion<br>c. Objectives of Trade- Oriented Sales Promotion<br>d. Techniques of Trade- Oriented Sales Promotion<br>e. Objectives of Consumer-Oriented Sales Promotion<br>f. Techniques of Consumer-Oriented Sales Promotion | 1. To learn about responsive process<br>2. To know about approaches and their objectives<br>3. Making students understand about how to talk and communicate with clients that helps in gaining more clients<br>4. To learn and understand aspects of sales promotions<br>5. To understand trade-oriented sales techniques as well as its objectives<br>6. To learn about consumer-oriented sales promotions | |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Copy Writing**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1:**<br>1. Introduction to Copywriting:<br>a. Basics of Copywriting,<br>b. Responsibility of Copywriter.<br>2. Creative thinking<br>a. How to inculcate a 'creative thinking attitude'<br>b. The idea incubation process<br>c. What's the Big Idea?- How to get to the ONE BIG IDEA that will inspire creative<br>d. Crafting the reasons why consumers should believe your brand and act<br>3. Idea Generation Techniques: Theories of Ideation, Idea generation techniques (Brainstorming, Triggered brain walking, Questioning assumptions, Picture prompts, scamper, Observation, Referencing, Interaction, Imagination, Dreams & Creative Aerobics.)<br>4. Transcreativity:<br>a. Introduction,<br>b. Purpose | 1. To understand the role and importance of copywriting.<br>2. Various responsibility of a copywriter<br>3. Understanding the psychology of the brain and its role in developing the skills for writing.<br>4. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source. | CO1- To familiarize the students with the concept of copywriting as selling through writing<br>CO2- To learn the process of creating original, strategic, compelling copy for various mediums.<br>CO3- To train students to generate, develop and express ideas effectively<br>CO4- To learn the rudimentary techniques of advertising - headline and body copywriting, the economy of words and thought peculiar to this type of writing, and the necessity of creative thinking in written expression.<br>CO5- In an ad agency, as a copywriter, one cannot "just be creative and express self"- here one is in a 'creative professional', and have to be able to use the power of creativity for a commercial/ business reason- as someone is paying you to get a problem solved, using your creativity.<br>CO6-There are two basic disciplines through which we make our communication- verbal / written and visual, and both need different skill sets to master them. The structure of the syllabus is designed to hone the necessary skills required for these two diverse disciplines. |

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| **Module 2: Writing for Advertising**<br>1. Briefs:<br>a. Marketing Brief,<br>b. Creative Brief.<br>2. Writing persuasive copy:<br>a. Tone of Voice<br>b. What's the Tone?<br>c. Tonality and character matter,<br>d. How to make your Writing, walk, talk and breathe<br>e. Creating Breakthrough Writing<br>f. How to Control the "Command Centre" in Your<br>g. Prospect's Mind<br>h. How to Change Perception<br>i. Emotionally, Storytelling | 1. Learning about the structure and formats of the briefs.<br>2. Understanding the client brief for proper execution of the content.<br>3. How to write appealing content by considering various elements and through the art of storytelling. | |
| **Module 3: Current Advertising campaigns**<br>Copy writing style of current advertising campaigns of the best advertising agencies for their clients Two current campaigns for each of the following agencies including TVC, Print, Outdoor, and Digital should be studied and analyzed in the classroom<br>a. JWT<br>b. Ogilvy<br>c. Lowe Lintas<br>d. FCB Ulka<br>e. DDB Mudra<br>f. Publicize Worldwide<br>• At least three international awards-winning previous year campaigns (one or two years previous) should be analyzed and discussed in the classroom.<br>• Student must be taught the following when discussions of campaigns:<br>a. Copywriting style<br>b. Idea and concept<br>c. How copy is varied for different media | 1. Learning to write copy for various advertising and marketing media.<br>2. To add various elements to balance a copy and convey the marketing message.<br>3. To explore and learn by real time examples of campaigns by various agencies.<br>4. To understand various appeals and tone of voice | |

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| d. Copy for children, Youth, women, senior citizens, executive's millennials, Baby Boomers, Gen X, Gen Y, Gen Z<br>e. Advertising appeals<br>f. The tone of Voice<br>g. Storytelling | | |
| **Module 4 Media and Audiences**<br>1. Writing for various Media<br>a. Print: Headlines, sub-headlines, captions, body copy, and slogans<br>b. Television: Storyboard, Storyboarding Techniques, Balance between words and visuals, Power of silence, formats of TVS'<br>c. Outdoor posters<br>d. Radio<br>e. Digital copy for social media like Facebook, Instagram, etc<br>f. Copy for web page<br>2. Writing copy for various audiences<br>a. Children<br>b. Youth<br>c. Women<br>d. Senior Citizen and<br>e. Executives<br>f. Baby Boomers, Gen X, Gen Y (Millennials), Gen Z | 1. To learn writing the copy for personal medium and mass medium.<br>2. Understanding the thought process of different categories of audiences.<br>3. Learning to persuade the audience through the copy. | |
| **Module V Writing copies, appeals, execution styles and evaluation**<br>1. How to write copy for<br>a. Direct mailer<br>b. Classified<br>c. Press Release<br>d. B2B<br>e. Email copy<br>f. Advertorial<br>g. Infomercial<br><br>2. Various types of Advertising appeals and execution styles: Rational appeals, Emotional appeal Humor, Fear, Sex appeal, | 1. Understanding the copy writing aspects for offline and online platforms<br>2. Understanding various writing appeals to connect a chord with the specific audience through storytelling<br>3. Evaluating the writings by understanding the reach of the advertising message.<br>4. Learning about campaign objectives.<br>5. Learning the final output of an advertising copy. | |

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| and Various advertising execution techniques.<br>3. The techniques Evaluation of an Ad Campaign:<br>a. Evaluate the ad in terms of its efficacy, i.e. to what extent the campaign has achieved its set objectives,<br>b. Learn to appreciate the aesthetic aspects of the ad, how the ad looks, its layout, color scheme, typography, balance, etc.<br>3.3 Corruption issues faced by the common man<br>3.4 Challenges faced by senior citizens and the physically/ mentally challenged | | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multi Media and Mass Communication:**

**Course: Advertising and Marketing Research**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module-1**<br>Fundamentals of Research<br>1. What is Literature Review<br>2. Statement of the problem<br>3. Aims and objectives of study<br>4. Relevant Research questions | 1. To learn about Research<br>2. To learn the fundamentals of Research<br>3. Aims and objectives research | CO1- The course is designed to indicate the analytical abilities and research skills among the students.<br>CO2- To understand research methodologies- Qualitative vs Quantitative<br>CO3- To discuss the foundation of Research and audience analysis that is imperative to successful advertising.<br>CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility. |
| **Module-2**<br>Research Design | 1. To learn about research design and its concepts | |

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| 1. Meaning, Definition, Need, and Importance<br>2. Scope of Research Design<br>3. Two types - Descriptive, Exploratory, and Causal | 2. To learn the types of research | |
| **Module -3**<br>Preparing Questionnaire<br>1. Survey instruments<br>2. Designing the questioning using projective<br>3. Technique for Qualitative research<br>4. Designing the Questionnaire using attitude<br>5. Measuring scale for Quantitative using attitude | 1. To understand the importance of questionnaire in research<br>2. To learn the techniques for qualitative research<br>3. To learn the measuring scale for quantitative using attitudes | |
| **Module-4**<br>1. Meaning of Sample and Sampling,<br>2. Process of Sampling<br>3. Methods of Sampling: Non-probability Sampling- Convenient, Judgment, Quota, Snow Ball Probability Sampling- Simple Random, Systematic, Stratified, Cluster, Multi-Stage. | 1. To learn the meaning of sample and sampling<br>2. To understand the process abd methods of sampling<br>3. To learn the types of sampling and its application | |
| **Module-5**<br>Preparing data sheet and data processing<br>Preparation of datasheet in excel format and rearranging the data as per the requirement of the Statistical software such as SPSS and the statistical tool | 1. To learn preparing sheets and how to process the data<br>2. To learn statistical software and understand its applications for analysis | |
| **Module-6**<br>Data Analysis<br>Data collected are to be presented and analyzed. Students will have to choose the methods that best suit the data collected. Data could be presented using tables, pie charts, bar charts, histograms etc. Data presented should be accompanied with the interpretation of the | 1. To understand the methods used for data collection<br>2. To learn and understand how interpretation is done for results and analysis presented via pie charts, histogram and so on. | |

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| associations and relationships among the data groups with the appropriate implication to the study or the unit of study. The summary of interpretation should provide answers to the research Questions. | | |
| **Module -7**<br>Methods of Data Analysis<br>The interpretations based on Descriptive statistics should include Mode, Mean, Median, Range, Variance, Standard deviation, Kurtosis, and Skewness<br>Any of the following multivariate analyses may be used such as Regression, Correlation, Test factor analysis, and discriminant analysis | 1. To learn about data and its interpretation<br>2. To learn various analysis tools | |
| **Module-8**<br>Report Writing<br>Format of the Research Reports<br>The research report shall have the following Components<br>1. Title Page<br>2. Index<br>3. Introduction and Research objective<br>4. Industry Overview<br>5. Literature Review<br>6. Statement of the Problem<br>7. Statement of Hypothesis (Min two Hypothesis)<br>8. Research Methodology and Research Design<br>9. Data Analysis and Interpretations<br>10. Findings<br>11. Conclusion<br>12. Suggestions<br>13. Annexure (questionnaires)<br>14. Bibliography | 1. To understand the prospects of research reports<br>2. To understand in depth how to write and state the hypothesis along with other research components | |
| **Module-9**<br>Advertising Research<br>1. Introduction to Advertising Research | 1. To learn about advertising research<br>2. To learn the various techniques used by the researcher | |

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| 2. Copy Research: a. Concept testing, b: Name testing<br>3. c. Slogan testing<br>4. Copy testing measures and methods: a. Free association,<br>5. b. Direct questioning, c. Direct Mail tests<br>6. d. Statement comparison tests<br>7. e. Qualitative interviews, f. Focus groups<br>8. Pretesting:<br>A. Print Pretesting: a. Consumer Jury Test,<br>B. Portfolio test,<br>C. Paired comparison test<br>D. Order-of-merit test,<br>E. Mock magazine test,<br>F. Direct mail test<br>G. Broad casting Pretesting:<br>a. Trailer tests,<br>b. Theatre tests,<br>c. Live telecast tests, d. Clutter tests<br>H. Challenges to pre-testing.<br>Example: The Halo effect<br>9. Post testing:<br>a. Recall tests,<br>b. Recognition test,<br>c. Triple association test,<br>d. Sales effect tests,<br>e. Sales results tests,<br>f. Enquires test<br>Physiological rating scales<br>1. Pupil metric devices,<br>2. Eye- movement camera,<br>3. Galvanometer,<br>4. Voice pitch analysis<br>5. Brain pattern analysis | 3. To understand each psychological rating scales in depth and audiences. | |
| **Module-10**<br>Marketing Research<br>1. Introduction to Advertising Research<br>2. New product research,<br>3. Branding Research,<br>4. Pricing research,<br>5. Packaging research,<br>6. Product testing | 1. To learn research and its marketing objectives and types | |

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**Faculty Name - Ms. Charmy S. Shah**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Social Media Marketing**

**TYBAMMC SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Digital ERA<br>1. Introduction to E-Marketing<br>What is E-marketing? The changing marketing landscape, The internet and business<br>2. E-Marketing<br>E-Marketing strength and application, Communication modes, The behavioral internet (B2C, B2B, C2C and C2B) E-marketing and Online advertising. E-marketing and Consumer segmentation, E-marketing and Consumer segmentation, E-marketing and Sales and Trade promotions<br>3. Types of Digital Marketing<br>Types of E- mail marketing, Types of Internet marketing and Types of Mobile marketing<br>4. Generation Y<br>Expectation and influence, Implication of Digital change, Emerging consumer segmentation in India | 1. To learn about the swift of online and offline marketing<br>2. To understand the advantages and disadvantages e- business<br>3. To understand the various types of digital marketing | CO1- Students learn real world skills from leading designers, artists, and entrepreneurs<br>CO2- The primary goal is to create problem solvers who strike a balance between traditional art and technology, and between individual vision and teamwork.<br>CO3- With a fundamental understanding of digital tools and their creative applications, graduates meet the demands of a diverse and expanding job market in visual storytelling<br>CO4- Identify and apply strategies to improve and succeed no matter what their initial skills.<br>CO5- Solve problems and learn from creative risks by using people skills, design principles, and processes.<br>CO6- Build a strong foundation in all aspects of design and production for storytelling in motion.<br>CO7- Use inspiration in fields outside of digital media such as poetry, science, music, astronomy, history, dance and more.<br>CO8- Develop a professional commitment to their field, their work, and themselves; preparing them to be members and leaders in their profession, as well as learning how to act both as individuals and as team members to support the whole. |
| **Module-II**<br>Social Media Marketing<br>1. Introduction to Social Media Marketing<br>Meaning, Importance, Myths about Social media marketing, brief History | 1. To learn about the importance and related myths to social media and marketing<br>2. To learn the importance of content and how to strategize it<br>3. To learn the various online | |

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| Characteristics of Social Media marketer and Careers in Social media marketing<br>2. Content Strategy for Social Media Marketing<br>10-step framework for creating successful SMM strategy, Building content for sharing, Generating Ideas, Creating content for Multiple platforms<br>3. Facebook Marketing<br>Facebook - the origin and Eight different versions of Facebook, What is Facebook marketing? Facebook page best practices, KPI and insights, How does Facebook advertising work- Facebook ad Campaign Objectives and Targeting and Content creation and sharing<br>4. Instagram Marketing<br>Optimizing Instagram profile, Creating content strategy, Influencer marketing and Instagram Ads<br>5. Linked In Marketing<br>LinkedIn for personal branding, LinkedIn for Company pages, Brand marketing for LinkedIn, Ads on LinkedIn<br>6. Pinterest Marketing<br>Pinterest for business, Marketing on Pinterest, Leveraging Rich Pins<br>7. YouTube Marketing<br>How to build foundation for your YouTube channel, Usage of free resource,<br>Optimize organic traffic by selecting keywords for videos, Optimization of advertisements | platforms and its concepts | |
| **Module -III**<br>Social Media Marketing Plan, and Campaign management<br>1. Social Media Marketing Plan<br>What is the SMM plan? Social Media Marketing cycle, Listen and Observe - 5 stages, Setting Social Media Marketing goals and objectives (Exposure, Engagement, Influence, Impact and Advocacy), Eight C's Strategy development, Uses of | 1. To learn in detail social marketing and get explore to know about planning done for marketing<br>2. To understand the importance of Campaigns and how to manage campaigns across various platforms<br>3. To learn about blogs and online opportunities via blogging | |

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| keywords, hashtags and emoji in targeting branded post, Evaluating Social media marketing success<br>2. Campaign Marketing<br>What is campaign management? Solutions, How to use campaign management for Facebook, Twitter etc, Sentiment mining, Using Corporate blog as a CRM tool. How Companies Use Blogs for Effective Campaign management? | | |
| **Module 4- Social Media Marketing Plan, and Campaign management**<br>1.Social Media Marketing Plan<br>What is SMM plan? Social Media Marketing cycle,<br>Listen and observe -5 stages, Setting Social Media<br>Marketing goals and objectives (Exposure, Engagement, Influence, Impact and advocacy).<br>Eight C's of strategy development<br>Uses of keywords, hashtags, and emoji in targeting branded posts, Evaluating Social media marketing success<br>2. Campaign Marketing<br>What is campaign management? Solutions, how to use campaign management for Facebook, Twitter etc, Sentiment mining, Using Corporate blog as a CRM tool. How Companies use blogs for effective campaign management? | 1. To understanding about SMM planning and its cycle-stages<br>2. To learn how to use hashtags, keywords and insights about post while campaigning. | |
| **5 Ethics and Careers**<br>1.Ethics<br>Code of ethics, 9 Rules of engagement for Social Media Marketing<br>2.Careers Careers in Social media marketing | 1. To learn the ethics and rules of SMM<br>2. To explore and fit in careers related to social media | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2021-2022

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Retailing & Merchandising**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- About Features**<br>1. Introduction to the World of Retailing<br>Introduction to the World of Retailing<br>2. Types of Retailers<br>Multichannel Retailing, Customer Buying Behaviour, Retail Market Strategy, Overview of Merchandising<br>3. Identifying and Understanding Retail Consumer:<br>Factors affecting retail strategies, Consumer Demographic and lifestyles,<br>4. Social Factor<br>Social factors, Consumer needs and desires,<br>Shopping attitudes and behavior, Consumer decision making process, Retailers' action<br>5. Formats based on Pricing<br>Pricing as a competitive advantage, Discount retailing, Super Store retailing, Off Price retailing | 1. To study the basics & functioning of Retailing.<br>2. To study through case study on Multi-Channel Retailing.<br>3. To understand the meaning & concept of Merchandising.<br>4. To understand Retail pricing in detail. | CO1-To familiarize the students with retail management concepts and operations.<br>CO2- To explain the understanding of retail management and types of retailers.<br>CO3- To discuss an understanding of retail management terminology including merchandize management, store management and retail strategy.<br>CO4- To acquaint the students with legal and ethical aspects of retail management.<br>CO5- To create awareness about emerging trends in retail management. |
| **Module II- Retail Communication And IT**<br>1. Managing Communication for a Retail Store Offering: | 1. To study the objectives of Retail communication.<br>2. To study the tips for attractive retail graphic design.<br>3. To understand the retail ERP system. | |

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| Introduction, Objectives, Marketing Communication, Thematic Communication,<br>2. Methods of Communication<br>Methods of Communication, Graphics, Signage<br>3. IT for Retailing:<br>Information Systems, Barcoding, Retail ERP<br>4. Trends & Innovation<br>Analytics & Tools | | |
| **Module III- Introduction to Merchandising**<br>1. Concept of Retail Merchandising<br>Meaning of Merchandising, Major Areas of Merchandise Management, Role and Responsibilities of Merchandisers<br>2. Merchandise Mix<br>Merchandise Mix, Concept of Assortment Management, Merchandise Mix of Show off<br>3. Merchandise Displays<br>Concept of Merchandise Displays, Importance of Merchandise Displays<br>4. Space Management<br>Concept of Space Management, Role of IT in Space Management, Concept of Planogram<br>5. Formats based on Merchandise selection:<br>Merchandise selection as a competitive advantage, Specialty store retailing, Department store retailing, Super specialist, Niche specialist | 1. To learn the advantages and disadvantages of merchandising.<br>2. To study the process of Merchandising.<br>3. To study the components of Assortment Strategies.<br>4. To study the importance of visual merchandising.<br>5. To study the emergence of retail planograms.<br>6. To study the advantages and disadvantages of specialty stores. | |
| **Module IV- Visual and On-line Merchandising**<br>1. Visual Merchandising<br>Merchandising: Meaning of Visual Merchandising, Objectives of Visual Merchandising, Growth of Visual Merchandising<br>2. Visual Merchandising in India | 1. To study the objective of visual merchandising.<br>2. To study the types of Non store retail merchandising. | |

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| Visual Merchandising in India, Product Positioning and Visual Merchandising<br>3. Non- Store Merchandising<br>Introduction, Objectives, Non-Store Retail Merchandising, Television retailing/ home shopping, Product presentation in Non- Store Retail Merchandising<br>4. Online Merchandising<br>Internet retailing/ online shopping, Catalog Management<br>5. Trends & Innovation<br>Analytics and Tools | | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Brand Management**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1. Introduction to Brand Management**<br>1.Introduction to Brand Management:<br>Meaning of Brand, Branding, Brand Management,<br>Importance of Branding to Consumers, Firms,<br>Brands v/s Products, Scope of Branding,<br>Branding Challenges and Opportunities,<br>2.Models<br>Strategic Brand Management Process, Customer<br>Based Brand Equity model (CBBE)<br>3.Brand Positioning:<br>Meaning, Importance, Objectives, Scope Basis of Brand Positioning, Brand Mantras Brand | 1. To understand the meaning of brand and its related concepts<br>2. To understand various models<br>3. To understand brand positioning and its importance along with related concepts | CO1- To understand the awareness and growing importance of brand management.<br>CO2. To know how to build, sustain and grow brands<br>CO3. To know the various sources of brand equity.<br>CO4. To know about the global perspective of brand management |

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| Repositioning and its characteristics, Point of Parity and Point of Differences | | |
| **Module 2- Planning and Implementing brand marketing programs**<br>1. Brand Elements<br>Meaning, Criteria for choosing Brand Elements, Types of Brand Elements, Integrating Marketing Programs and Activities<br>2.Personalising Marketing<br>Experiential Marketing, One to One Marketing,<br>Permission Marketing. Product Strategy:<br>Perceived Quality and Relationship Marketing,<br>Pricing Strategy: Setting Prices to Build Brand<br>Equity Channel Strategy: Direct, Indirect<br>Channels, Web Strategy<br>3.Cause Marketing to Build Brand Equity<br>Meaning of Cause Marketing, Advantages, Green Marketing Building Global Customer Based Brand Equity | 1. To make students understand the brand and its criteria for being chosen.<br>2. To learn about personalizing marketing<br>3. To explore about various marketing aspects, channels and strategies | |
| **Module 3- Growing and sustaining brand equity**<br>1.The Brand Value Chain- Model Value stages and implication, What to track,<br>designing brand tracking studies<br>2.Brand Equity<br>Meaning , Importance , Objectives, Sources of<br>Brand Equity, Steps of Brand Building including Brand Building, Blocks, Leveraging Secondary Brand Associations to Build Brand Equity<br>3.Measuring | 1. To make students learn about all necessary concepts related to brand equity<br>2. To teach about brand personality and its values<br>3. To learn about various quantitative research techniques in detail | |

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| Sources of Brand Equity<br>Qualitative Research Techniques: Projective<br>Techniques: Completion, Comparison, Brand<br>Personality and Values: The Big Five, Free<br>Association<br>Quantitative Research Techniques: Brand<br>Awareness: Recognition, Recall, Brand Image,<br>Brand Responses. | | |
| **Module 4- Measuring and interpreting brand performance**<br>1.Brand Performance and Management<br>Global Branding<br>Strategies, Brand Audit, Role of Brand Managers<br>2.Brand Communication<br>Online Brand Promotions, Role of Brand Ambassadors, Celebrities, Loyalty Program<br>3.Managing Brands over Geographical Boundaries<br>Global Marketing Program, advantages and disadvantages, Cultivate Brand Partnership | 1. To study about brand performances and the global branding strategies management<br>2. To cultivate the sense of communication as brands do through online promotions, loyalty programs and so on | |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Digital Media**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1- About features**<br>1. Introduction to Digital Marketing<br>a. Understanding Digital Media<br>b. Advantages of Digital Media<br>c. Principles of Digital Media Marketing<br>d. Key Concepts in Digital media<br>e. Traditional Vs Digital Media | 1. Introduction to Digital media and its key concepts<br>2. To learn about its evolution and principles.<br>3. To differ traditional media and digital media. | CO1- Understand digital marketing platform<br>CO2- Understand the key goals and stages of digital campaigns<br>CO3- Understand the of use key digital marketing tools<br>CO4- Learn to develop digital marketing plans |
| **Module 2-**<br>**2. Search Engine Optimization (SEO):**<br>a. How search Engine works<br>b. Introduction to SEO<br>c. On Page Optimisation<br>d. Off Page Optimisation<br>e. SEO Audit, Tools and Measurement<br>f. SEO resources, Careers in SEO | 1. To understand SEO (On-page and Off- page) in detail<br>2. Importance of websites and keywords<br>3. To study the algorithms and its mechanisms. | |
| **Module 3-**<br>**3. Search Engine Marketing (SEM)**<br>a. What is SEM?<br>b. Why SEM<br>c. What is Google AdWords? Why Google AdWords<br>d. Google network<br>e. AdWords terminologies<br>f. Campaign types<br>g. Creation of Google Display NETWORK (GDN)<br>h. Display Ads format<br>i. Conversion tracking<br>j. GDN Campaign creation (DEMO)<br>k. Remarking<br>l. What are Google shopping Ads | 1. To study how Google Ads & SEM works for Advertising & Marketing. | |

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| **8. Content writing**<br>a. Intro to content writing<br>b. Core Principles of Content writing<br>c. Why blogs matter<br>d. Principles of writing blogs<br>e. How to write content for Twitter and Mobile | content for utilization on the internet.<br>2. Learning skills and qualities required for content writing on various online sites, applications and websites. | |
| **Module 9**<br>**9. Cyber laws**<br>a. Information Technology Act<br>b. Copyright Act<br>c. Cyber ethics<br>d. Digital Security | 1. To learn about cyber laws<br>2. Case studies related to each law so as to better understand the real world.<br>3. Ethics in Digital Media. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Media Planning & Buying**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction to Media Planning**<br>1. Introduction to Media Planning<br>a. Basic Terms and Concepts<br>b. The function of Media<br>c. Objectives of MP<br>d. Role of Media Planner<br>e. Challenges in Media planning<br>f. BARC and NCCS grid<br>g. Factors influencing media<br>h. The criterion for selection of media vehicles | 1. Learning the concepts of Media planning.<br>2. Key role of a Media planner. | CO1- To develop knowledge of various characteristics of media.<br>CO2- To understand procedures, requirements, and techniques of media planning and buying.<br>CO3- To learn the various media mix and its implementation<br>CO4- To understand budget allocation for a Media plan |
| **2. Negotiation Skills in Media Buying:**<br>a. Negotiation Strategies,<br>b. Laws of Persuasion. | 1. To study the negotiation skills for proper buying of media.<br>2. To study the various laws for learning consumers perspective in making a purchase. | |

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| **3. Media Planning Process:**<br>a. Situation analysis & Marketing Strategy plan,<br>b. Media Briefing<br>c. Setting Media Objectives, and target audiences analysis<br>d. Media selection and strategy<br>e. Media Budgeting<br>f. Media Buying<br>g. Evaluation. | 1. To learn the step-by-step process for selection of media.<br>2. Understanding different strategies taken for an effective selection of media. | |
| **4. Media Mix**<br>Factors affecting Media Mix Decision | 1. To understand the reasons behind selection of media vehicles. | |
| **5. Media Measurement**<br>a. Reach<br>b. Frequency<br>c. Grps/ GVT Ratings<br>d. TRP/ TVT rating<br>e. Impressions<br>f. Cost efficiency<br>g. Cost per thousand<br>h. Cost per rating<br>i. Circulation/ Readership/ AIR<br>j. Selectivity Index<br>k. Share of Voice | 1. Calculating the revenue expenditure spent on each media cycle and execution of the budget on the right media. | |
| **6. Sources of Media Research:**<br>a. Nielsen Clear Decision,<br>b. Broadcast Audience Research Council,<br>c. Audit Bureau of Circulation,<br>d. RAM,<br>e. Comscore- Digital,<br>f. Alexa | 1. Understanding the individual reach of media through various measurement bodies. | |
| **7. Selecting suitable Media options**<br>(Advantages and disadvantages)<br>a. Newspapers,<br>b. magazines,<br>c. Television,<br>d. Radio,<br>e. Outdoor and OOH,<br>f. Transit<br>g. Cinema Advertising. | 1. Learning about various media and different mediums for advertising.<br>2. Understanding the pros and cons of each medium. | |

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| **8. Media Buying**<br>a. Newspapers<br>b. Magazine<br>c. Television<br>d. Radio | 1. To learn how to buy media space for traditional medias | |
| **9. Communication Mix:**<br>Communication Mix | 1. Learning about the IMC and its tools.<br>2. To study innovative ways for advertising and marketing of the product. | |
| **10. Digital Media Buying**<br>1. Buying Digital Advertising; An Overview Paid media, Owned media and Earned media<br>2. Digital Sales Funnel<br>3. Direct buys from the websites/ Impact buy<br>4. Programmatic Buying: [DSP (Demand-side Platform) or RTB (Real-Time bidding)]<br>5. Advertising via Premium Publishers<br>6. Advertising via Networks and exchanges<br>7. Affiliate Network (Click bank, Commission junction, adfuncky, 7search)com)<br>8. The Local Publishing Market<br>9. OTT platform<br>10. Influencers Marketing or social media influencers<br>11. Content advertising<br>12. Native advertising<br>13. App installed campaign<br>14. Push notification<br>15. Google ads<br>16. Bing ads<br>17. Lead Progression<br>a. Cost per impression<br>b. Cost per click (CPC)<br>c. Cost per lead (CPL) Cost per action (CPA) or pay per action ( PPA)<br>d. cost per conversion or Revenue sharing or cost per sale. | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms.<br>4. To study about online platforms and available spaces used for advertising.<br>5. Understanding various advertising formats with respect to social media and video advertising. | ! |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Advertising Design**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction:**<br>**Advertising Design -**<br>Communication Design<br>1. Project Paper<br>Introduction to Project paper & Campaign<br>Campaign outline, Elements to be produced, Viva-voce<br><br>2. Role of Agency Departments<br>1. Accounts dept: Client handling, Strategy planning<br>2. Media dept: Media research, Media planning, Buying & billing<br>3. Creative dept: Prime caliber, All of the visualization, Creative thinking, Execution,<br>4. Production dept: (in-house or outsource) Photography, TVC, Print of promotional material.<br><br>3. Process of Design<br>Research of:<br>1. Product (features & benefits)<br>2. Market: (TA) Psycho & Demography<br>3. Message Strategy: What to say & How<br>4. Competition & claim<br>5. Visualisation & Copy<br>6. Illustration: Choosing one among<br>7. Execution: Graphic design<br><br>4. Art Direction<br>Role of art director in various media<br>Detailing in illustration<br>Detailing in TVC- Location, Models, Costume, Working on storyboard | 1. To study about the agency and its departments who handle an advertising campaign of a brand.<br>2. To study about the production stage of the campaign.<br>3. To study the idea generation process for any creative. | CO1- To make students understand the process of planning & production of advertisement<br>CO2- To highlight the importance of visual communication<br>CO3- To provide practical training in the field of advertising |

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| 5. Analyzing Ads & Logos<br>Discussion of existing ads:<br>Prints ads: For layout, Colors, Message<br>TVCs: AV, Pace, Tne, etc<br>Innovative, Ambient, Transit for relevance<br>PoS: For size, Place, Consumer psychology | | |
| **Module II- Design Basics: Language of Visuals**<br>1. Elements of Design- Vocabulary: Point, Line, Shape, Size, Tone, Colors, Texture, Space<br>2. Principles of Design- Grammar: Proportions, Contrast, Harmony, Balance, Rhythm, Unity<br>3. Rules of Design- Rules/ Guides: Emphasis, Proximity, Alignment, Visual path, Syntax Gestalt: Completion, Closure, Invariance, Multi-stability, Figure & ground etc<br>4. Optical illusions- Visual Influence:<br>Shapes & proportions, Tones & contrast, Lines & length<br>5. Typography- Type as a Design element:<br>Classification: Serif, Sans serif, Decorative, Trendy etc.<br>Measurement: size, weight, Kern, Track, leading, baseline etc.<br>Word Expression, Meaning expressed by appearance | 1. To learn about the elements of designing.<br>2. To study the Gestalt principle which helps to create perspective through designs.<br>1. Understanding different fonts and typefaces of an ad-copy.<br>2. Learning meaning and tone form the typography.<br>1. To study the focal point of an advertising and using this idea in making the creatives. | |
| **Module III- Layout: The Blue Print**<br>1. Types of Layout-<br>Mondrian, Picture window, Split, Big type, All text, All art, Circus etc.<br>2. Stages of Layout-<br>Thumbnail sketches, Rough layout, Finished layout, Comprehensive<br>3. Choosing Picture- | 1. To learn how negative space in a figure-ground is creative and gives new shapes and vision and adding meaning to the brand.<br>2. Learning about the types of layouts used in creating copies.<br>3. Understanding the process of creating layouts. | |

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| Strong visual capable of selecting Target Group, Suitable with headline, Trail close<br>4. Choosing Typo-<br>Sorting text into parts of copy.<br>Choosing appropriate typeface for Headline, Subheads Slogan, Body etc.<br>5. Putting all Together-<br>Choosing canvas size, Trying formats, orientations, Various proportions of verbal & Visual | | |
| **Module IV- Planning A Campaign: Working on Final Project**<br>1. Choosing a product<br>Finalizing what to sell.<br>Designing a Logo: Type based, Shape based, Combo, Symbolic etc.2. Research<br>Product/ Service (feature & benefits)<br>Market: Wants & Needs, Psycho & Demography, What words may click their minds.<br>Tone & Voice<br>3. Idea generation<br>Coming to big idea, Trying various idea generation techniques<br>4. Visualizing Layout<br>Choosing appropriate image/ s & working on rough layout<br>Finalizing layout for highest effectiveness. | 1. To learn the shapes and symbols from our surroundings.<br>2. To study the effects and beauty of colors from nature and use it in the creative. | |
| **Module V- Execution: On system work (Faculty to Guide & Instruct)**<br>1. Logo Design<br>Working on system: Corel Draw/ Illustrator<br>Designing Logo, Deciding color scheme<br>(Logo is vector based)<br>Modifying Typo, Using glyphs, Considering shape as identity<br>2. Logo Manual | 1. To study different types of logos and its meaning.<br>2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience. | |

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| Creating a Logo design Philosophy Explaining the logic behind choice of Type, Choice of color, Reason for shape, Tagline as brand promise. Making everything compact. Creating 4 diff sizes & also reverse<br>3. Print Ads/ Press ads<br>Press: Using finalized layout for creating series of three ads (Synergy maintained)<br>Diff image same typo OR<br>Diff expressions same model-(brand ambassador) & same typo Creating headlines suitable to image (syntax)<br>4. Outdoor ad, Innovative/ Transit /Ambient Point of purchase<br>Outdoor: Deciding location, Format, Spotting frequency, Advantage of location, Advantage of local surroundings, Spotability, Appropriate headlines<br>5. TVC or Web Ads<br>TVC: Story line, Script, Floor plan, Camera plot,<br>Storyboard with, VFX, OSD, SFX, VO<br>Web ad: Pop up, Scroll, Banner etc<br>Printing, Mounting & Preparing for viva | | |

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**Faculty Name - Ms. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia and Mass Communication:**

**Course: Advertising & Sales Promotion**

**TYBAMMC SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I- Introduction**<br>1. Introduction-<br>a. Nature and importance of sales promotion,<br>b. Role of Promotion in the Marketing Mix<br>c. The Scope and Role of Sales Promotion<br>d. Reasons for the Increase in Sales Promotion<br>e. Consumer franchise building versus non franchise building promotions<br>2. Theories in Sales Promotion<br>a. Push promotion<br>b. Pull Promotion<br>c. Combination theory<br>3. The psychological theories behind sales promotion<br>a. Reciprocation<br>b. Social Proof<br>c. Foot-in-the Door Technique<br>d. Door- in-the-Face Technique<br>e. Loss Aversion<br>f. Social Norms Marketing<br>g. High, Medium, low | 1. To understand the process of sales promotion.<br>2. To understand the increased sales promotion activities.<br>3. To learn in detail the Theories of sales promotion. | CO1- Students should be able to demonstrate a thorough understanding of the major sales promotion concepts.<br>CO2- Use a framework to make effective sales promotion decisions.<br>CO3- Adopt the necessary skills and point of view of an effective sales promotion Campaign. |
| **Module II**<br>1. Methods of consumer- oriented sales promotion<br>a. Sampling<br>b. Coupons<br>c. Premiums<br>d. Refund, rebates, cash backs<br>e. Contests and Sweepstakes<br>f. Bonus pack<br>g. Price off<br>h. Exchange offers | 1. To study the types of consumer-oriented sales promotion.<br>2. To study about cooperative advertising.<br>3. To study the objectives & types of sales force promotions. | |

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| i. EMI<br>j. Demonstration of product<br>k. After Sale Service<br>2. Methods of Trade oriented sales promotion<br>a. Contest & Incentives for dealers<br>b. Trade allowances (Buying allowances, slotting allowances, promotional allowances)<br>c. Point of purchase displays<br>d. Sales training programs<br>e. Trade shows and dealer conferences<br>f. Stock return<br>g. Credit terms<br>h. Dealer trophies<br>3. Methods of sales force oriented sales promotion<br>a. Bonus and incentives to Sales Force<br>b. Sales Promotion Contest<br>c. Sales Meetings and Conferences:<br>d. Free travel<br>e. Sales literature<br>f. Demonstration kits<br>g. Honor or recognition | | |
| **Module III**<br>1. Study and analyze sales promotion campaign on the major brands<br>a. Three loyalty programs. (One each of FMCG, Consumer durable and service)<br>b. Three Consumers oriented sales promotion program. (One each of FMCG, Consumer durable and service)<br>c. Three trade oriented sales promotion programs. (One each of FMCG, Consumer durable and service)<br>d. Three sales force oriented sales promotion programs. (One each of FMCG, Consumer durable and service) | 1. To study and analyze sales promotion campaigns through various contemporary case studies. | |

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| e. Two sales promotion of any luxury brands | | |
| **Module IV**<br>1. Predicting Sales Promotion Effects<br>a. Evaluation Methods of sales promotion<br>b. Short term and long term effects of sales promotions<br>c. Long-term impact of sales promotion on brand image<br>d. Influence of Sales Promotion on Customer Purchasing Behaviour<br>2. Steps in Designing of sales promotion campaign<br>a. Designing Loyalty, continuity and frequency program<br>b. Big Data and Loyalty<br>c. Gratification and Loyalty<br>3. Coordination sales promotion & Advertising<br>a. Budget allocation<br>b. Coordination of Ad and Promotion Themes<br>c. Media Support and Timing<br>4. Sales promotion Abuse<br>a. Over use<br>b. Sales promotion trap | 1. To understand how to retain consumers through value-added promotions.<br>2. To learn how to design a sales promotion campaign.<br>3. To study in detail about the budget allocation for the promotion.<br>4. To study about the sales promotion traps. | 1 |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Fundamentals of Mass Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Introduction and Overview<br>1. Meaning and importance of Mass Communication.<br>2. Forms of Communication: Intra Personal Communication, Interpersonal Communication, Group Communication, Mass Communication: Electronic, Satellite, Interactive, Digital<br>3. Communication etc.<br>4. Models of Communication: Gerber's Model, Sociological Model, Gatekeeping Model, Defleur's Model of the Taste-differentiated Audience Model, Hub Model, Sadharanikaran. | 1. To understand the need of Mass communication<br>2. Learning of various mass communication models.<br>3. Understanding their functions and barriers of mass communication. | CO1- To introduce students to the history, evolution and the development of mass communication in the world with reference to India.<br>CO2- To study the evolution of mass media as an important social institution.<br>CO3- To understand the development of the mass communication models.<br>CO4- To develop a critical understanding of Mass Media.<br>CO5- To understand the concept of New Media and Media convergence and its implications. |
| **Module II**: History of Mass Communication:<br>1. From Oral to Communication (Kirtan, Davandi, Powada, Nagara)<br>2. From Electric to Electronic communication, From Electric to Digital Communication, Contemporary Scene in Indian Communication Landscape. | 1. Understanding the difference between mass communication and mass media.<br>2. To learn various tools of mass communication.<br>3. Understanding the importance and nature of Audiences. | |
| **Module III**: Major Forms of Mass Media<br>1. Traditional and Folk Media<br>2. Print: Books, Newspapers, Magazines<br>3. Broadcast: Television, Radio<br>4. Films | 1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society. | |

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| 5. Internet | 2. Helping students to understand more clearly with the help of case studies.<br>3. Showing the contribution of various religion reformers in saving their valuable literature. | |
| **Module IV**: Impact of Mass Media on Society:<br>A.I. Social Impact (with social reformers who have successfully used mass communication)<br>II. Political impact (with political leaders who have successfully used mass communication)<br>III. Economic Impact (With how economic changes were brought about by mass communication)<br>IV. Development Impact (With how the government has successfully used in mass communication)<br>B. Impact of mass media on:<br>1. Education,<br>2. Children<br>3. Women<br>4. Culture<br>5. Youth<br>6. Development. | 1. Understanding media and its convergence; how new mass media is a back bone to society.<br>2. To understand how the new mass media allows a huge increase in the volume of communication.<br>3. In- depth understanding of social media on mass communication. | |
| **Module V**: The New Media and Media Convergence:<br>1. Elements and features of new media, Technologies used in new media,<br>2. Major Challenges to new media Acquisition- personal, social and national,<br>3. Future prospects. | 1. Creating awareness in the masses due to the emergence of technology.<br>2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom.<br>3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies. | |

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**Faculty Name – Mrs. Shilpi Dey**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Current Affairs**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Current National stories:<br>1. Three political stories of national importance.<br>2. Political Leaders: newsmakers of the season (Brief profile of any three)<br>3. One dominating economic / business news<br>4. One dominating environment news stories<br>5. One story of current importance from any other genre. | 1. To learn about political stories of national importance.<br>2. To also know in detail the contributions of political leaders and their history.<br>3. To know the environment more nearly covering genres of news. | CO1- To provide learners with an overview on current developments in various fields.<br>CO2- To generate interest among the learners about burning issues covered in the media.<br>CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news.<br>CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture. |
| **Module 2**: Polity and Governance:<br>1. Ministries of Government of India: Autonomous Government bodies<br>2. Ministry of Home Affairs: Enforcement Organizations, Internal Security, Police<br>3. Communal tensions: Review of latest episodes of communal tensions.<br>4. Tensions in J&K: Background, Political players, Update on the current situation<br>5. Review of any three Central Government projects and Policies. | 1. To introduce and understand the government of India.<br>2. In-depth information about the Home Ministry and its Ministerial Team.<br>3. Covering all the aspects of communalism and communal violence/ tensions.<br>4. To know more about Jammu and Kashmir and its issues.<br>5. Understanding in-depth about Governmental schemes, projects and policies. | |
| **Module 3**: International Affairs:<br>1. Security Council: Structure and role<br>2. Issues that currently engage the SC<br>3. Role of United Nations General Assembly, Other main organs of the UNO.<br>4. Issues that currently engage the UNO | 1. To learn about United Nations Systems.<br>2. To highlight the key functions and roles of the United Nations General Assembly.<br>3. To discuss and understand international issues and conflicts. | |

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| 5. Four conflicts/ issues of international importance. | | |
| **Module 4**: Maharashtra Issues:<br>1. Political parties reach and challenge political leaders.<br>2. An update on the current political dynamics of Maharashtra<br>3. News relating to the marginalized and displaced tribes.<br>4. The latest news on floods and drought, unemployment, health issues, etc<br>5. Update two ongoing state projects | 1. To learn in detail about the history of polity in Maharashtra.<br>2. To also understand past and current situations of politics and their political leaders.<br>3. Introducing students to the marginalized and displaced Tribes.<br>4. Talking about developmental projects of the state. | |
| **Module 5**: Technology<br>1. Mobile Application for Journalists: Mobile apps help in content creation, Examples of Mobile apps used by journalists worldwide<br>2. Artificial Intelligence and Content Automation Tools:<br>Introduction to AI and data science, Introduction to Content Automation tools, Examples of content automation tools in content creation.<br>3. Augmented Reality and Virtual Reality in Media:<br>Introduction to Augmented Reality, Introduction to Virtual Reality, Examples of Augmented Reality games and apps, Examples of Virtual Reality news websites worldwide.<br>4. Digital Gaming Industry:<br>Introduction to Digital Gaming Industry<br>5. Digital Gaming in India:<br>Overview of Indian digital gaming | 1. To highlight the use of mobile applications and strategies to capture the attention of readers.<br>2. To understand the cusp of rapid transformation with digital media.<br>3. To learn some of the content automation tools and its handlings.<br>4. Introducing students to Virtual Reality and Augmented Reality.<br>5. To learn and discuss digital gaming and how it leads to market growth. | |

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**Faculty Name – Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Introduction to Communication<br>1. The concept of communication: Communication, its concepts, process Importance of Communication in Media; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication.<br>2. Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication Advantages of verbal communication- Significance of Non-verbal Communication.<br>3. Oral Communication and Media: Anchoring, voice, modulation, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion.<br>4. Listening Skills: Listening Process, Classification of listening; Purpose of Listening; Common Barriers to the Listening Process; Measures to Improving Listening; Listening as an important Skill in Workplace. | 1. To understand and introduce communication<br>2. To understand the process and types of communication<br>3. To enhance the listening skills required to communicate effectively. | 1. To make students aware of the functional and operational use of language in media.<br>understand each type in detail.<br>2. To equip or enhance students with structural and analytical reading, writing and thinking skills.<br>3. To introduce key concepts of communications. |
| **Module 2**: Reading- English, Hindi or Marathi<br>1. Types of Reading: Types of reading -skimming and scanning Reading- examples newspaper/ Magazine article, TV, feature and | 1. Understanding reading and its types.<br>2. Understanding languages and their aspects when communicating through various platforms. | |

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| documentary, radio bulletins, advertising copy, press release in English, Hindi or Marathi. Recognizing aspects of language particularly in media. Importance of spelling.<br>2. Various aspects of language: Recognizing various aspects of language particularly related to media, Vocabulary 100 media words.<br>3. Grammar and Usage: Grammatical structure- spelling, structure of sentences, Active/ Passive voice, tenses, Idioms, Phrases, proper usage of homophones, homonyms etc. | 3. To get deeper and broader knowledge about grammar aspects. | |
| **Module 3**: Thinking and Presentation<br>1. Thinking:<br>1.Types of thinking (rational, logical, critical, lateral, etc.) Errors in thinking, Partialism, Time scale, Egocentricity,<br>2.Prejudices, adversary Thinking.<br><br>2. Presentation: Presentation, its importance, steps in making a presentation; delivering a Presentation. | 1. To make students understand the importance of thinking and its role in communication.<br>2. Understanding types and errors of thinking.<br>3. To understand presentations and the tips on how to deliver and communicate effectively. | |
| **Module 4**: Translation<br>1. Introduction to Translation: Concept, importance, need for translation, challenges in translation, problems and importance of Information and Technology in translation.<br>2. Interpretation: Meaning, Difference between interpretation and translation.<br>3. Role of a translator: Translator and its Role in Media, Qualities, Importance of Translator, Challenges faced by translator. | 1. Understanding the concept, needs, and technologies of translation.<br>2. Understanding the difference between interpretation and translation.<br>3. To understand the translator's perspective for effectively communicating in the media. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Overview of India Society:<br>Understand the Multi-cultural diversity of Indian Society through its demographic composition.<br>Population distribution according to religion, caste, and gender<br>Appreciate the concept of Linguistic diversity in relation to the Indian situation<br>Understand regional variations according to rural, urban and tribal characteristics<br>Understanding the concept of diversity as difference. | 1. To understand the cultural and religion wise composition.<br>2. To learn the classification of Indian Languages.<br>3. To understand the regional variations in India. | CO- 1 To introduce students to the overview of the Indian Society.<br>CO-2 To help them understand the constitution of India.<br>CO-3 To acquaint them with the socio-political problems of India.<br>CO-4 The student will apprehend regional variations according to rural, urban and tribal characteristics.<br>CO-5 Students will become more aware of the political frameworks.<br>CO-6 Learners will comprehend the multi-cultural diversity of Indian society through its demographic composition. Appreciate the concept of linguistic diversity in relation to the Indian situation |
| **Unit-2**<br>Concept of Disparity-1<br>Understand the concept of disparity as arising out of stratification and inequality.<br>Explore the disparities arising out of gender with special reference to violence against women, female feticide (declining sex ratio), and portrayal of women in Media.<br>Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities. | 1. To learn the meaning of Social Inequality.<br>2. To learn about social stratification, its characteristics and its types.<br>3. To understand the class system.<br>4. To understand the declining sex ratio in India.<br>5. To learn about the status and portrayal of women in each era. | |
| **Unit-3**<br>Concept Disparity-2<br>Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof,<br>Understand inter-group conflicts arising out of communalism | 1. To understand the inequalities of the caste system.<br>2. To learn about the causes of Communalism in India.<br>3. To learn about the remedial actions to overcome | |

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| Examine the causes and effects of conflicts arising out of regionalism and linguistic differences. | communalism, linguism, regionalism. | |
| **Unit-4**<br>The Indian Constitution;<br>The Structure of the Constitution- the Preamble, Main Body and Schedules<br>Fundamental Duties of the Indian Citizen<br>Tolerance, Peace and Communal harmony as crucial values in strengthening the social fabric of Indian society<br>Basic features of the Constitution. | 1. To understand the meaning of Preamble and its Characteristics.<br>2. To learn the structure of the Indian Constitution.<br>3. To learn about the significance of the Fundamental Duties, its advantages, and disadvantages. | |
| **Unit-5**<br>Significant Aspects of Political Processes:<br>The party system in Indian Politics<br>Local self-government in Urban and Rural areas<br>The 73rd & 74th Amendments and their implications for inclusive politics<br>Role and significance of women in politics. | 1. To learn about the multi-party system of Indian politics and its evolution.<br>2. To understand the working of the local self-government.<br>3. To learn the important features of the Amendments. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: History of Media**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction:<br>Evolution of Press in India-<br>a. Newspaper- The Rise of the Voice of India during British Rule.<br>b. India's Freedom Struggle and role of Media.<br>c. Independence and Rise of Newspapers,<br>d. Newspapers- A Social Aspect for Freedom Struggle,<br>e. Press Acts of India.<br>f. Press during the Emergency Period. | 1. To learn about the pointers in History of Newspapers in India.<br>2. To understand about the factors that added to the boom of newspapers in India.<br>3. To learn the role of the press in India's struggle for freedom.<br>4. To deeply understand the different Press acts of India. | CO1- Learner will be able to understand Media History through key events in the cultural history.<br>CO2- TO enable the learner to understand the major developments in Media History.<br>CO3- To understand the history and role of professionals in shaping communications.<br>CO4- To understand the values that's shaped and continues to influence Indian Mass Media. |



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| | | CO5- Learner will develop the ability to think and analyze about Media.<br>CO6. To sharpen the reading, writing, speaking and listening skills that will help the students to understand the development of Media. |
| **Module-II** Language Press:<br>History of Indian Language Press in India-<br>a. Rise of Hindi Language Newspapers (detailed report on Vernacular Press in India referring to Newspapers).<br>b. Regional press and its popularity of Indian Regional Languages in various regions.<br>c. Vernacular Press Act,1876. | 1. To learn about the diversity and growth of Indian Language Newspapers.<br>2. To understand the effect of the vernacular press act on Indian Publishers.<br>3. To learn the difference between English newspapers and Language Newspapers. | |
| **Module-III** Documentaries and Films:<br>History of Documentaries and Films-<br>a. Genesis of Documentaries and Short Films (Screening of a few documentaries is essential- like Hindustan Hamara, Zalala, The Vanishing Tribe).<br>Role of Documentarians- P.V.Pathy, D.G.Tendulkar, K.S.Hirlekar, Paul Zils and Fali Billimoria, Anand Patwardhan.<br>b. Evolution of Film Making in India- Brief History, Photography to Moving Films.<br>c. Origin of Hindi Cinema.<br>d. Origin of Short films to what it is today, Role of YouTube and WhatsApp.<br>e. Great Masters of World Cinema. | 1. To learn about different types of Documentaries.<br>2. To learn how to make documentaries.<br>3. To understand about Indian Documentary and the struggle for Indian Independence.<br>4. To learn about the New Media and their roles in Movie making. | |
| **Module-IV** Broadcasting:<br>History of Radio and Television in India:<br>a. Radio and Television as Mass Media.<br>b. Radio and Television Broadcasting-<br>c. The beginning of Radio and Television Shows.<br>• A New Era in Broadcasting in India.<br>• Satellite Television and Privatization in Broadcasting.<br>• Advertising in India. | 1. To study the history of Prasar Bharti Act.<br>2. To study the functions and objectives of Radio.<br>3. To study the Business model of the cable TV industry.<br>4. To understand the key recommendations of TRAI. | |

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| d. Internet Protocol Television.<br>**Module- V** Media Icons:<br>Role of Media Icons in the History of Indian Media-<br>1. Raja Rammohan Roy<br>2. Bal Gangadhar Tilak<br>3. M.K. Gandhi<br>4. B.R. Ambedkar<br>5. K.P.Kesava Menon<br>6. K.C. Mammen Mapillai<br>7. Maulana Abul Kalam Azad. | 1. To study about the various movements of history.<br>2. To learn about our Media icons who played important role in marking the change. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Visual Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I**: Development to Visual Communication<br>Introduction to Visual Communication:<br>1. History and Development of Visuals<br>2. Need and Importance of Visual Communication<br>3. Visual Communication as a process and as an Expression, Language and Visual Communication<br>4. Visible Concepts:<br>• Plans and Organizational Charts<br>• Maps<br>• Chronologies<br>5. Invisible Concept:<br>• Generalization Theories<br>• Feelings or attitudes | 1. To understand communication and the aspects.<br>2. To introduce students to VISUAL AIDS and the history of visuals.<br>3. Understanding visual communication in detail with various connections.<br>4. To learn about visible and invisible concepts. | CO1- To provide students with tools that would help them visualize and communicate.<br>CO2- Understanding Visual Communication as part of Mass Communication.<br>CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.<br>CO4- To acquire basic knowledge in theories and languages of Visual Communication.<br>CO5- The ability to understand and analyze visual communication from a critical perspective. |
| **Module II**: Theories of Visual Communication | 1. To extend the knowledge of the students by discussing | |

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| Sensual Theories<br>a. Gestalt<br>b. Construction<br>c. Ecological<br>Perceptual Theories<br>a. Semitics<br>b. Cognitive | theories and case studies.<br>2. To make them understand how the visual cortex works to create unified perception.<br>3. Knowing about complexity and multifaceted cognitive processes. | |
| **Module III**: Impact of Colors<br>Colors and Design in Visual Communication<br>1. Color Theory<br>2. Psychological Implications of color<br>3. Colors and Visual Pleasure<br>4. Elements of Design | 1. To understand theories related to color for visuals.<br>2. Understanding the psychological influence of color on perception.<br>3. Understanding in detail visual plans and designs. | |
| **Module IV**: Channels of Visual Communication<br>Tools/ Mediums of Visual communication:<br>1. Painting and Photography<br>2. Film and Television, Documentaries, Script Writing an Visualization<br>3. Comics and cartoons, Digital Images, Animation and VFX<br>4. News Papers, Advertisements, Photojournalism<br>5. Folk and Performing Arts, Theatre | 1. Understanding of various tools of visual communication.<br>2. Understanding various styles and types of visual communications.<br>3. To strategize visuals for mass appeals.<br>4. To understand the perception and structure of each platform. | |
| **Module V**: Language and Culture in the age of social media<br>Visual Communication in the Age of social media:<br>1. Ethics<br>2. Impact of Language and Culture, Images and Messages, Signs and Symbols (GIF, etc.)<br>3. Audience Behavior<br>4. Citizen Journalism, Going Viral<br>5. Visual Stereotyping in social media | 1. To adapt to new changes with the advent of technologies.<br>2. Understanding the ethics and audience behavior.<br>3. Understanding the role of stereotyping in social media. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

# Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Advertising**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Introduction to Advertising:<br>1. Introduction to Advertising- Evolution, Importance, Features, Benefits, Limitation, Effects and 5 M's of Advertising.<br>2. Types of Advertising- Consumer, Industrial, Retail, Classified, Corporate, Public Service, Generic, National, Global, International, Social (CSR) and Advocacy.<br>3. Ethics and Laws in Advertising- Puffery, Subliminal, Weasel claim, Surrogate, Shocking ads, Controversial, Comparative, Advertising code of ethics, Regulatory bodies, Laws, and regulations.<br>4. Social, Cultural and Economic impact of Advertising- Women and advertising, Children and advertising, Senior citizen and advertising, Pop culture and advertising.<br>5. Theories- Stimulus theory, AIDA, Hierarchy, Means-Ends Theory. | 1. To understand the evolution of advertising<br>2. To relate with the advantages & disadvantages to consumers, traders, manufactures and society.<br>3. To understand advertising laws and ethics<br>4. To understand various types of advertising | CO1- To provide the students with basic understanding of advertising, growth, importance, and types.<br>CO2- To understand effective advertising campaigns, tools, models etc.<br>CO3- To comprehend the role of advertising, various departments, careers, and creativity.<br>CO4- To provide students with various advertising trends, and future. |
| **Module-2** Integrated Marketing Communication and Tools:<br>1. IMC- Emergence, Role, Tools, Communication process, The IMC Planning Process. | 1.To comprehend the concept of IMC<br>2. To understand the role and various tools of IMC<br>3. To be able to understand the | |



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| 2. Print Media and OOH Media- Basic concepts, Types of Newspapers advertising, Advantages and Disadvantages of Newspaper advertising, Magazines, Factors to consider for Magazine advertising, OOH Advertising, On-premise advertising, Transit advertising, Posters, Directory advertising.<br>3. Broadcast Media: Radio advertising Advantages and Disadvantages of Radio advertising, Television advertising and its Advantages and disadvantages, Film advertising and product placement- advantages and disadvantages.<br>4. Public Relation- Meaning of Public Relations, Types of PR, Difference between PR and Advertising, Difference between Publicity and Advertising, advantages and disadvantages of Public Relations, Advantages and Disadvantages of Publicity.<br>5. Sales Promotion and Direct Marketing- Growth and Types of Sales Promotion, Advantages and Disadvantages, Growth of Direct marketing, and its tools Advantages and disadvantages | difference between print media & Outdoor media<br>4. To get basic knowledge about Radio & Television as a means of mass communication and advertising | |
| **Module-3**<br>1. Introduction to Creativity- Importance of Creative process, Creative strategy development determining message theme, big idea, Positioning strategies, Types of Appeals.<br>2. Role of different elements in ads- Logo, Jingle, Company signature, Slogan Tagline, Illustration, Creating Radio commercial- words, sounds, clarity, coherence, etc.<br>3. Elements of copy- Headline, Sub headline, Layout, Body copy, Types of copy and slogan, creating storyboard. | 1. To make students understand the creative process in advertising industry<br>2.To make students comprehend the different elements in an advertisement | |

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| **Module-4** Types of Advertising Agency, Department, Careers and Latest Trends in Advertising.<br>1. Types of Advertising Agency- Full service, Creative Boutique, Media buying agency, In-house agency, Specialized agencies and others.<br>2. Various departments in an agency- Account handling, Production, Art, Copy, Media, Public relation, Human resources, Finance and others.<br>3. Latest Trends- Rural advertising, Ambush advertising, Internet advertising, Email advertising, Advertainment, Advertorial, Mobile Advertising. | 1. To help students understand the different types of ad agencies and their basic difference<br>2. To be able to know the various departments in an ad agency<br>3. To understand the latest trends in career in advertising industry | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Content Writing**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation:<br>1. Grammar Refresher- With special emphasis on use of punctuation, preposition, capital letters and lower case.<br>2. Vocabulary building- Meaning, usage of words, acronyms.<br>3. Common errors- Homophones and common errors in English usage.<br>4. Essentials of Good writing- With emphasis on writing with clarity, logic, and structure. | 1. To learn and revise English grammar.<br>2. To practice vocabulary building in order to understand its aspects and significance.<br>3. Learning about common errors while communicating in the English language and understanding the requirements for good writing.<br>4. In-depth knowledge of creativity exposure in creating phrases and idioms. | CO1- To provide students with tools that would help them communicate effectively.<br>CO2- Understanding crisp writing as part of Mass communication.<br>CO3- The ability to draw the essence of situations and develop clarity of thought. |
| **Module-2** Editing Skills<br>1. Redundant words- Identifying redundant words and phrases and eliminating these. | 1. To understand some editing tips for better writing and encouraging readers to read which helps in publishing well.<br>2. To boost students to write | |



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| 2. Editing sentences- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>3. Editing captions- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>4. Editing Headlines- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>5. Editing copy- Structuring a story, creating a flow, editing redundant words/ phrases, and replacing wrong words/punctuation/grammatical errors. | and edit captions that are catchy and attractive.<br>3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning.<br>4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story. | |
| **Module-3** Writing Tips and Techniques<br>1. Writing tickers/scrolls- For Television news.<br>2. Writing social media post- Twitter and for other social networks.<br>3. Writing briefs/snippets- News briefs, Lifestyle and Entertainment snippets.<br>4. Caption writing- Picture stories, etc.<br>5. Writing Headlines- News headlines and features headlines | 1. To understand how to write tickers for the television medium.<br>2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks.<br>3. Understanding in detail writing methods for writing headlines and content briefs along with its software's and tools. | |
| **Module-4** Presentation Tools and Techniques<br>1. PowerPoint Presentation:<br>Uses of PowerPoint Tools<br>PowerPoint to Pdf<br>PowerPoint to self-animated presentation<br>Auto-timing of PowerPoint presentation<br>2. Infographic:<br>Color selection<br>Use of Clip art<br>Use of PowerPoint smart Tools | 1. Understanding PowerPoint presentations, their related terms and tools.<br>2. Understanding in detail infographics and their impact while making presentations.<br>3. Tips on how to make a presentation convincing to listeners and viewers.<br>4. To learn terms and concepts related to Google Advanced Search and Plagiarism in detail. | |



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| Minimalist animation for maximum impact<br>3. Three-minute presentation:<br>Content for single slide<br>Uses of phrases<br>Effective word selection<br>Effective presentation<br>4. Google Advanced search:<br>How to select relevant information<br>Locating authentic information<br>How to gather information for domestic and international websites.<br>5. Plagiarism:<br>How to do a plagiarism check<br>Paraphrasing<br>Citation and referencing style | | |
| **Module-5** Writing for the Web<br>1. Content is King- Importance of content<br>2. Less is more- Writing for Print media/social media like Twitter, etc.<br>3. Copywriting- Ad campaigns (Creative, witty and attractive)<br>4. Real Time content- Difference in writing for print vs digital<br>5. Keywords- Designing keywords for Search Engine Optimization. | 1. Understanding content and its essentials.<br>2. To differentiate between print and digital platforms and their content creation.<br>3. To understand the importance of keywords in Digital media. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Writing<br>1. Report Writing:<br>Report Writing (English, Hindi, or Marathi)<br>General report and News report writing- Basics and Format | 1. To learn about report writing and its various elements.<br>2. Understanding in-depth headlines and their features.<br>3. To make students understand the need to | Co1- To make the students aware of the use of language in media and organization.<br>CO2- To equip or enhance students with structural and analytical reading, writing, and thinking skills. |

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| (Headlines, Sub-headline, Various type of Report)<br>2. Organizational Writing:<br>(English, Hindi, or Marathi) Internal communication,<br>E-mail- E-mail Etiquette, Overcoming Problems in E-mail Communication, Stakeholder communication, Circulars- Guidelines for writing a circular- language and writing style of a circular- format of a circular; Notices- Purpose- Format- Important points to remember while writing a notice, Letters of complaint, claim and adjustment, Consumer grievance letters, Letters under the Right to Information Act, Press Release, Letter to the Editor.<br>3. Writing for Publicity Materials:<br>Writing for Publicity Materials (English, Hindi, or Marathi) Headline, Sub-headline, Body copy, Slogan, Jingle, Radio spot. | communicate with internal and external publics of the organization company through types of organizational writing.<br>4. Understanding publicity in detail. | CO3- To introduce key concepts of communication. |
| **Module-2** Editing<br>Editing:<br>(English, Hindi, and Marathi) Principles of Editing, Punctuation, Substitution of words, Restructuring of sentences, Re-organizing sentence sequence in a paragraph, Use of link words,<br><br>(Principles of Coherence and Cohesion), Writing Synopsis, Abstracts, Precis writing, Newspaper Editing and Magazine editing. | 1. To learn the ability to spot mistakes via editing.<br>2. To understand how editing is different from medium to medium.<br>3. To elaborate on grammar aspects for communicating effectively. | |
| **Module-3** Paraphrasing and Summarizing<br>1. Paraphrasing- Meaning, how to use paraphrase in communication, Paraphrase in plagiarism, Translation<br><br>2. Summarization- Summarizing content, the points and sub-points | 1. To understand paraphrasing in writing communication.<br>2. The role of plagiarism while paraphrasing and translations.<br>3. Understanding summarization. | |



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| and the logical connection between the points. | | |
| **Module-4** Interpretation of Technical Data<br>Interpret Technical Data- Read graphs, Maps, Charts, write content based on the data provided. | 1. To learn to interpret data resulting from pies, graphs, maps, and charts. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Globalization and Indian Society: Understanding the concepts of Liberalization, privatization & globalization;<br>Growth of Information technology and communication and its impact manifested in everyday life;<br>Impact of globalization on industry-changes in employment and increasing migration;<br>Changes in agrarian sector due to globalization;<br>Rise in Corporate farming and increase in farmer's suicides. | 1. To study the elements of liberalization, its advantages, and disadvantages.<br>2. To study the impact of Globalization on Indian Industries.<br>3. To study the role of IT and Communication. | CO-1: To introduce students to the overview of the Indian Society. CO-2: To help them understand the constitution of India.<br>CO-3: To acquaint them with the socio-political problems of India.<br>CO-4: To understand stress and conflicts.<br>CO-5: To manage stress and conflicts in contemporary society.<br>CO-6: To learn about Contemporary Societal Challenges |
| **Unit-2** Human Rights:<br>Concept of Human Rights; Origin and Evolution of the concept;<br>The Universal Declaration of Human Rights;<br>Human Rights constituents with special reference to Fundamental Rights stated in the Constitution | 1. To study the basic characteristics of Human Rights.<br>2. To understand the evolution of Human rights.<br>3. To study the classification of the provisions of UDHR. | |
| **Unit-3** Ecology: | 1. To study the concept and disciplines of Ecology. | |



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| Importance of Environment studies in the current developmental context;<br>Understanding concepts of Environment, Ecology, and their interconnectedness;<br>Environment as natural capital and connection to quality of human life;<br>Environmental Degradation- causes and impact on human life;<br>Sustainable development- concept and components; poverty and environment. | 2. To study the structure of Ecosystem and causes of environmental degradation.<br>3. To learns about Sustainable development and the global need for the Sustainable development | |
| **Unit-4** Understanding Stress and Conflict:<br>Causes of stress and conflict in individuals and society;<br>Agents of socialization and the role played by them in developing the individual;<br>Significance of values, ethics, and prejudices in developing the individual.<br>Stereotyping and prejudice as significant factors in causing conflicts in society.<br>Aggression and violence as the public expression of conflict. | 1. To learn about the levels of Stress.<br>2. To study about the types of Organizational conflict.<br>3. To understand the measures for resolving aggression and violence in society. | |
| **Unit-V**<br>Managing Stress and Conflict in Contemporary Society:<br>Types of conflicts and use of coping mechanisms for managing individual stress;<br>Maslow's theory of self-actualization;<br>Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society. | 1. To learn the assumptions & limitations in Hierarchy of Needs Theory.<br>2. To study the need for peace and harmony in India. | |

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**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Journalism**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** History of Journalism in India:<br>Changing face of Journalism from Guttenberg to New Media.<br>Journalism in India- Earliest Publications,<br>The rise of Nationalist Press, Post 1947<br>The Emergency 1975, Post Emergency<br>Post Liberalization of the Economy boom in Magazines, Niche Journalism<br>How Technology Advancement has helped Media<br>New Media with special reference to Rise the citizen Journalism. | 1. To learn the history and eras of journalism along with challenges.<br>2. To understand the new media and technology advances.<br>3. To briefly understand the news transmission and gathering process.<br>4. To discuss and learn about how the internet led to the rise of citizen journalism along with its pros, risks, and nature. | CO1- To help media students to acquaint themselves with an influential medium of journalism that holds the key to opinion formation and to create awareness. |
| **Module-2** News and its Process:<br>Definitions of News,<br>The News Process from the Event to the Reader<br>What makes a good story?<br>Anatomy of a news story<br>Types of Beats: Crime, Environmental, Entertainment, Educational, Agricultural, Sports, etc. | 1. To get knowledge about news and the process of gathering news.<br>2. Elements required for a good news story.<br>3. Understanding the beats and parts of a news story in detail. | |
| **Module-3** Principles and Format:<br>What makes a Great Journalist- Objectivity, Accuracy, Without fear or favor, Balance Proximity<br>Difference between a PR and a Journalist<br>Criteria for Newsworthiness<br>Hard News/Soft News and blend of the two<br>News Reports, Features Editorials | 1. Understanding the avenues to explore in journalism.<br>2. To learn about journalists/ reporters and their practices on various platforms.<br>3. Understanding the types of news.<br>4. To make students understand the difference between PR and journalism. | |

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| **Module-4** Career in Journalism- Reporter, Feature Writer, Mojo, Data Journalist, Real Time Journalist, Investigate Journalist, Rural Journalist, In-depth Journalist, Lifestyle Journalist. | 1. To learn and understand career prospects in journalism.<br>2. To encourage students to participate in grabbing opportunities related to the field. | |
| **Module-5** Covering an Event (Flip Class)<br>Background Research<br>Finding a News Angle<br>Capturing the Right Pictures for a Photo Feature<br>Writing Headline, Captions and Lead. | 1. To make students understand the importance of a piece of information to convert it into the news.<br>2. The unbiasedness and impartiality objectives must be cleared among the students.<br>3. To make understanding students to cover news from all angles and the format in writing news. | |

**Faculty Name – Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Gender & Culture**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1 Evolution, Need, Concepts and theories**<br>Evolution, features of cultural studies, Need and significance of cultural studies and media<br><br>Concepts related to culture- Acculturation, enculturation, ethnocentrism, cultural relativism, cultural shock and its relevance in media<br><br>Theories:<br>• Stuart Hall: encoding and decoding, Circuit of culture<br>• John Fiske: culture and industry<br>• Feminism and Post feminism | 1. To understand the evolution of culture and significance of Cultural studies and media.<br>2. Brief learning on the concepts related to culture.<br>3. To learn and understand the various ideologies and theories reflecting the culture, gender, and media. | CO1- To discuss the significance of culture and the media industry.<br>CO2- To understand the association between the media, gender, and culture in the society.<br>CO3- To stress on the changing perspectives of media, gender, and culture in the globalized era. |

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| • Techno culture and risk – Ulrich Beck | | |
| **Module-II** Culture & Media:<br>Construction, commodification, impact and recent trends<br>Construction of culture- social, economic, political, religion and technology<br>2. Culture, industry and media- commodification, memes, representation, articulation, popular culture, power, cyber culture<br>3. Media and its impact on the cultural aspect of the society.<br>4. Culture industry and communication - with reference, to film, TV, social media, advertisements etc.,<br>5. Recent trends in Culture consumption: Changing values, Ideologies & its Relevance in the Contemporary society. | 1. To understand and discuss social constructionism and its terms.<br>2. To understand culture from various aspects such as politics, religion- technology and media.<br>3. Understanding how power is an integral element of culture and features.<br>4. To learn recent trends in culture consumption. | |
| **Module-III** Gender & Media Culture:<br>Role and influence of media<br>1. The influence of the media on views of gender (theme, under representation, Stereotypes, Women & Men, Stereotypes Images, Roles, etc)<br>2. Role of social construction of gender, Changing Attitudes and Behaviour for empowerment of Women: Movements of Change.<br>3.Gender equality and media, Hegemonic masculinity in media.<br>4. Hegemonic Masculinity in Media.<br>5. Gender issues in news media (TV, radio, newspapers & online news). | 1. To have a deeper understanding about influences of media on gender and views.<br>2. To discuss and have better understanding on gender equality with reference to the media.<br>3. To relate the gender challenges on various platforms. | |
| **Module-IV** Globalization & Media Culture:<br>Global, Local, Consumer and the recent trends<br>1. Media imperialism<br>2. Globalisation and Local culture- Issues and Perspectives, threat to regional and local identities, Impact of global culture and its relevance in media and gender<br>3. Consumer culture and media in the era of globalisation. | 1. To know about current trends of globalization.<br>2. To discuss case studies and concepts relation to global culture.<br>3. Understanding about consumer culture and its evolution.<br>4. Elaborating the aspects related to issues and impact of | |

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| 4. Digital Media culture: Recent trends and challenges<br>5. Media and Globalisation: Global economic flows, global cultural flows, homogenization & fragmentation, glocalization, creolization, globalization & power. | cultures along importance in media and gender. | |

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# Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Corporate Communication & Public Relations**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation of Corporate Communication:<br>1. Introduction to Corporate Communication:<br>Meaning, Need and scope of Corporate Communication towards Indian Media Scenario.<br>2. Keys Concept in Corporate Communication:<br>Corporate Identity- Meaning and Features.<br>Corporate Image- Meaning, Factors influencing corporate image.<br>Corporate Image creation sustainability & restoration.<br>Corporate Reputation & Management- Meaning, Advantages of Good Corporate Reputation.<br>3. Ethics and law in Corporate Communication:<br>Importance of Ethics in Corporate Communication.<br>Professional Code of Ethics.<br>Mass Media Laws: Defamation, Invasion of Privacy, Copyright Act, Cyber-crime and RTI. | 1. To study the features of corporate identity.<br>2. To study the advantages of corporate reputation<br>3. To study important code and ethics of corporate communication.<br>4. To study corporate communication and management | CO-1 To provide the students with basic understanding of the concepts of corporate communication and public relations.<br>CO-2 To introduce the various elements of corporate communication and consider their roles in managing media organizations.<br>CO-3 To examine how various elements of corporate communication must be coordinated to communicate effectively in today's competitive world.<br>CO-4 To develop critical understanding of the different practices associated with corporate communication with the latest trends and social media tools.<br>CO-5 Construct effective corporate communication and public relation plans/strategies. |
| **Module-2** Understanding Public Relations:<br>1. Introduction and growth of PR-Indian Scenario: | 1. To study the growth and importance of Public Relations.<br>2. To study the objective and significance of Public Relations in Business. | |



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| Meaning, Definitions, Scope, Objective and Significance of PR in Business.<br>Tracing Growth of PR in India, Internal & External PR,<br>Reasons for Emerging International Public Relations,<br>Mergers/Collaborations/Joint ventures between India and International PR agencies,<br>Advantages & disadvantages of Public Relations.<br>2. Role of PR in various sectors: Healthcare, Entertainment, Banking and Finance, Real Estate, Fashion and Lifestyle and Service.<br>3. Theories and Tools of PR: Grunting, Pseudo-events, Publicity, Propaganda, Persuasion, Situational theory, Diffusion theory and Various tools of Public Relations (Press conference, Press release, Media Dockets, Advertorials, Sponsorship). | 3. To study the key roles of PR in various sectors.<br>4. To study about theories and propagandas from various PR events. | |
| **Module-3** CCPR's Range of functions:<br>1. Media Relations- Importance of Media Relations, Sources of Media Information, Building Effective Media Relations, Principles of Good Media Relations, Media analysis & evaluation.<br>2. Employee Communication: Sources of Employee Communications, Organizing Employee Communications, Benefits of Good Employee Communications, Steps in Implementing an Effective Employee Communications Program, Role of Management in Employee Communications.<br>3. Crisis Communication: Impact of Crisis, Role of Communication in Crisis, Guidelines for Handling Crisis, Trust Building, Case Studies such as | 1. To study the various importance of Media Relations.<br>2. To study the principles and analysis of Media Relations.<br>3. To study effective communication with employees.<br>4. To study on managing the crisis through communication with various examples. | |



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| Nestle, Maggie, Indigo, Cadbury Dairy Milk, Nira Radia, Tylenol, etc. | | |
| **Module-4** Latest Trends, Tools & Technology role of social media in CCPR.<br>1. Emerging trends, tools & technology:<br>Today's Communication Technology, Importance of Technology to Corporate Communication, Pros and cons of technology used in Corporate Communication.<br>2. New Media Tools:<br>Website, Online press Release, Article marketing, Online newsletters, Blogs.<br>3. Role of social media:<br>Role of social media as Influential marketing, identifying brand threats, influencing journalist's stories, swiftly reacting to negative press, Viral Marketing, engaging and interacting, storytelling, E-Public Relations and its importance. | 1. To study how technology plays an important role in corporate communication.<br>2. To study about social media influencers.<br>3. To understand E-Public Relations and its importance. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**<br>**Unit-1**<br>1. Introduction:<br>Introduction to Radio,<br>2. History of Radio-Growth & Development,<br>Radio as a Mass Medium- uses & Characteristics, | 1. To study about the invention of Radio and the beginning of broadcasting<br>2. To study the golden age of American radio<br>3. To study the rise of radio networks and the Radio act of 1927 | CO1- The course is intended to explore the art of audio production.<br>CO2-The students are made familiar with the aesthetics of sound and its application in various radio program formats.<br>CO3-To provide them with the basic knowledge and understanding |



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| 3. Writing for the Radio- Who are you talking to?<br>What do you want to say?<br>4. Structure & Signposting,<br>5. The Script | 4. To understand the script writing style for Radio | of radio business and production. |
| **Module 2**<br>The Work of Producer:<br>1. Ideas,<br>2. The Audience, Resource Planning, Preparation of Material,<br>3. The Studio Session,<br>4. Post-Production,<br>5. Technician, Editor, Administrator & Manager. | 1. To learn how to generate ideas for a radio program.<br>2. To study research on different target audience<br>3. To understand the structure of the organization and their roles. | |
| **Module 3**<br>The Radio Studio:<br>1. Studio Layout,<br>2. The studio desk, Mixer, Control Panel console or Board<br>3. Digital Mixers,<br>4. Studio Software,<br>5. Digital Compression and Digital | 1. To understand about various equipment used to broadcast a radio program.<br>2. To learn about digital mixers and its importance.<br>3. To study the history of Sound recording | |
| **Module 4**<br>News-Policy & Practice:<br>1. Interesting<br>2. Nes Values- Accuracy, Realism, & Truth.<br>3. The Newsroom Operation,<br>4, The news conference & press release,<br>5. News reading and presentation: The seven Ps, News Reading, Pronunciation, Vocal Stressing, Errors & Emergencies. | 1. To study the News story material.<br>2. To understand news style for TV and Radio,<br>3. To study about Media Convergence and pragmatism | |
| **Module 5** Interviewing:<br>1. Types of Interviews,<br>2. What the Interviewee should know?<br>3. Preparation before the Interview and the Pre-Interview discussion,<br>4. Devil's Advocate,<br>5. Question Technique: Multiple questions and Leading Questions. | 1. To learn about various questioning techniques.<br>2. To learn about preparation done before the interview. | |



SHETHUL & SUNDARBAI V. COLLEGE OF SCIENCE & COMMERCE
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MUMBAI-69.

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media Studies**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1 Introduction**<br>Eras, relevance, connection to culture literature:<br>• Era of Mass Society and culture-till 1965.<br>• Normative theories, Social Responsibility Theory<br>• Development media Theory. | 1. To learn various dynamics of culture and the theories.<br>2. To learn and differentiate various eras of Mass society. | CO1- To provide an understanding of media theories<br>CO2- To understand the relationship of media with culture and society<br>CO3- To understand Media Studies in the context of trends in Global Media<br>CO4 - To understand the impact of media on individual attitude, values, behavior, and geopolitics<br>CO5- To study the impact of new media technologies and pop culture in the field of advertising |
| **Module 2 Media Theories**<br>Propaganda and Propaganda Theory-<br>• Origin and meaning of Propaganda<br>• Hypodermic Needle/Magic bullet theory<br>• Harold Laswell<br>Scientific perspectives to limited perspectives:<br>• Paul Lazarfeld- Two-step flow theory<br>• Carl Hovland and Attitude change theory | 1. To understand various theories laid by theorists<br>2. To adapt change in perspective and attitude along with society and mass communication | |
| **Module 3 Cultural Perspectives**<br>Various Schools:<br>• Toronto School (McLuhan)<br>• Schools- Birmingham (Stuart Hall) | 1. To understand theorists and their theories related to media and consumption<br>2. to learn about technological advances with eras.<br>3. To formulate and identify | |



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| • Frankfurt- Theodor Andorno and Max Horkheimer.<br>• Raymond Williams- Technological Determinism,<br>• Harold Innis- Bias of Communication.<br>Media and Identity:<br>Feminism/ Racism/Ethnicity. Caste/class/tribal/queer representations. (Indian examples) | biases of communication and get in depth knowledge about social issues. | |
| **Module 4 Media Effects**<br>Theories on Media effects:<br>• Media effects and behavior<br>• Media effect theories and the argument against media effect theories<br>• Agenda Setting Theory<br>• Cultivation Theory<br>• Politics and Media studies- media bias, media decency, media consolidation. | 1. To understand the theories on media effects<br>2. To learn about media and its effect on behaviors.<br>3. To get an in-depth idea about the history of politics and current scenario as discussions. | |
| **Module 5 New Media and the Age of Internet**<br>Meaning Making Perspectives:<br>• New media<br>• Henry Jenkins- Participatory culture<br>• Internet as public sphere- Habermas to Twitter<br>• McLuhan's concept of Global Village in the age of Netflix<br>• Uses and Gratification in the age of the Internet. | 1. To learn about new media and its effects<br>2. To understand the new global village concept by theorist<br>3. To understand the evolution of the internet via theory. | |

SHETHLIA V. COLLEGE OF SCIENCE & COMMERCE
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MUMBAI-69.

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: History:<br>Still pictures to moving images<br>1.1 History of Cinema<br>1.2 Birth of Visual Art.<br>1.3 Understanding the Language of Cinema<br>1.4 Transition from Documentary to Feature Film | 1. To learn about History of cinema, its origin, and various phases of cinema<br>2. To learn about the language and key concepts of cinema<br>3. To understand the transition from documentary to feature films. | C01- To inculcate liking and understanding of good cinema.<br>C02- To make students aware with a brief history of movies; the major cinema movements.<br>C03- Understanding the power of visuals and sound and the ability to make use of them in effective communication.<br>C04- Insight into film techniques and aesthetics. |
| **Module 2**. Understanding aspects of film appreciation<br>2.1 Grammar, Technology and Art Director- the captain<br>Writer- the back-bone.<br>2.2 Aspects of Film-1: Visual Aspects and Editing<br>Mise-en-Scene (Art, Costume, Camera placement)<br>Cinematography<br>Creating Meaning through editing<br>2.3 Aspects of Film-1: Film Sound<br>Three components of Film Sound<br>The relationship between Sound and Image | 1. To learn about techniques and technology in film making<br>2. To learn about film makers<br>3. To learn and understand various aspects of film appreciation and its components | |
| **Module 3**: The Early Cinema: 1895-1950<br>3.1 Early years (1895-1919) World and India<br>The Silent Era (1920-1931)<br>3.2 Early Sound Era (1930-1939)<br>3.3 The development stage (1940-1950) | 1. To learn about early years of world including Indian cinema<br>2. To understand the silent era and its transition till the development stage. | |
| **MODULE 4:** Major Film movements and its impact | 1. To know and introduce students to major cinema | |

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| 4.1 The major cinema movements and their film makers<br>4.2 Hollywood Cinema- Brief history of Hollywood, Star system, academy awards, global audience of Hollywood cinema<br>4.3 Italian neo-realism- Origin and impact on world cinema, work of Roberto Rossellini and Vittorio de sica<br>4.4 Japanese cinema- Work of Yasujiro ozu, Akira Kurosawa, Hayao Miyazaki, etc<br>4.5 Irani cinema: Contribution of Abbas Kiarostami, Majid Majidi, etc. | movements and filmmakers.<br>2. To know films from various countries and cultures and learn its concepts used in this industry.<br>3. To know about the contributions of people who got recognized and accredited for their hard work in the respective cinema. | |
| **MODULE 5**: Mainstream Indian Cinema and parallel Indian Cinema<br>5.1 Art v/s Commercial<br>5.2 Indian Meaningful cinema (Commercial)<br>• The Angry Young Man<br>• The Indian Diaspora and Bollywood<br>• Contemporary Bollywood Cinema<br>• Globalization and Indian Cinema, The multiplex Era<br>5.3 Golden era of Indian Cinema- Important work of Bimal Roy, Guru Datt, Raj Kapoor, and V. Shantaram<br>5.4 Indian New Wave cinema: Mrinal Sen, Mani Kaul, Girish Kasaravalli, MS Sathu<br>5.5 Parallel cinema: Contribution of Shyam Benegal, Govind Nihlani, Gulzar, Mani Kaul, Said Mirza, etc. | 1. To understand and have knowledge about art and commercial cinema.<br>2. To understand Indian diaspora and Bollywood<br>3. Learning about the important contributions as directors, producers, actors, actress and so on of persons and learning Indian new wave cinema in detail | |

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MUMBAI-69

**Faculty Name – Mrs. Yashashree Mhatre**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Photography**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module 1**<br>**Camera: The storyteller**<br>**1. The Body:** The faithful middleman<br>• The heart of the system<br>• How the camera sees differently than human eyes.<br>• Limitations and Wonders of camera.<br>• Formats of camera: Small Full frame, Half frame<br>• (APS-C), Medium, Large (camera movements)<br>• Experiencing frame<br>• Types of cameras: DSLR; View; Rangefinder; Mirrorless<br>**2. Aperture:** The iris of the camera<br>• Diaphragm<br>• Controls amount of light entering lens<br>• Factor in Exposure calculation<br>• Active factor of Depth of field and Bokeh (creative)<br>• F'-numbers and aperture scale.<br>• Application of Depth of Field in advertising and<br>• Journalism.<br>**3. Shutter**: The Click magic<br>• Blind between Lens and Image sensor<br>• Controls duration of light<br>• Major factor in Exposure calculation<br>• Main player in controlling action | 1. The understand about the body parts of a basic camera<br>2. To understand the formats and various concepts related to camera<br>3. To learn how a camera is a storyteller by capturing still images. | **C01-** To introduce to media learners the ability of an image into effective communication.<br>2. C02- To help the learner understand that media photography is a language of visual communication and beyond just point and shoot fun moments.<br>C03- To practice how a picture speaks thousand words by enlightening the learner on how.<br>C04- To develop the base of visualization among learners in using pictures in practical projects.<br>C05- To help learners work on a given theme of the subject into making relevant pictures or photo features. |

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| • Motion blur, Motion freeze and long exposure effects<br>• Application of motion blur/freeze in Advertising and<br>• journalism.<br>• Synchronization with Flash, Creative Slow sync<br>**4. Image sensor:** The retina that sees<br>• The image maker or recorder<br>• Film v/s digital<br>• Film: Photochemistry<br>• Digital: Photo-electronics<br>• Types of Sensors: CCD and CMOS<br>• ISO: Photosensitivity (Sensor/Film Speed)<br>**5. Viewfinder:** The interactive monitor<br>• The control room cum monitor<br>• Displays camera settings<br>• Aperture, Shutter and ISO<br>• Metering modes, Focusing modes, Exposure modes,<br>• Frame count, File format etc | | |
| **Module 2**<br>**Lens: Imaging device**<br>**6. The eye of camera:** Learning to see<br>• Main player in image formation, Focusing the object<br>• (Sharpening the image)<br>• Speed of the Lens (light intake ability)<br>• Numbers and Markings on the Lens<br>• AF, ED, IF, IS, SW, ASP etc.<br>**7. Focal length:** Which lens is suitable | 1. To understand techniques of how to capture images.<br>2. To understand various techniques and understand focal length.<br>3. To learn in detail the various types of lenses and its uses. | |



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| • The factor to consider for Type of Photography and<br>• choosing lens for the purpose.<br>• Main distinguishing factor<br>• Fixed V/s Variable focal length<br>**8. Image size:** See close<br>The magnification ratio of a lens<br>Longer focal length = Bigger image size<br>**9. Coverage angle:** Crop out unwanted<br>• Prime concern in Composition<br>• How much of a scene a lens takes in from a viewpoint?<br>• Safe focusing distance, Distortion: Barrel/ Pincushions<br>**10. Types of lenses:** The right one for the task at hand<br>• Prime Lens v/s Zoom lens<br>• Prime = Fixed focal length<br>• Zoom = Variable focal length<br>• Normal, Wide angle and Telephoto<br>• Special purpose lenses: Macro, Fish eye, Tilt-shift | | |
| **Module 3**<br>**Light: Parameters of Light- The essential raw material**<br>**1. Intensity and Exposure:** Perfect tone<br>• How much light: consideration for exposure<br>• Exposure triangle (A, S, ISO) The model of exposure<br>**2. Direction and Lighting: Lighting for Cinema Television and Advertising**<br>• From where: direction begets shadow<br>• Shadow = Depth | 1. To learn about intensity and exposure of light while clicking an image<br>2. To understand in comparison with advertisements and various types of lighting.<br>3. To eam about color and moods in photography<br>4. To learn to be as creative as possible. | |

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| • Lighting = Shading<br>• Three-point lighting<br>• Key: Main<br>• Fill: Contrast level (lighting ratio)<br>• Kicker: Separation or background light<br>• Types of lighting:<br>• Portrait, Effect, Ambient and Mood or drama<br>3. Quality and Ambience: Why there are umbrellas and reflectors<br>• How soft or how hard:<br>• Effective size of light source<br>• Small: Hard, Contrast, Sharp<br>• Medium: Mid soft, moderate contrast, soft shadow<br>• Large: Extra soft, low contrast, shadowless<br>• Modifiers: Umbrella, Soft-box, Reflector, Diffuser,<br>• Grid, Gobos<br>**4. Color and Mood: What tells Cozy or Cool**<br>• Color of light concept: Main distinguishing factor<br>• Kelvin: Color temperature Pure light>True colors<br>• White balance: Neutralizing<br>• Preset white balance and AWB<br>• Color and Mood (warm/cool)<br>**5. Measure: The Director in you is the King**<br>• Light meter: Main input of exposure<br>• Incident v/s Reflective (advantage / disadvantage)<br>• In built meter and Metering modes:<br>• Average, Center weighted, Spot, Matrix, Focus | | |



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| • priority<br>• Exposure Modes: M, A, S, P, and Smart program<br>• modes<br>• Errors in inbuilt metering>Exposure compensation | | |
| **Module 4**<br>**Composition: Art of Seeing> Way of portraying a subject**<br>**1. Frame and Aspect ratio**<br>• Dimensions of sensor and proportion<br>• Aspect ratio: 2:3/ 4:5/ 16:9 (HD)<br>**2. Visual indicators**<br>• Line, Shape, Size, Tone, Color, Texture, Space and Center of interest; Subject= Aesthetic Assembly of Objects<br>**3. Rules of composition**<br>• Rule of thirds/ Balance/ Leading lines/ Frame within frame, Enhancing depth/ Unusual viewpoint/ Shadow/ Pattern breaking<br>• Cropping, Panorama, Flattening<br>**4. Breaking the Rules**<br>Cropping, Panorama, Flattening<br>**5. Viewpoint and Perspective:**<br>• 1-, 2- and 3-point perspective: Vanishing points and viewpoint<br>• Normal: The way we see<br>• Enhanced: Exaggerated depth<br>• Compressed: Feeling of distance taken away<br>• Forced: Unrealism<br>• Aligned: Back projection and green screen application | 1. To understand concepts related to frame and aspect ratio<br>2. To understand the types under composition<br>3. To understand in detail about viewpoints and perspectives along with types. | |

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| **Module 5**<br>**Digital Imaging: Electronic format**<br>1. Image sensor<br>Format, 135mm/ APS-C, Medium format, large format<br>2. Megapixel<br>Pixel and its values, Total number of pixels, File size<br>3. Resolution<br>Pixel Per inch: Quality of image, magnification of image<br>4. Image Magnification<br>Viewing distance, Image size and Pixelation<br>How large an image can be forgiven megapixel<br>5. File Format<br>RAW, JPEG, TIFF (Bit and Compression) advantages and limitations of Raw format | 1. To learn about electronic format<br>2. To learn about pixels and its values and megapixel<br>3. To understand various types of files saved and limitations of RAW format | |

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-I**

**SYBAMMC SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1 Photoshop: Pixel based Image editing Software**<br><br>**1. Introduction to Photoshop**<br>Image editing theory<br>Bitmaps v/s Vectors<br>When to use Photoshop and when to use drawing tools<br>**2. Photoshop Workspace**<br>The tools, Toolbox controls<br>Property bar, Options bar, Floating palettes<br>**3. Working with images** | 1. Learning Introduction to Photoshop Image editing theory Bitmaps v/s Vectors When to use Photoshop and when to use drawing tools.<br>2. Understanding the Photoshop Workspace, The tools, Toolbox controls Property bar, Options bar, Floating palettes.<br>3. Learning and working with images Image mode, Image size, canvas size Image | Co1- To equip the students with an understanding of industry knowledge required to make a career in the field of print and Advertising, Digital Marketing. Television media, Film etc.<br>CO2- To train them with the software knowledge required in the above-mentioned Industries. |

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| Image mode, Image size, canvas size<br>Image resolution, size and resampling<br>**4. Image Editing**<br>Levels, Curves,<br>Contrast adjustment,<br>Color adjustment Photo filters<br>**5. Working with Text**<br>Text layer, Character palate, Paragraph palate<br>Text resizing, Text color, Text attributes<br>Working on simple project/ one page design | resolution, size and resampling.<br><br>4. learning Image Editing Levels, Curves, Contrast adjustment, Color adjustment Photo filters.<br>5. Understanding and Working with Text layer, Character palate, Paragraph palate Text resizing, Text color, Text attributes Working on simple project/ one page design. | |
| **Module 2- CorelDraw: Vector based Drawing software**<br><br>**1. Introduction to CorelDraw**<br>CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats<br>**2. Using text**<br>Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C:<br>**3. Exploring tools**<br>Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos<br>**4. Applying effects**<br>Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips<br>**5. Exporting in CorelDraw**<br>Exporting, Types of export, Exporting for other software | 1. Understanding the Introduction to CorelDraw. CorelDraw Interface, Tool Box, Importing files in CorelDraw, Different file formats.<br>2. Learning to Using text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects Text C2C.<br>3. Understanding the Exploring tools Basic shapes: Cut, Erase, Combine, shaping tool: Nodes, Handles, Corners Convert to Curves: Reshaping, Creating figures, Logos.<br>4. Learning how to Applying effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Understanding the Exporting in CorelDraw Exporting, Types of export, Exporting for other | |

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| | software. | |
| **Module 3- Quark Xpress/ InDesign: Layout Software**<br>**1. Introduction to QuarkXPress**<br>List the menus, List the tools, Benefits of using Quark, Application of Quark<br>**2. Text Edits in Quark**<br>Format of text, Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>**3. Using palettes**<br>Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark,<br>**4. Color correction in quark**<br>Embedding images in proper formats, Color correction on the images,<br>Adjusting according to the color tone of the publication,<br>**5. Exporting files**<br>Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | 1. Understanding of Introduction to QuarkXPress List the menus, List the tools, Benefits of using Quark, Application of Quark.<br>2. Learning to Text Edits in Quark Format of text, Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images.<br>3. Learning how to Use palettes Using palettes for different types of publications made in quark, Magazine in quark, Newspaper in quark.<br>4. Understanding the Color correction in quark Embedding images in proper formats, Color correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning how to Export files Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **Module 4- Premiere Pro: Audio-visual: Video editing software**<br>**1. Introduction to editing**<br>Editing importance, Great editing examples, Editing for different formats (film/ad/news/etc.)<br>**2. Introduction to premiere**<br>How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/etc.) | 1. Understanding of Introduction to editing importance, Great editing examples, Editing for different formats (film/ad/news.)<br>2. Learning How premiere helps in editing, Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different | |



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| **3. Understanding file formats**<br>Understanding different file formats (AVI/MPEG/MOV/H264, etc.), Importing raw footage for edits, performing video checks while editing<br>**4. Using color grading**<br>What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing<br>**5. Exporting and rendering**<br>Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintain file format, improving quality and time to render techniques | windows.)<br>3. Understanding file formats Understanding different file formats (AVI/MPEG/MOV/H264), Importing raw footage for edits, performing video checks while editing.<br>4. Learning how to Use color grading What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning to Export and rendering Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintaining file format, Improving quality and time to render techniques. | |
| **Module 5- Sound Forge/Sound Booth: Sound Editing Software**<br><br>**1. Introduction to Digital Audio**<br>Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate<br>**2. Concept of Dolby Digital**<br>Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker<br>**3. Sound Recording**<br>Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, CDA, MP3 Digital Computer software<br>**4. Working with Sound** | 1. Learning the Introduction to Digital Audio Sound basics, Audio band pitch volume Understanding Digital audio Sampling, bit rate.<br>2. Understanding the Concept of Dolby Digital Mono, Stereo, Quadraphonic Surround sound, 5.1 Channel, Subwoofer Difference in Dolby Digital and DTS, More about DTS Three-way sound speaker.<br>3. Understanding the Sound Recording Equipment Microphone and Types of microphones Preamps, Power amps, Sound card Input from audio sources, Extract audio from CD Different audio saving formats Wave, WMA, | |

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| Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter<br>**5. Advanced Sound Processing** Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters | CDA, MP3 Digital Computer software.<br>4. Learning and Working with Sound Workspace, play bar, timeline, Transport toolbar Working with audio file Basic editing, cut/copy/paste, paste special Using Markers, Regions and Commands Sound processing techniques Channel converter, Bit depth converter.<br>5. Understanding the Advanced Sound Processing Delay, Echo, Reverb, Chorus Mixing sounds Noise gating. Expansion, changing pitch and Time duration Soundtrack output Create your audio CD and mark chapters. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Radio Program Production-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1** The Discussion:<br>1. Format,<br>2. Selection of Participants,<br>3. Preparation,<br>4. Speaker Control & Technical Control,<br>5. Ending the Program. | 1. To study various Interview styles.<br>2. To study about different Radio formats.<br>3. To learn techniques for ending a radio program. | CO1. To give learners basic knowledge of radio/audio production theory, techniques, and aesthetics via practical experience in the writing and production of several program formats.<br>CO2. To make them familiar with the art of audio recording, editing, mixing, and aural storytelling techniques. |
| **Module 2 Commentary**<br>1. Preparation work with the Base Studio,<br>2. Different Sports,<br>3. Communicating Mood & Coordinating the images,<br>4. Content & Style,<br>5. News Action & Sports actions. | 1. To understand different Base Stations.<br>2. To learn structure of commentary as the state of art<br>3. To understand the beginning of sports broadcasting<br>4. To learn different types of Commentary. | |
| **Module 3** Using the Internet and social media<br>1. An online presence,<br>2. Internet radio,<br>3. Radio podcasts,<br>4. Internet Research,<br>5. Making the best use of social media | 1. To study the evolution of the Internet.<br>2. To understand the working of Social Networking.<br>3. To briefly understand the making & working of Radio podcasting | |
| **Module 4** Phone-ins | 1. To understand how-to pick-up subjects for the phone-in | |



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| 1. Technical facilities, Program classification,<br>2. The open line & choosing the calls,<br>3. The role of the Host & the Host style,<br>4. Reference Material, Use of Delay,<br>5. Linking Programs together, personal counseling, the Presenter as Listener. | programs.<br>2. To learn the reasons to take live calls. | |
| **Module 5** Making Commercials:<br>1. Copy Policy,<br>2. The Target Audience,<br>3. The Product or Service 'premise',<br>4. Voicing & Treatment,<br>5. Music and effects. | 1. To understand the subsistence of Copyright.<br>2. To understand the difference between commercials vs. Non-commercial radio<br>3. To learn the tips to mastering Radio voice. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Writing & Editing for Media**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Module 1: Print Media**<br>Writing for Print Media:<br>1. What makes news? (Determinants of news),<br>2. Art and basic tools of writing,<br>3. Steps and elements of writing-editorials, features, and review,<br>4. Writing for Newspapers & Magazine,<br>5. Writing a News story/ feature stories/ Article/ Editorials (differences)<br>6. Leads, nut shelling, & story structure,<br>7. Writing style and the storybook<br>8. Public Relations & Corporate Writing- various forms | 1. To learn the art and basic tools of writing.<br>2. To study the elements of News stories.<br>3. To learn the types of Feature stories and how to craft the story.<br>4. To study different writing style guides | CO1. Provide the ability to understand writing styles that fit various media platforms.<br>CO2. It would help the learner acquire information gathering skills and techniques.<br>CO3. On completion of this course, students will be able to understand similarities and differences in writing for all forms of media including the internet and digital.<br>CO4. The learner will gather knowledge of different news and copy formats along with appropriate style-sheets and layout.<br>CO5. The learner will imbibe the importance of writing clearly, |

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| Writing for Advertisements | | precisely, and accurately for different types of audiences<br>CO6. Provide basic proficiency in proof-reading and editing. |
| **Module 2: Radio and Television**<br>Writing for Broadcast Media:<br>1. Radio & Television: Challenges & Weakness,<br>2. Writing Script for different Radio Programs,<br>3. Script writing formats<br>4. Writing for Interviews, Live news & daily news,<br>5. Radio jockeying / online radio and new trends<br>Storyboarding for Television commercials. | 1. To study how to write scripts for the Broadcast media.<br>2. To study about the different scripting formats.<br>3. To learn the Rundown sheet for Radio program<br>4. To learn the tips and techniques to write the television commercial | |
| **Module 3: Digital Media**<br>Digital Media: A sunrise opportunity<br>1. Difference between- Newspaper writing & web writing, Headline writing, deck heads, Subheads, Lists & hyperlinked content.<br>2. How to produce well-written webpages<br>Writing content for the web, digital spaces & digitally distributed media,<br>3.Development of Web-specific style guides, convergence of text & video on digital,<br>4. Emerging fields of personal publishing including blogging & micro blogging. (or publishing on LinkedIn)<br>5. Dealing with Breaking news & fake news in real time.<br>6. Writing for Advertisements through emails & SMS.<br>7. Writing Blogs | 1. To study the difference between newspaper writing and writing for the web.<br>2. To learn about Digital Convergence and audience engagement<br>3. To learn how to write blogs and essentials of blogging | |
| **Module 4: Editing**<br>Evaluation of content<br>1. Checking spelling & grammar, Checking news/magazine copies for headlines, sub heads, use of graphics | 1. To learn how to edit a copy.<br>2. To study the principles of good news editing.<br>3. To learn the general tips for proofing and editing. | |

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| & illustrations for construction and information flow in Newspapers.<br>2. Rewriting leads.<br>3. Achieving fitment with spacing requirements at any newspaper, magazine, or webpage.<br>4. Checking Advertising agency copies, checking headlines/sub headline (type appeal) and maintaining sequence and flow in body copy.<br>5. Online editing:<br>editing requirements, content, layout, clarity, style, conciseness, online headlining-website design. | | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Laws & Ethics**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE 1**: Constitution and Media:<br>1. Core values of the Constitution: Refreshing Preamble, unique features of the Indian Constitution<br>2. Freedom of Expression: Article 19 (1) (a), Article 19(2)<br>3. Judicial Infrastructure: Hierarchy of the Courts, Independency of the Judiciary, Legal terminologies<br>4. Social responsibility of the media: Social Responsibility Theory, Emerging issues in Social Responsibility, Theory in today's era<br>5. Social media: Threat of Fake news and facts verification social media decorum | 1. To learn about preamble and constitution<br>2. To understand about various freedoms like speech and expression<br>3. To develop a sense of social responsibility towards society by understanding they theory<br>4. To learn social media and its related concepts in detail | CO1- To provide the learners with an understanding of laws those impact the media.<br>C02- To sensitize them towards the social and ethical responsibility of the media. |
| **MODULE 2:** Regulatory Bodies:<br>1. Press Council of India: | 1. To know about Press Council of India | |

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| 1. Brief History: Statutory status<br>2. Structure and Importance<br>3. Powers and limitations<br><br>2. TRAI: Role of Telecom Regulatory Authority of India<br><br>3. IBF:<br>1. Indian Broadcasting Foundation<br>2. Broadcasting Content Complaints Council<br>3. Broadcasting Audience Research Council<br><br>4. ASCI:<br>1. Advertising Standard Council of India<br>2. Mission<br>3. Structure<br>4. Consumer Complaint Council<br><br>5. NBA:<br>1. News Broadcasters Association<br>2. Structure<br>3. Mission<br>4. Role | 2. Introducing TRAI to students to understand the telecommunication industry<br>3. Understanding about various regulatory bodies related to media and their functions | |
| **MODULE 3:** Media Laws:<br>1. Copyright and IPR:<br>What is copyright, Intellectual Property Rights, Exceptions, Major Amendments, Recent Case Studies<br><br>2. Defamation:<br>1. Definition,<br>2. Civil, Criminal,<br>3. Exceptions,<br>4. Recent Case Studies<br><br>3. IT Act:<br>1. Information Technology Act, 2000<br>2. Amendment 2008<br>3. Section 66A<br>4. Section 67<br>5. Case Studies<br><br>4. Contempt:<br>1. Contempt of Court | 1. To know importance related to IPR<br>2. To learn defamation and it laws in India<br>3. To know and understand what is contempt of court and its punishments<br>4. To know prohibition of Drugs and magical Remedies advertisements under act. | |



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| 2. Contempt of Parliament<br><br>5. More acts:<br>1. Drugs and Magic Remedies (Objectionable Advertisements) Act<br>2. Emblems and Names (Prevention of improper Use) Act | | |
| **MODULE 4**: Media Laws:<br>1. Right to Privacy:<br>1. Evolution<br>2. Right to Privacy a fundamental Right<br><br>2. Morality and Obscenity:<br>1. Indecent Representation of Women's Act<br>2. 19.2, IPC 292, 293<br>3. Change in perception with time<br><br>3. Unfair Trade Practices:<br>Unfair Trade Practices and the Competition Act,2002<br><br>4. OSA:<br>1. Official Secrets Act<br>2. Controversies<br>3. Case Studies<br><br>5. RTI:<br>1. Right to Information Act, 2005<br>2. Brief History<br>3. Importance and current status | 1. To know and learn about privacy and its conflict to RTI<br>2. To discuss and learn about women in current situation and trends and Indecency Representation on Women's Act<br>3. To understand about various organizations laid by Media bodies underlying certain laws, sections, and its functions. | |
| **MODULE 5:** Media Ethics and Social Responsibility<br>1. Why Ethics:<br>What is ethics, and why do we need ethics?<br>2. Ethical Responsibility of Journalist:<br>1. Code of conduct for journalist<br>2. Conflict of interest<br>3. Misrepresentation<br>4. Shock Value<br><br>3. Fake news | 1. To understand role and concepts related to ethics<br>2. The ethical responsibility as a journalist and conflict of interest<br>3. To widening knowledge about stereotypes and its applications on various categories of human and according to age | |

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| 1. post-truth and challengers of fighting fake news<br>2. Techniques of fact verification<br><br>4. Ethical responsibility of advertisers:<br>1. Violation of ethical norms by advertisers<br>2. Case studies<br><br>5. Stereotyping:<br>Stereotyping of minorities, women, senior citizens, regions, LGBT | | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Mass Media Research**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Research in Media - Introduction to Mass Media Research:<br>• Relevance, Scope of Mass Media Research and<br>• Role of Research in Media<br>• Steps involved in Research Process<br>• Qualitative and Quantitative Research<br>• Discovery of Research Problem, Identifying Dependent and Independent Variables, Developing Hypothesis. | 1. To introduce students to research and the need for research in society.<br>2. Understanding about research process in detail<br>3. Understanding various types of research and learning about hypotheses and its use in research. | CO1- To introduce students to debates in Research approaches and equip them with tools<br>to carry on research<br>CO2- To understand the scope and techniques of media research, their utility and limitations |
| **Module II**: Design- Research Design:<br>• Concepts, Types and Uses<br>• Research Designs:<br>a. Exploratory<br>b. Descriptive and | 1. To learn about research design and its importance in carrying out research.<br>2. The questions to be solved while preparing an outline of the research or thesis. | |



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| c. Causal | 3. The types of research design. | |
| **Module III**: Data Collection: Data Collection Methodology<br>a. Primary Data Collection Methods:<br>I. Depth Interviews<br>II. Focus Group<br>III. Surveys<br>IV. Observations<br>V. Experimentations<br>b. Secondary Data Collection Methods<br>c. Literature Review<br><br>d. Designing Questionnaire and Measurement Techniques:<br>a. Types and basics of Questionnaire<br>b. Projective Techniques<br>c. Attitude Measurement Scales<br><br>e. Sampling Process<br>f. Data Tabulation and Research Report Format | 1. To learn various data collection methods<br>2. To learn about literature of review<br>3. To know about measurement techniques, tabulation, and Research Format. | |
| **MODULE IV**: Analysis- Content Analysis:<br>a. Definitions and Uses<br>b. Qualitative and Quantitative Approach<br>c. Steps in Content Analysis<br>d. Devising Means of a Quantification System<br>e. Limitations of Content Analysis | 1. To understand about Content analysis and its uses<br>2. To learn steps in content analysis<br>3. 3. To understand the limitations of content analysis in detail | |
| **MODULE V**: Application of Research- Application of Research in Mass Media<br>a. Readership and Circulation Survey<br>b. TRP<br>c. RRP<br>d. Audience Research<br>e. Exit Polls<br>f. Advertising Consumer Research | 1. Learning about the various applications of Research in Mass Media<br>2. To learn about the effect of media on people.<br>3. To find solutions to media-related questions. | |
| **MODULE VI**: The Semiotics- The Semiotics of the Mass Media<br>a. What is Semiotics in Media?<br>b. Why is Semiotics Important? | 1. To learn about codes of signs, symbols and actions and communicate the same with all masses- Study of signs | |



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| c. What are the Codes in Semiotics?<br>d. Semiotics and Media | "Semiotics"<br>2. The importance of semiotics<br>3. Understanding relation of semiotics and media | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Film Communication-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Understanding Cinema<br>Regional Cinema:<br>Regional Films and Filmmakers- Marathi (V. Shantaram), Bengali (Satyajit Ray/ Ritwik Ghatak), Malayalam/ Tamil/ Telugu/ Kannada, (Film makers- K. Balachandar, K. Vishwanath, Adoor Gopalkrishan) etc. | 1. To learn about various regional cinema and its contributions to the industry<br>2. To know about social issues, topics and how films evolved by contributions of individuals.<br>3. To know famous personalities and their journey in the industry personal and professional both. | CO-1 Awareness of cinema of different regions.<br>CO-2 Understand the contribution of cinema in society.<br>CO-3 How to make technically and grammatically good films.<br>CO-4 From making to marketing of films.<br>CO-5 Economic aspects of film.<br>CO-6 Careers in films. |
| **Module 2**: Hindi Cinema:<br>2.1 Popular Hindi Commercial Films (Bollywood)<br>2.2 Past to Present<br>2.3 Economic contribution of cinema<br>2.4 Convergence of Art and Commercial<br>2.5 Genres in present (Romcom, Thriller, Biographic, Action, Musical, etc.) | 1. To understand the famous / popular Hindi Commercial films<br>2. To get in-depth knowledge of how cinema has evolved from past to present with movie names.<br>3. To learn about various economic aspects of cinema along with the genres. | |
| **Module 3**: Cinema now:<br>Contemporary Era<br>Celluloid to Digital (1990-1999)<br>Digital Explosion (2000) onwards<br>Media Convergence and Film Viewing Culture | 1. Understand about contemporary era of filmmaking<br>2. The conversion from celluloid to Digital cinema<br>3. To learn how people adapted a convergence in viewing culture of cinema<br>4. To learn about OTT | |



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| **Module 4**: Film Making:<br>Film Production to Film Exhibition<br>41. Aspects of Production Systems: Financial, Administrative and Creative<br>4.2 Stages of Filmmaking- 1: Pre-Production<br>4.3 Stages of Filmmaking- 2: Actual Production<br>4.4 Stages of Filmmaking- 2: Post-Production<br>4.5 Film and Censorship<br>4.6 ROI Systems in Film Industry<br>Distribution<br>Promotion<br>Marketing<br>Branding<br>Internet | 1. To learn the process from Film production to Film Exhibition<br>2. To learn the stages of Film Making in brief<br>3. To learn the concepts in detail related to exhibition of movies through various techniques.<br>4. To grow the industry with more competition and creative skills. | |
| **MODULE 5**: Film Culture:<br>5.1 Introduction to Film Institute, Film Bodies and Trade Association such as FTII, NFAI, Films Division, DFF, IFFI, CBFC, IFTDA, SGI, WICA, etc.<br>5.2 Film Festival?<br>What is a Film Festival?<br>Major Film Festivals in India and Abroad<br>5.3 Film Awards:<br>Nature and Types of Film Awards<br>Major Film Awards in India and Abroad | 1. To learn about institutions and Trade associations for Films and its history to present the situation.<br>2. To learn about film festivals and major film festivals in India and Abroad.<br>3. To learn about Film awards and its nature, various awards are recognized in India and Abroad. | |

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ANDHERI (EAST) MUMBAI-69

**Faculty Name - Mr. Mukesh Verma**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Computers & Multimedia-II**

**SYBAMMC SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1- Photoshop: Advanced Image Editing**<br>1. Working with multiple images<br>Mixing<br>Selection marquee, Lasso, Magnetic lasso, feather Slice tool, Erase tool Pen tool and image tracing Clone tool, Stamp tool<br>2. Image Effects<br>Editing<br>Burning, Dodging<br>Smudge, Sharpen, Blur Eyedropper, Choosing color Swatches, Colour pick<br>Filters<br>3. Working with Layers<br>Layer basics<br>Changing background, Gradient<br>Moving linking aligning layers<br>Applying Transformations Masking layers<br>Masts and extractions Layer effects, Adjustment layers<br>4. Wonders of Blend Modes Blend modes<br>Advanced blending options Layer blends<br>5. Fully Editable Text<br>Text as art, Glyphs, Creative text<br>Type mask tool, Image in text Text to path and Direct selection<br>Path selection (black arrow) Creating Professional design using all the tools | 1. To learn Tools of Photoshop.<br>2. Understand effects Sharpen, Blur, Eyedropper and color pick filter.<br>3. Learning to change image background, Layer Masking and gradient.<br>4. Learning Blends modes and advanced blending options.<br>5. Students learn text editing and its selection.<br>6. Learning to create a professional design using all tools. | After completing the course, the learner will be able to:<br><br>CO1: To help learners be media industry ready. This will help learners to be aware of the minimum requirement of the software when stepping in the industry.<br>CO2: To introduce the media soft wares to make the learner understand what goes behind the scene and help them choose their stream.<br>CO3: To prepare learners skilled enough for independence during project papers in TY sem.VI.<br>CO4: To help learners work on small scale projects during the academic period. |
| **Module 2- Adobe Illustrator: Vector based Drawing software**<br>1. Introduction to Adobe Illustrator<br>Illustrator Interface,<br>Tool Box, Panels and Bars | 1. Learning to Adobe Illustrator Illustrator Interface, Tool Box, Panels and Bars Importing files in | |

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| Importing files in illustrator, Different file formats<br>2. Using text<br>Artistic and paragraph text, Formatting Text,<br>Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects<br>3. Creating Simple designs<br>Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity<br>4. Applying effects<br>Power of Blends,<br>Distortion and contour Effects, Envelopes,<br>Lens effects, Transparency,<br>Creating Depth Effects and Power Clips<br>5. Exporting in Illustrator Exporting, Types of export,<br>Exporting for other soft wares | illustrator, Different file formats.<br>2. Learning text Artistic and paragraph text, Formatting Text, Embedding Objects into text, Wrapping Text around Object, Linking Text to Objects.<br>3. Understanding to Create Simple designs Text based logo replication, Shape based logo replica, Creating new symbols, Fill color, Outline color, Weight and opacity.<br>4. Understanding to Apply effects Power of Blends, Distortion and contour Effects, Envelopes, Lens effects, Transparency, Creating Depth Effects and Power Clips.<br>5. Learning to Export in Illustrator Exporting, Types of export, Exporting for other software's. | |
| **3 InDesign: Layout Software**<br>1. Introduction to Adobe In Design<br>List the menus,<br>List the tools, Palates<br>Benefits of using In Design,<br>Application of In Design<br>2. Text Edits in InDesign Format of text,<br>Character and Paragraph Bars<br>Purpose of text selection,<br>Aligning text in different design formats,<br>Text alignment with embedded images<br>3. Using palettes<br>Using palettes for different types of publications made in InDesign,<br>Magazine in InDesign, Paragraph styles<br>Newspaper in InDesign, | 1. Understand to Adobe In Design List the menus, List the tools, Palates Benefits of using In Design, Application of In Design<br>2. Learning Text Edits in InDesign Format of text, Character and Paragraph Bars Purpose of text selection, Aligning text in different design formats, Text alignment with embedded images<br>3. Learning Using palettes for different types of publications made in InDesign, Magazine in InDesign, Paragraph styles Newspaper in InDesign, Paragraphs type palate, Text wrap palate. | |

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| Paragraphs type palate, Text wrap palate<br>4. Color correction in InDesign<br>Embedding images in proper formats,<br>Colour correction on the images,<br>Adjusting according to the color tone of the<br>publication<br>5. Exporting files<br>Types of files,<br>Exporting for different publications/templates,<br>Newspaper, magazine, etc. | 4. Learning Colour correction in InDesign Embedding images in proper formats, Colour correction on the images, Adjusting according to the color tone of the publication.<br>5. Learning to Export files Types of files, Exporting for different publications/templates, Newspaper, magazine, etc. | |
| **4 Premiere Pro: Audio-visual: Advanced applicatioa**<br>1. Introduction to editing importance,<br>Great editing examples,<br>Editing for different formats (film/ad/news/etc.)<br>2. Exploring Premiere Pro How premiere helps in editing,<br>Understanding the toolbar,<br>Importing files,<br>Experimenting with video and audio layers,<br>Basics of editing (cut/layers/different windows/etc.)<br>3. Right application of various file formats Understanding different file formats<br>(AVI/MPEG/MOV/H264, etc.)<br>Importing raw footage for edits,<br>Performing video checks while editing<br>Using inbuilt transitions,<br>4. Using color grading<br>What is color grading,<br>Examples of color grading,<br>Using filters and presents in color mixing,<br>Applying presents on layers for editing<br>5. Exporting and rendering Exporting in different formats,<br>Choosing right formats for exposing,<br>Managing quality while exporting,<br>Rendering and maintain file format, | 1. Understanding Introduction to editing importance, Great editing examples, Editing for different formats (film/ad/news/)<br>2. Understanding the toolbar, importing files, Experimenting with video and audio layers, Basics of editing (cut/layers/different windows/)<br>3. Understanding the Right application of various file formats Understanding different file formats (AVI/MPEG/MOV/H264, etc.) Importing raw footage for edits, performing video checks while editing Using inbuilt transitions,<br>4. Learning Using color grading What is color grading, Examples of color grading, using filters and presents in color mixing, Applying presents on layers for editing.<br>5. Learning Exporting and rendering Exporting in different formats, choosing right formats for exposing, managing quality while exporting, Rendering and maintaining file format, | |

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| Improving quality and time to render techniques | improving quality and time to render techniques. | |
| **Module 5- Adobe Dreamweaver: Web designing software**<br>1. Introduction to Dreamweaver<br>Workspace overview<br>Document toolbar, Document window, Panel<br>groups, Files pane, Property inspector, Tag<br>selector<br>Defining website in Dreamweaver<br>2. Working with DW<br>Creating Dreamweaver template<br>Page layout in DW<br>CSS layouts: advantages and disadvantages<br>Creating HTML pages, Insert content and form<br>Creating Forms in DW<br>3. Linking pages<br>Using DW to accomplish basic web page development,<br>Page properties<br>Title, Background image, BG colour, Text colour,<br>Links<br>4. Using Tables<br>Cell padding, cell spacing, Border<br>Table basics: Colour BG in cell,<br>Invisible tables,<br>Changing span,<br>Making image into clickable link<br>5. Typo in DW<br>Changing Font typefaces, size, style, colours<br>Text to hyperlink | 1. Understanding the Introduction to Dreamweaver Workspace overview Document toolbar, Document window, Panel groups, Files pane, Property inspector, Tag selector Defining website in Dreamweaver.<br>2. Learning and Working with DW Creating Dreamweaver template Page layout in DW CSS layouts: advantages and disadvantages Creating HTML pages, insert content and form Creating Forms in DW.<br>3. Understanding to Linking pages Using DW to accomplish basic web page development, Page properties Title, Background image, BG color, Text color, Links.<br>4. learning for Using Tables Cell padding, cell spacing, Border Table basics: Colour BG in cell, Invisible tables, changing span, Making image into clickable link.<br>5. Understanding to Typo in DW Changing Font typefaces, size, style, colors Text to hyperlink. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Brand Building**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Brand:<br>Definition, Importance of branding, Difference between brand & product, Process of Branding. | 1. To learn and understand brand and its related concepts<br>2. To study importance of branding and its process<br>3. To distinguish between a brand and a product. | CO1- To study the concept of Brands<br>CO2- To study the process of building brands<br>CO3- To study its importance to the consumer and advertisers |
| **Module -II**<br>Brand Identity:<br>Core Identity, Extended Identity, Brand Identity Traps. | 1. To understand the concept of brand identity.<br>2. to be aware of the various mistakes a brand makes due to which a brand can be trapped in its own identity. | |
| **Module -III**<br>Brand Positioning:<br>Definition, Importance of Brand Positioning, Perceptual Mapping. | **1.** To understand the concept of positioning and its various types | |
| **Module -IV**<br>Brand Personality:<br>Importance of creating Brand Personality, Attributes that affect Brand Personality, Factors that affect Brand Personality.<br>Brand Personality Models-<br>Relationship Model, Self-expressive Model, Functional Benefit Model<br>The Big Five, User Imagery | **1.** To understand the role of building brand personality and its impact on consumer behavior<br>2.to understand the visual imagery and the difference brand personality can create between brands that sell similar products. | |
| **Module -V**<br>Brand Leverage:<br>User Extension, Brand Extension, | 1.To understand the extension & expansion strategies a brand undertakes. | |

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| Moving Brand up/down, Co-branding. | | |
| **Module -VI**<br>Brand Strategies:<br>The Three perspectives of Brand Strategic customer analysis, Completion self-analysis, Multi-Product Branding, Multi Branding, Mix Branding, Brand Licensing, Brand Product Matrix, Brand Hierarchy, Brand Building Blocks | 1.To understand the extension & expansion strategies (horizontally & vertically) a brand undertakes.<br>2.Various types of branding strategies with examples. | |
| **Module -VII**<br>Brand Repositioning:<br>Meaning, Occasion of use, falling sales, Making the brand contemporary, new customers, Changed Marketing conditioning, Differentiating brands from competitors (Case study such as Vicks Vapour, Milkmaid, etc) | 1.To understand why brands reposition.<br>2. Case studies gives insights on the reasons for the change and process | |
| **Module -VIII**<br>Brand Equity:<br>Definition, Steps in creating Brand Equity, Awareness, Perceived Quality, Brand Association, Brand Loyalty, Other Brand Assets. | 1.To understand how good will a brand is generated and maintained.<br>2. Equity evaluating models | |
| **Module -IX**<br>Brand Equity Management Models:<br>Brand Equity Ten, Y&R (BAV), Equi Trend, Interbrand. | 1.To understand how good will a brand is generated and maintained.<br>2. Equity evaluating mode | |
| **Module -X**<br>Brand Building Imperative:<br>Coordination across the organization, coordination across media, coordination strategy & tactics across markets. | 1. To understand how corporate brand share business.<br>2. To coordinate brand building activities across diverse media options like events, sponsorship, PR and promotions. | |

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**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Consumer Behaviour**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>a. Introduction to Consumer Behavior:<br>• Concepts,<br>• Need to Study Consumer Behavior,<br>• Factors Influencing Consumer Behavior,<br>• Changing Trends in Consumer Behavior.<br>2. Consumer Behavior & Marketing:<br>• Marketing Segmentation-VALS,<br>• Components, Process of Marketing Communication,<br>• Message,<br>• Persuasion-Need & Importance (ELM, Appeal.) | 1. To study the components of consumer behavior.<br>2. To study the external and internal variables influencing consumer behavior.<br>3. To study the components of communication.<br>4. To study the theories of persuasion. | CO1- To understand the role of marketing in influencing consumer behavior.<br>CO2- To analyze the role of marketer & the consumer in advertising.<br>CO3- To sensitize the students to the changing trends in consumer behavior. |
| **Module -II**<br>Relevance of Perception & Learning in Consumer Behavior:<br>a. Concepts, Elements in Perception, Subliminal Perception.<br>b. Learning: Elements of Consumer Learning, Cognitive Theory- Social Learning, Behavioral Learning-Classical, Instrumental Theory. | 1. To study the three aspects of persuasion,<br>2. To study the different types of subcultures.<br>3. To study the factors influencing non-verbal communication.<br>4. To study the theories of learning. | |
| **Module-III**<br>Psychological Determinants & Consumer Behavior:<br>a. Motivation- Needs, Types, Theories- Role of Motivation in Consumer Behavior.<br>b. Personality & Attitude- Theories of Personalities & its application. Freudian, Trait, Jungian, Self-Concept. | 1. To study the important characteristics of attitude.<br>2. To study the models of attitude.<br>3. To study the types of motives.<br>4. To study the nature and characteristics of personality. | |

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| c. Formation of Attitude- Theories and its relevance in Consumer Behavior. Cognitive Dissonance, Tricomponent, Changing attitude in Consumer Behavior. | | |
| **Module -IV**<br>Social & Cultural Aspects of Marketing & its impact on Consumer Behavior.<br>• Family<br>• Social Stratification- class, age, gender<br>• Group- Reference group<br>• Culture- Subculture<br>• Changing Indian Core Values. | 1. To study the value and lifestyle segmentation.<br>2. The basic characteristics of social class.<br>3. To study the classification of groups.<br>4. To study the reasons for the popularity of reference groups.<br>5. To study the family life cycle, & family purchase decision. | |
| **Module -V**<br>a. Consumer Decision Making<br>• Process<br>• Models<br>• Levels'<br>• Opinion leaders and Consumer decision making<br>b. Diffusion & Adoption process | 1. To study the characteristics of opinion leaders.<br>2. To study the types of consumer decisions.<br>3. To study the category of innovation.<br>4. To study the adoption process. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Advertising in Contemporary Society**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Change in the Environment: Policy Post-Independence, Policy 1990 Onwards. | 1. To study surrogate advertising.<br>2. To study the objectives and missions of the regulatory bodies.<br>3. To study the rules and restrictions implemented on the advertisements. | CO1- To understand the environment in Contemporary Society<br>CO2- To understand Liberalization and its impact on the economy<br>CO3- To study contemporary advertising and society |

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| **Module -II**<br>Study of Environment Post-independence and Post 1991 Liberation Policy:<br>Effects of Liberation on- Economy, Business, Employment, Advertising, Lifestyle. | 1. To study the measures initiated as a part of liberalization and globalization.<br>2. To study about globalization in the Indian economy.<br>3. To study the objectives of Privatization. | |
| **Module -III**<br>International & Global Advertising & Marketing:<br>The Environmental Analysis of all Foreign Countries, The use of this Analysis in Marketing & Advertising. | 1. To study the growth of Global commerce.<br>2. To study the challenges of Global advertising.<br>3. To study the impact of culture on Globalization.<br>4. To study the elements of culture.<br>5. To study the promotions for international markets. | |
| **Module -IV**<br>Social Marketing:<br>Definition Need for social Marketing, The difficulties of Social Marketing, The various subjects for Social Marketing, Effects of Social Marketing | 1. To study the planning process for social marketing.<br>2. To study the additional marketing P's.<br>3. To study the effects of social marketing. | |
| **Module -V**<br>Advertising:<br>Advertising & Children, Advertising and Old People, Controversial Advertising, Gender Bias, Advertising and Popular Culture, Social Implication of Advertising, The role of Advertising on the Economy. | 1. To study the effect of Advertising on society.<br>2. To study the negative impacts of Advertising.<br>3. To study the positive and negative impact of advertising on the economy. | |
| **Module -VI**<br>Types of Advertising:<br>Political Advertising, B to B Advertising, Consumer Advertising, Retail Advertising, Industrial Advertising, and Financial Advertising. | 1. To study the positive and negative impact of political advertising.<br>2. To study the different categories of financial advertising.<br>3. To study the categories of consumer advertising. | |
| **Module -VII**<br>Internet: | 1. To study the tools of digital marketing. | |



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| Digital Marketing | 2. To study the advantages & disadvantages of Internet marketing. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Copy Writing**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module- I**<br>Introduction to Copywriting:<br>• Basics of Copywriting,<br>• Responsibility of Copywriter. | 1. To understand the role and importance of copywriting.<br>2. Various responsibility of a copywriter | CO1- To familiarize the students with the concept of copywriting as selling through writing<br>CO2- To learn the process of creating original, strategic, compelling copy for various media<br>CO3- To train students to generate, develop and express ideas effectively<br>CO4- To learn the rudimentary techniques of advertising - headline and body copywriting. |
| **Module -II**<br>Creative Thinking:<br>• How to inculcate a 'creative thinking attitude',<br>• Left brain thinking; Right brain thinking,<br>• Conscious mind; unconscious mind,<br>• Role of Heuristics and assumptions in creative thinking,<br>• Five steps of the creative process. | 1. Developing critical thinking for learning creative writing.<br>2. Understanding the psychology of the brain and its role in developing the skills for writing. | |
| **Module -III**<br>Idea Generation Techniques:<br>• Theories of Ideation, | 1. Learning idea generation techniques through various prompts which helps in | |



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| • Idea generation techniques<br>a. (Brainstorming,<br>b. Triggered brain walking,<br>c. Questioning assumptions,<br>d. Picture prompts,<br>e. scamper,<br>f. Observation,<br>g. Referencing,<br>h. Interaction,<br>i. Imagination,<br>j. Dreams &<br>k. Creative Aerobics.) | structuring the content. | |
| **Module -IV**<br>Trans creativity:<br>• Introduction,<br>• Purpose | 1. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source. | |
| **Module -V**<br>Briefs:<br>• Marketing Brief,<br>• Creative Brief. | 1. Learning about the structure and formats of the briefs.<br>2. Understanding the client brief for proper execution of the content. | |
| **Module -VI**<br>Writing persuasive copy:<br>• The CAN Elements (connectedness, appropriates & novelty).<br>• Getting Messages to 'Stick' simplicity, Unexpectedness, Concreteness, Credibility, Emotionality, and Storytelling. | 1. How to write appealing content by considering various elements and through the art of storytelling. | |
| **Module -VII**<br>Writing copy for various Media:<br>a. Print: Headlines, sub-headlines, captions, body copy, and slogans.<br>b. Television: Storyboard, Storyboarding techniques, Balance between words and visuals, Power of silence, formats of TV's<br>c. Outdoor posters<br>d. Radio<br>e. Digital: email, web pages. | 1. Learning to write copy for various advertising and marketing media.<br>2. To add various elements to balance a copy and convey the marketing message. | |

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| **Module -VIII**<br>Writing copy for various audiences:<br>a. Children,<br>b. Youth,<br>c. Women,<br>d. Senior Citizens &<br>e. Executives. | 1. Understanding the thought process of different categories of audiences.<br>2. Learning to persuade the audience through the copy. | |
| **Module -IX**<br>How to write copy for:<br>a. Direct mailers,<br>b. Classified,<br>c. Press releases,<br>d. B2B,<br>e. Advertorial, and<br>f. Infomercial. | 1. To learn writing the copy for personal medium and mass medium. | |
| **Module -X**<br>Various types of Advertising appeals and execution styles:<br>a. Rational appeals,<br>b. Emotional appeal Humor, Fear, Sex appeal,<br>and<br>c. Various advertising execution techniques. | 1. Understanding various writing appeals to connect a chord with the specific audience through storytelling. | |
| **Module -XI**<br>The techniques Evaluation of an Ad Campaign:<br>a. Evaluate the ad in terms of its efficacy, i.e. to what extent the campaign has achieved its set objectives,<br>b. Learn to appreciate the aesthetic aspects of the ad, how the ad looks, its layout, color scheme, typography, balance, etc. | 1. Evaluating the writings by understanding the reach of the advertising message.<br>2. Learning about campaign objectives.<br>3. Learning the final output of an advertising copy. | |



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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Media Planning & Buying**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Introduction to Media Planning & Selection:<br>1. An Overview of Media Planning<br>2. Basic Terms and Concepts<br>3. The function of Media planning in advertising<br>4. Role of Media planner<br>5. Challenges in Media planning<br>6. Media Brief<br>7. Media Audit<br>8. NCCS Grid | 1. Learning the concepts of Media planning.<br>2. Key role of a Media planner. | CO1- To develop knowledge of various characteristics of media.<br>CO2- To understand procedures, requirements, and techniques of media planning and buying.<br>CO3- To learn the various media mix and its implementation<br>CO4- To understand budget allocation for a Media plan |
| **Module -II**<br>Sources of Media Research:<br>1. Nielson Clear Decision (NCD for Print)<br>2. Broadcast Audience Research Council<br>3. Audit Bureau of Circulation<br>4. RAM<br>5. Comscore - Digital | 1. Understanding the individual reach of media through various measurement bodies. | |
| **Module -III**<br>Media Planning Process:<br>1. Situation analysis and Marketing strategy plan<br>2. Setting Media objectives<br>3. Determining Media strategy<br>4. Selecting broad Media classes<br>5. Selecting Media within classes<br>6. Budget and Media Buying<br>7. Evaluation. | 1. To learn the step-by-step process for selection of media.<br>2. Understanding different strategies taken for an effective selection of media. | |
| **Module -IV** | 1. Calculating the revenue expenditure spent on each | |

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| Criteria for selecting Media Vehicles:<br>• Reach<br>• Frequency<br>• GRPS/GVT Ratings<br>• TVT Ratings<br>• Cost efficiency<br>• Cost per thousand<br>• Cost per rating<br>• Waste<br>• Circulation<br>• Pass-along rate (print) | media cycle and execution of the budget on the right media. | |
| **Module -V**<br>Selecting suitable Media options & Media Buying<br>1. Newspaper<br>2. Magazine<br>3. Television (National, Regional and Local)<br>4. Radio<br>5. Outdoor and out of home<br>6. Cinema Advertising<br>7. Digital Advertising | 1. Learning about various media and different mediums for advertising.<br>2. Understanding the pros and cons of each medium. | |
| **Module -VI**<br>Communication Mix:<br>• Events<br>• Sponsorship<br>• Merchandising<br>• Point of purchase<br>• In film advertising<br>• Mobile advertising<br>• Word of mouth<br>• Ambient advertising | 1. Learning about the IMC and its tools.<br>2. To study innovative ways for advertising and marketing of the product. | |
| **Module -VII**<br>Negotiation Skills in Media Buying:<br>1. Negotiation Strategies<br>2. Laws of Persuasion | 1. To study the negotiation skills for proper buying of media.<br>2. To study the various laws for learning consumers perspective in making a purchase. | |
| **Module -VIII**<br>Digital Media Planning:<br>1. Various Digital channels<br>a. Search Engine Optimisation | 1. To study about online platforms and available spaces used for advertising.<br>2. Understanding various | |

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| b. Search Engine Marketing<br>c. Email marketing – (Cost per email open (CPO), Cost per email sent (CPS), Cost per Visit, Cost per click, cost per transaction, cost per form fill or cost per lead (CPL)<br>d. Targeting/Remarketing<br>e. Mobile advertising (WAP & APP)<br>2. Various types of digital<br>a. Display Advertising ads and its various Ad formats<br>b. Video Advertising and its various Ad formats<br>c. Types of social media (Text + Visual, FB, Twitter, Instagram, Snap Chat etc). | advertising formats with respect to social media and video advertising. | |
| **Module -IX**<br>Digital Media Buying:<br>1. Buying Digital Advertising: An Overview Paid media, owned media and Earned media).<br>2. Direct buys from the websites<br>3. Programmatic Buying: [DSP (Demand side platform) or RTB (Real time bidding)]<br>4. a. Cost per action (CPA), or pay per action (PPA)<br>b. cost per conversion or Revenue sharing or cost per sale,<br>5. Advertising via Premium Publishers<br>6. Advertising via Networks and Exchanges<br>7. Affiliate Network (Clickbank, Commission junction, adfuncky, 7search.com)<br>8. The Local Publishing Market | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms. | |



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**Faculty Name - Mrs. Yashashree Mhatre**

**Program: Bachelors in Mass Media**

**Course: Advertising Design**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| 1. Introduction to Agency Departments & Role of each department.<br>a. Basic depts.:<br>i. Account Dept: Client handling/ Servicing/ Strategy planning/ Creative brief.<br>ii. Media Dept: Media research/ Media planning/ Media booking, buying.<br>iii. Creative Dept: Idea generation/ Brainstorming/ Mind-mapping/ Ad-CW duo/ Illustrator/ Graphic designer/ Storyboarding/ Web tree<br>iv. Production Dept: In house or outsource. Production<br>1. Print: Hoardings/ Brochures/ Packaging etc<br>2. Video: Storyboard/ Casting/ Location/ Costume/ Editing/ Dubbing<br>3. Photography: In-house or location/ Model/ Costume/ Shoot/ Editing | 1. To study about the agency and its departments who handle an advertising campaign of a brand.<br>2. To study about the production stage of the campaign.<br>3. To study the idea generation process for any creative. | CO1- To make students understand the process of planning & production of advertisement<br>CO2- To highlight the importance of visual communication<br>CO3- To provide practical training in the field of advertising |
| 2. Understanding Design: Design as a language of emotions/ Communication.<br>a. Introducing to students to: Elements of design (as vocabulary).<br>i. Point/ Line/ Shape/ Tone/ Colour/ Texture<br>b. Introducing to students to: Principles of Design: (grammar of design Language)<br>i. Proportion/ Contrast/ Harmony/ Balance/ Rhythm/ Unity<br>c. Introducing students to the Rules: Gestalt principles | 1. To learn about the elements of designing.<br>2. To study the Gestalt principle which helps to create perspective through designs. | |



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| i. Proximity/ Closure/ Similarity/ Continuation/ Figure & ground | | |
| 3. Introduction to Negative space & its use: Creative use/ Finding shape within/<br>Adding a meaning. | 1. To learn how negative space in a figure-ground is creative and give new shapes and vision and adding meaning to the brand. | |
| 4. Introduction to Optical illusions:<br>a. Influence of surrounding shapes on shape & size<br>b. Influence of surrounding colour/ tone on object colour & tone<br>c. Appearance of space & depth/ form | 1. To learn the shapes and symbols from our surroundings.<br>2. To study the effects and beauty of colors from nature and use it in the creative. | |
| 5. Introduction to Word expression: (Expressive words)<br>a. How word meaning is expressed through the appearance of word/ visual impact.<br>b. Calligraphy & graceful typography. | 1. Understanding different fonts and typefaces of an ad-copy.<br>2. Learning meaning and tone form the typography. | |
| 6. Logo unit: Understanding Logo as a company face/ Brand identity/ Character/ Class<br>a. Elements of Logo: Shape/ Typeface/ Treatment/ Colours/ Symbol or symbolism used to fulfill the impression.<br>b. Tagline: typeface/ alignment/ placement etc. | 1. To study different types of logos and its meaning.<br>2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience. | |
| 7.Introduction to Layout:<br>Choosing right format/ right canvas/ Optical<br>center/ Equilibrium<br>a. Types of Layouts: All text/ Text dominant/ Picture dominant/ Picture window<br>b. Stages of Layout: Thumbnail sketches/ Rough layout/ Finished rough/ Comprehensive | 1. To study the focal point of an advertising and using this idea in making the creatives.<br>2. Learning about the types of layouts used in creating copies.<br>3. Understanding the process of creating layouts. | |
| 8. Use of picture (visual) as means to select Target audience | 1. To understand the right use of visuals for justifying the | |



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| a. Choosing a picture<br>i. Expression of Problem (Hair-fall, toothache etc.)<br>ii. Expression of benefit (Glowing face, fitness etc.)<br>iii. Irresistible presentation of product (Watch/Car etc.) class<br>iv. Dramatization (Cold drinks/ Mentos etc.)<br>v. Association of ideas<br>b. Headline size/ break/ highlight/ two tone head<br>c. Subhead size/ style<br>d. Body copy type: Descriptive/ pointer/ bulleted | copy message.<br>2. To learn the presentation of the products to persuade the audience with the visuals.<br>3. Understanding the writing tone as per target audience. | |
| 9. Introduction to Typography & Text treatment: (2 Lectures)<br>a. Classification of typefaces & combinations.<br>b. Size/Weight/posture etc. | 1. To study about the typeface and various fonts used in a copy. | |
| 10. Layout: Putting all together: What goes together must be placed together. Grouping the relevant elements to have 2 to 3 groups for easier to understand | 1. Learning the principle of grouping and creating a thought process through the copy for Visuals and words. | |
| 11. Introduction to Art direction for diff media: (4 Lectures) Role of an Art Director<br>a. Diff in design for Magazine Ad & N Paper Ad (Considering Factors: paper Q/ Printing Q/ Life/ reading habits etc<br>b. Outdoor & indoor ad: Time available for reading/ spotting frequency etc<br>c. Transit ad: Psychology & mindset of the TA/ State of mind at the spot etc<br>d. TVC/ Radio: Advantage of Music/ Voice modulation etc, Demonstration on TV<br>e. Web ad: Advantage of pop up/ Key word SEO etc | 1. Understanding the use of minimum and maximum words to write the advertising message.<br>2. To learn and understand in writing persuasive copy based on different media and different platforms.<br>3. Learning the pros and cons of various mediums. | |

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| f. Direct mailers: Advantage of prior knowledge/ prior relation etc | | |
| 12. Campaign planning: Rest of the lectures in guiding the students through developing the campaign Introduction to the process of Idea generation (Brainstorming/ Mind-mapping)<br>a. Understanding Brand (Brand building)<br>b. Understanding TA's favorite place, shows, reading (Media research/ planning)<br>c. Understanding buying motives/ habits/ influences (Consumer behaviour)<br>d. Understanding product/ Market (demo-psycho)/ Client/ deriving message/ Creative brief<br>e. Arriving to a Big idea/Copy platform (Copy writing) considering all the factors above.<br>f. Layout stages & final design | 1. To study the execution of an advertising campaign through various existing ad-campaign examples.<br>2. Learning various important stages in advertising campaigns. | |
| 13. Corporate stationary & Brand manual (Logo design philosophy | | |
| 14. Ad Campaign (system work) Prints & presentation | | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

## Unit and Course Outcome A.Y 2020-2021

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Agency Management**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE I**<br>Advertising Agencies:<br>• their role, Functions, Organization and Importance<br>• different types of ad agencies | 1. To study the evolution of Advertising Agency.<br>2. To study the role & Functions and services offered by the Agency.<br>3. To study the types of advertising agencies. | CO1- To acquaint the students with concepts, techniques for developing an effective advertising campaign.<br>CO2- To familiarize students with the different aspects of running an ad agency<br>CO3- To inculcate competencies to undertake professional work in the field of advertising. |
| **MODULE -II**<br>Client Servicing:<br>• The Client - Agency Relationship<br>• 3P's of Service: Physical evidence, Process and People<br>• The Gaps Model of service quality<br>• Stages in the client-agency relationship<br>• How Agencies Gain Clients<br>• Why Agencies Lose Clients<br>• Evaluation Criteria in Choosing an Ad Agency<br>• The roles of advertising Account executives | 1. To study the characteristics of services.<br>2. To study the stages & principles in client-agency relationships.<br>3. To study the factors that influence the success or failure of an advertising agency. | |
| **MODULE -III**<br>Account Planning:<br>• Role of account planning in advertising<br>• Role of Account Planner<br>• Account Planning Process | 1. To study about the account planning process.<br>2. To study the attributes of an account planner.<br>3. To study the 5M of advertising programme | |



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| **MODULE -IV**<br>Advertising campaign management:<br>• Means-End chaining and the Method of Laddering as guides to Creative Advertising Formulation<br>• Digital Advertising Strategy / Campaigns | 1. To study the campaign development process.<br>2. To study digital advertising strategies and campaigns.<br>3. Briefly learning through the specimens of Digital Advertising Campaigns. | |
| **MODULE -V**<br>Ad Film making:<br>• Converting story board to TVC<br>• Editing and post production | 1. To study the process of converting a storyboard into TVC.<br>2. To study the complete process of Ad-film making. | |
| **MODULE -VI**<br>Marketing Plan of the Client:<br>• The marketing brief, Marketing Audit, Marketing Objectives, Marketing Problems and OpportMODULEies Review, STP, Executing the plan, Evaluating the plan | 1. To study marketing strategy.<br>2. To study the process of developing a marketing plan.<br>3. To study the constraints in strategy implementation. | |
| **MODULE -VII**<br>The Response Process:<br>• Traditional Response Hierarchy Models: AIDA<br>• Sales-Oriented Objectives<br>• Communications Objectives<br>• DAGMAR: An Approach to Setting Objectives | 1. To study the objectives of communication and advertising.<br>2. To study the stages of buying behavior.<br>3. To study about IMC and its tools. | |
| **MODULE -VIII**<br>Setting up an Agency: Business Plan Introduction, Various Stages in Setting up a New Agency | 1. To study the nature of agency business.<br>2. To study the components of the business environment.<br>3. To study a business plan for an advertising agency. | |
| **MODULE -IX**<br>Agency Compensation: Various Methods of Agency Remunerations. | 1. To study about the expenditure heads of the agency.<br>2. To study the financial planning of leading ad agencies.<br>3. To study the AAAA regulation | |
| **MODULE -X** | 1. To study the agency | |



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| Growing the Agency:<br>• The Pitch: request for proposal, speculative pitches, Pitch Process<br>• References, Image and reputation, PR. | business management and development.<br>2. To study customer relationship management.<br>3. To understand the prospecting for new businesses. | |
| **MODULE -XI**<br>Sales Promotion Management:<br>• The Scope and Role of Sales Promotion<br>• Reasons for the Increase in Sales Promotion<br>• The psychological theories behind sales promotion<br>• Consumer Franchise-Building versus Nonfranchise-Building Promotions<br>• Designing Loyalty, continuous and frequency programs<br>• Objectives of Trade-Oriented Sales Promotion<br>• Techniques of Trade-Oriented Sales Promotion<br>• Objectives of Consumer-Oriented Sales Promotion<br>• Techniques of Consumer-Oriented Sales Promotion | 1. To study the advantages and limitations of sales promotion.<br>2. To study pull and push strategy.<br>3. To study about CFB promotion and Non-CFB promotion. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Principles and Practices of Direct Marketing**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Introduction to Direct Marketing:<br>• Meaning & Introduction to Marketing<br>• Traditional versus Direct Marketing Techniques. | 1. To understand Direct marketing in depth.<br>2. To understand Traditional techniques<br>3. Analyzing real- world strategies for marketing. | CO1- To understand the concept and importance of Direct Marketing<br>CO2- To understand the various techniques of direct marketing and its advantages |



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| **Module -2**<br>Basics of Direct & Interactive Marketing:<br>• Meaning, Definitions, Importance of Direct Marketing,<br>• Advantages & Disadvantages of Direct Marketing,<br>• Approaches of Direct Marketing,<br>• Reasons for the Growth of Direct Marketing,<br>• Economics of Direct Marketing<br>• 3 Tasks of Direct & Interactive Marketing, customer acquisition, development & retention. | 1. To introduce the basic and key concepts used in Direct Marketing<br>2. To understand and identify the tasks relevant in Direct Marketing.<br>3. To create potential consumers for the brand. | |
| **Module -3**<br>Customer Relationship Management:<br>• What is Customer Relationship Management,<br>• Importance of CRM,<br>• Planning & Developing CRM,<br>• Customizing Products to different needs,<br>• Studying the customers mix & managing the key customers,<br>• Relationship Marketing-Customer Loyalty | 1. To understand CRM how it is useful in decision making of a customer.<br>2. To give students an insight about features and functionality of CRM.<br>3. To study how to manifest and engage customers' loyalty towards product and brand. | |
| **Module -4**<br>Database Management:<br>• Meaning, Importance, Functions of Database sources & uses of E-databases,<br>• Techniques of Managing Database- Internal/External,<br>• Steps in developing a database, | 1. Introducing and evaluating new concepts used in Database Management.<br>2. To understand the process of Data management<br>3. To get insight on advantages and disadvantages of Database management.<br>4. To understand the importance of strategies in using Direct marketing as a | |

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| • Advantages & Disadvantages of Database Management.<br>Direct Marketing Strategies:<br>• Meaning of Marketing Strategies- Why it is needed,<br>• Internal & External Analysis,<br>• Objectives of Strategies,<br>• Creating a Direct Marketing Budget.<br>Direct Marketing Research & Testing:<br>• What is customer Lifetime value (LTV),<br>• Factors affecting lifetime value,<br>• How we use LTV,<br>• LTV- sums (3 methods- Present/Historical & Discounted),<br>• Using LTV analysis to compare the effectiveness of various marketing strategies.<br>Direct Marketing Analysis:<br>• List Selection, Prospecting,<br>• Market Segmentation,<br>• Product Customization,<br>• Response Modeling & Experimentation,<br>• Mail order, Lead generation, Circulation, Relationship/Loyalty programs, Store traffic/Site traffic generation,<br>• Fund raising, Pre-selling, selling (Cross selling, Up selling), & Post-selling. | tool for communication and marketing.<br>5. How to analyze the results, feedback, and so on, creating and maintaining loyalty through loyalty programs.<br>6. Students will understand Customer life cycle and how it helps in research and its calculations. | |
| **Module -5**<br>Direct Marketing as an Integral Part of Integrated Marketing Communication:<br>• Meaning, Introduction of IMC, | 1. To introduce IMC and its concepts.<br>2. It helps in expanding the knowledge for advertising industry along with various campaigns of brand | |

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| • Role of IMC in Marketing Process.<br>• Relationship of IMC with Direct Marketing.<br>• Importance of IMC.<br>• Tools of IMC- Advantages, Sales, Promotion, Publicity, Personal Selling, etc.<br>• Person to person, Group Selling, Direct Mail.<br>• Direct response Television (DR-TV).<br>• Direct Response Print Advertising.<br>• Catalogs, Inserts, Videos, E-mail, Trade shows. | 3. It also helps to understand and compare direct marketing being an Integral part of IMC. | |
| **Module -6**<br>Future of Direct Marketing Scenario:<br>• Growth of Direct Marketing in Future,<br>• Indian & Global Perspective in Direct Marketing | 1. To make students ready for future scope of Direct marketing with practical reality<br>2. Understanding not only Indian markets but Global | |
| **Module -7**<br>Direct Marketing Case Study:<br>• Product offering, re-generation, database management & methodology. (Shampoo, Gym, Pre - School.) | 1. To discuss few case studies according to the topics covered<br>2. To study the methods involved in creating and maintaining the database and how to manage it along with re-generation. | |

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**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Advertising & Marketing Research**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE-I**<br>Fundamentals of research:<br>1. Research (definitions), importance and objectives of research.<br>2. Terms and concepts in research such as variables, qualitative and quantitative<br>3. Literature Review and its role in research<br>4. Stages in Research process | 1. To study the basic concepts of research.<br>2. To learn the process of research.<br>3. To study the importance and objectives of a research in detail. | CO1- To inculcate the analytical abilities and research skills among the students.<br>CO2- To understand research methodologies – Qualitative vs Quantitative<br>CO3- To discuss the foundations of Research and audience analysis that is imperative to successful advertising.<br>CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility. |
| **MODULE-II**<br>Hypothesis:<br>Meaning, Nature, Significance, Types of Hypothesis, | 1. To learn the nature of hypothesis.<br>2. To learn the formation of the hypothesis through research questions.<br>3. To study various other types of hypothesis and its uses in the research. | |
| **MODULE -III**<br>Research Design:<br>1. Meaning, Definition, Need and Importance, Scope of Research Design<br>2. Types- Descriptive, Exploratory and Causal. | 1. To learn how research design works as a blueprint for research.<br>2. Learning types of research design. | |
| **MODULE -IV**<br>Sampling:<br>1. Meaning of Sample and Sampling,<br><br>2. Process of Sampling | 1. To study different ways through which research samples are collected.<br>2. To learh methods of sampling. | |

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| 3. Methods of Sampling:<br>i) Non- Probability Sampling – Convenient, Judgment, Quota, Snow ball.<br>ii) Probability Sampling – Simple Random, systematic, Stratified, Cluster, Multi Stage. | | |
| **MODULE -V**<br>Data Collection:<br>1. Types of data and sources- Primary and Secondary data sources<br>2. Methods of collection of primary data:<br>a. Observation<br>b. Experimental<br>c. Interview Method:<br>i) Personal Interview<br>ii) focused group,<br>iii) In- depth interviews -<br>d. Survey<br>e. Survey instrument –<br>i) Questionnaire designing.<br>f. Scaling techniques-<br>i) Likert scale,<br>ii) Semantic Differential scale, iii) Staple scale,<br>iv) Constant sum scale<br><br>Projective Techniques<br>a. Association,<br>b. Completion, c. Construction d. Expressive | 1. To understand the basic idea on data collection.<br>2. Understanding the types of data collection. | |
| **MODULE -VI**<br>Report Writing:<br>1. Essential of a good report,<br>2. Content of report,<br>3. Steps in writing a report,<br>4. Footnotes and Bibliography | 1. Learning Basic format of research report writing. | |
| **MODULE -VII**<br>Advertising Research:<br>1. Introduction to Advertising Research | 1. Learning about advertising research in detail.<br>2. To study different other types of copy testing.<br>3. Learning various other steps | |

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| 2. Copy Research: a. Concept testing, b. Name testing, c. Slogan testing<br>3. Copy testing measures and methods:<br>a. Free association, b. Direct questioning, c. Direct mail tests, d. Statement comparison tests, e. Qualitative interviews, f. Focus groups<br>4. Pretesting:<br>A. Print Pretesting:<br>a. Consumer Jury Test, b. Portfolio test, c. Paired comparison test, d. Order of-merit test, e. Mock magazine test, f. Direct mail test.<br>B. Broad casting Pretesting:<br>a. Trailer tests, b. Theatre tests, c. Live telecast tests, d. Clutter tests<br>C. Challenges to pre-testing.<br>Example: The Halo effects<br>4. Post testing: a. Recall tests, b. Recognition test, c. Triple association test, d. Sales effect tests, e. Sales results tests, f. Enquires test<br><br>Neuroscience in Advertising Research<br>1. Neuroscience: A New Perspective<br>2. When to use Neuroscience<br><br>Physiological Rating Scales<br>1. Pupil Metric Devices<br>2. Eye-movement Camera<br>3. Galvanometer<br>4. Voice Pitch analysis<br>5. Brain Pattern Analysis | in pre-testing.<br>4. Briefly understanding the concept of Neuroscience and its applications. | |
| **MODULE -VIII**<br>Marketing Research:<br>1. Advertising Research introduction<br>2. New product Research | 1. Learning different marketing processes in details. | |

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| 3. Branding Research<br>4. Pricing Research<br>5. Packaging Research<br>6. Product Testing | | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Contemporary Issues**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE -I**<br>Ecology and its related concerns:<br>• Climate change and Global warming- causes, consequences and remedial measures<br>• Deforestation- causes, consequences and remedial measures<br>• Costal regulatory Zone- need and importance, CRZ Act<br>• Sustainable development- concept, need and significance<br>• Movements related to environmental protection. | 1. To study about the Ecological system.<br>2. To study the Hippo effect.<br>3. To study renewable and non-renewable resources and its types. | CO1- To understand and analyze some of the present day environmental, political, economic and social concerns and issues.<br>CO2- To highlight the importance of human rights and its implementation in India.<br>CO3- To understand the present-day problems and challenges and its implications on development. |
| **MODULE -II**<br>(a) Human Rights:<br>• UDHR and its significance<br>• CRC and CEDAW<br>• DRD<br>(b) Legislative Measures with reference to India:<br>• Women: Constitutional Rights and legal safeguards, Domestic and Family<br>Violence Act of 2012, Sexual Harassment Act at the Work Place 2013, The<br>Criminal Law (Amendment) Act of 2013 | 1. To study human rights.<br>2. To study the principle of Substantive equality.<br>3. To study the POSCO act.<br>4. To study the objectives of health policy. | |

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| • Child: Protection of Children from sexual offence Act -2012 (POCSO), Child Labour Act with new amendments, Juvenile Justice (Care and Protection of Children Act) 2000.<br>• Education: Right to Education Act 2009<br>• Health: National Health Policy of 2015, Transplantation of Human organs Act of 2002, Prenatal Diagnostic Technique Regulation and prevention of Misuse amendment rules of 2003, Prohibition of sale of cigarettes and other tobacco products around educational institutions 2004. | | |
| **MODULE -III**<br>Political Concerns & Challenges:<br>• Crime and Politics<br>• Corruption: Causes and remedial measures. RTI Act, Lok Pal Bill.<br>• Whistle Blowers- Whistle Blowers protection act 2011.<br>• Anti- State violence- Naxalism and its Impact.<br>• Insurgency with reference to North East – Issues involved, ULFA, Nagas, Manipur issue, AFSPA and its impact.<br>• Terrorism- causes, consequences and remedial measures | 1. To study the analysis of Lok Sabha election.<br>2. To study the top corruption scams in India.<br>3. To study the salient features of Jan Lokpal Bill.<br>4. To study the role of NNC, NFA and NFG. | |
| **MODULE -IV**<br>Economic Development & Challenges:<br>• The Role of MIDC in the economic development of Maharashtra<br>• Special Economic Zone: Its role and significance in Maharashtra<br>• Food Security Act 2013<br>• Agrarian issues: rural indebtedness, farmers' suicides and its implications. | 1. To study the contribution of MIDC in economic sectors.<br>2. To study about the Mid-day meal rule, 2015<br>3. To study the benefits of the farmers. | |



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| **MODULE -V**<br>Social Development & Challenges:<br>• Tribal Issues: Marginalisation of the Tribals, Forest Rights Act, Land Acquisition Act.<br>• Police reforms: Problems faced by Police and the Need for Reforms<br>• Illegal immigration from Bangladesh: Challenges and impact<br>• Developmental Issues: Displacement and rehabilitation | 1/ to study the causes of the trial movement and its type.<br>2. To study the categorization of the tribal movements.<br>3. To study the controversy over the Land Acquisition Bill. | |

**Faculty Name - Ms. Charmy Shah**

**Program: Bachelors in Mass Media**

**Course: Digital Media**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE -I**<br>Introduction to Digital Media:<br>1. Understanding Digital Media<br>2. Principles<br>3. Key Concepts<br>4. Evolution of the Internet<br>5. Traditional v Digital | 1. Introduction to Digital media and its key concepts<br>2. To learn about its evolution and principles.<br>3. To differ traditional media and digital media. | CO1- Understand digital marketing platform<br>CO2- Understand the key goals and stages of digital campaigns<br>CO3- Understand the of use key digital marketing tools<br>CO4- Learn to develop digital marketing plans |
| **MODULE -II**<br>Search Engine Optimization (SEO):<br>1. What are Search Engines:<br>• Types of Search Engines,<br>• How Search Engines work and how they rank websites based upon a search term?<br>2. Introduction to SEO and what it involves:<br>• What is the importance of search for websites? | 1. To understand SEO (On-page and Off- page) in detail<br>2. Importance of websites and keywords<br>3. To study the algorithms and its mechanisms. | |



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| • What are the areas of operation for Search Engine Optimization Professionals?<br>• How do you search for the right keywords that will help bring in the most traffic?<br>3. What is On-Page Optimization?<br>• Keyword Research with Google Keyword Planner, Page Naming {URL Structuring}<br>and Folder Naming, What are Meta Tags, Redirection Tags,<br>4. What is OFF-Page Optimization?<br>• What are Backlinks?, How to Get Backlinks?<br>• What is Google Page Rank? How to Increase Page Rank?<br>5. Search Engine Algorithms:<br>What is Search Engine's Algorithms? How Algorithms Works? Page Rank Technology, Why a Search Engine penalizes a Website, Google Panda Update, | | |
| **MODULE -III**<br>Social Media:<br>1.Introduction:<br>Definition of social media, Types of social media, how social media is affecting Google Search,<br>Integrating social media into websites and blogs.<br>2. Using Facebook:<br>What can You do with Facebook, Facebook Features, Facebook Fan Pages, Facebook Pages. How to promote your Facebook page, Creating Facebook Application / Widget, linking with YouTube, Creating Events, Building content Calendar.<br>3. Using Twitter: | 1. To introduce students to the social world and medium of communication.<br>2. Learning various platforms of social media and its tools used in evaluating campaigns analysis.<br>3. To understand blogging and create blogs, as a tool for communication to the online audiences. | |

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| Following And Listening, Tools for managing your Tweets,<br>Finding People and Companies on Twitter, Twitter Tools, Reputation Management, Keyword Research, Hashtags and Trends Tools<br>Influence on Twitter: Tweet Deck, Klout, Peer Index.<br>4. Using LinkedIn:<br>Lead Generation through Individual Profiles, Lead Generation as Enterprise: Company Page Ads, Developer API, Groups.<br>5. Using Blogs:<br>How Blogging can be used as a tool. | | |
| **MODULE -IV**<br>Tools and Trends:<br>1. Key terms and concepts<br>2. Web analytics<br>3. Tracking Tools to enhance lead nurturing Tracking and Collecting Data: Log file analysis, Page tagging. | 1. To introduce students to online marketing channels.<br>2. To understand Google Ad-words and PPC (Pay per Click)<br>3. Understanding web analytics and its tools. | |
| **MODULE -V**<br>Features of a Website:<br>1. Homepage<br>2. Links<br>3. Navigation<br>4. Multimedia | 1. To introduce students to websites along with its concepts and how it helps businesses to get business.<br>2. To explain in detail the features of a website.<br>3. HTML & HTTP | |
| **MODULE -VI**<br>Content Writing:<br>1. Blog<br>2. Twitter<br>3. Mobile | 1. To create appropriate content for utilization on the internet.<br>2. Learning skills and qualities required for content writing on various online sites, applications and websites. | |
| **MODULE -VII**<br>New Challengers: | 1. To understand cybercrimes and its types.<br>2. Challenges of new media / | |

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| 1. Cyber Crime and Challenges of the new media | Digital media<br>3. To create an awareness in students related to pros and cons of new media. | |
| **MODULE -VIII**<br>Cyber Laws:<br>1. Information Technology Act<br>2. Copyrights and its importance<br>3. Ethics<br>4. Digital Security | 1. To learn about cyber laws<br>2. Case studies related to each law so as to better understand the real world.<br>3. Ethics in Digital Media. | |

**Faculty Name - Mr. Ajay Chauhan**

**Program: Bachelors in Mass Media**

**Course: Financial Management for Marketing & Advertising**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>Introduction of Financial Management:<br>Meaning of Financial Management, Definition, Goals, Functions, Role of Finance in Marketing and Advertising. Types of Finance, Owned and Borrowed, Long term and Short- Term Finance, Sources of Long Term and Short-Term Finance. | 1. To study the features of Corporate Finance.<br>2. To study the objective of financial management.<br>3. To study the relationship between finance function and production function.<br>4. To study the emerging role of Finance Manager in India. | CO1- To provide a brief overview of the basic concepts, goals functions and types of finance available for new and existing business and marketing units.<br>CO2- To enable the understanding of the need for financial planning through Budgets and their benefits.<br>CO3- To enable students to evaluate the financial implications of marketing decisions through simple analytical tools. |
| **Unit-II**<br>Financial Planning and Budgets:<br>1. Financial Planning for a Marketing Unit through budgets, Pro Forma Financial Statements and Spreadsheets.<br>2. Budgeting, Types of Budgeting, Functional Budgets, Master budget, Zero based budget, Sales Budget, Cash Budget (Application from | 1. To learn in detail business plan and financial plan along with its techniques.<br>2. To learn Budgetary Control and its steps<br>3. To study various budgeting types (Sales & Cash) and elements involved in marketing budgets<br>4. To solve problems/ sums in | |

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| Sales Budget and Cash Budget only)<br>3. Elements of Marketing Budgets, Advertising Agency Budget, Budgeting for Films, Broadcast Print and Electronic Media. | class to get the organizational finance clearer. | |
| **Unit-III**<br>Working Capital Estimation:<br>Working Capital- Concept of Operating Cycle, Types of Working Capital, Factors influencing Working Capital, Methods of Calculating Working Capital (Theory and Basic Application) | 1. To study working capital and concepts of Operating cycles<br>2. Capital Financing approaches and factors influencing Working Capital<br>3. To study and practice during lectures various methods of calculating Working Capital | |
| **Unit-IV**<br>Financial Statements and Ratio Analysis:<br>1. Vertical Financial Statements, Financial Decision making using Financial Statement Analysis.<br>2. Ratio Analysis- Debt Equity Ratio, Current Ratio, Proprietary Ratio, Stock to Working Capital Ratio, Gross Profit Ratio, Net profit ratio, Operating Ratio, Debtors Turnover Ratio, Creditors turnover Ratio, Selling Expenditure Ratio. | 1. To understand Financial Statements, Balance- sheet and parties interested in financial statements<br>2. To study Ratio analysis of the operations of an enterprise.<br>3. To solve Illustrations in class during for better understanding (Theory and Applications) | |
| **Unit-V**<br>Introduction of Costing<br>1. Costing- Types of Cost- their Relevance in Marketing Decision making.<br>2. Classification of costs- Traceability, Functionality and Level of Activity.<br>3. Estimation of Profit/ Loss using Cost Volume Profit Analysis- Break Even Analysis, Calculation of Profit Volume Ratio, Break- even Point, Margin of Safety, Sales required in Units and Rupees (Theory and Application) | 1. To understand and learn Cost, importance of costing in marketing decisions and Cost Accounting.<br>2. To classify cost into three (3) different parameters.<br>3. Estimating Profit/ Loss on the basis on analysis of cost volume<br>4. Solving sums boosts students' calculations techniques and better understanding of topics and subjects. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Advertising Ethics and Legal Environment**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Legal Environment:<br>(i) The importance & the relationship between Self –Regulation, Ethics & the Law<br>(ii) The laws of the land:<br>- Constitutional Laws – Fundamental Rights<br>- Personal laws- Criminal & Civil laws<br>- Corporate laws<br>- Consumer laws<br>- Laws pertaining to Media<br>(iii) Laws of Defamation & Contempt of Court with respect to cases specific to Media | 1. To understand the legal environment and its regulation.<br>2. To learn about the basic fundamental human rights.<br>3. To study about various laws in detail, learning with examples. | CO1- To acquaint students to the Legal Environment in contemporary India highlighting the relevance of the same with reference to Advertising media.<br>CO2- To emphasise & reiterate the need to have ethical practices in the field of advertising media both in India & internationally.<br>CO3- To appreciate the role of advertising in contemporary consumerism, the need for consumer awareness & consumer protection.<br>CO4- Advertising as a profession today & how to protect it the future of advertising<br>a. The socio – economic criticisms<br>b. Why Advertising needs to be socially responsible?<br>c. The need for Critiques in Advertising<br>CO5- The syllabus has been redesigned to include advertising in both traditional & New Media. |
| **Module -II**<br>Government Policies & Cyber Laws:<br>(i) Government Policies governing advertisements<br>(ii) The role of Prasar Bharati for advertisements in Public Broadcast Services<br>(iii) Cyber laws including Section 66; Laws pertaining to advertising in cyber space. | 1. Learning about cyber law and cyber securities.<br>2. To study about broadcasting body in detail and its role in smooth running of broadcasting. | |

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| (iv) The Question of Net Neutrality & its relevance in Media<br>(v) Right to Information Act | 3. Understanding the Internet cyberspace and RTI act. | |
| **Module -III**<br>Laws pertaining to Media:<br>(i) Standard Contract between Advertiser & Agency<br>(ii) Laws:<br>- Drugs & Cosmetics Act<br>- Drugs & Magic Remedies (Objectionable Advertisements) Act<br>- Drugs Price Control Act<br>- Emblems & Names (Prevention of Improper Use) Act<br>- Indecent Representation of Women's Act<br>- Intellectual Property Rights-<br>-Copyright Act<br>- Trademarks Act<br>- Patents Act | 1. To study media laws and the format of media agency contract.<br>2. Understanding government laws for drugs and magical remedies.<br>3. Brief study about the citizenship, title and emblem. | |
| **Module -IV**<br>A. Ethics in Advertising:<br>(i) What is Ethics? Why do we need Ethics?<br>(ii) The philosophy of Ethics- Absolutist & Situational<br>(iii) Ethics in Advertising &Stereotyping:<br>- Religious minorities<br>- Racial minorities<br>- Ethnic groups<br>- Cultural Minorities<br>- Senior Citizens<br>- Children<br>- Women<br>- LGBT<br>(iv) Advertising of Controversial products<br>(v) Surrogate & Subliminal Advertising<br>(vi) Political Advertising<br>(vii) Manipulation of Advertising Research<br><br>B. Bodies helping to maintain a Code of Ethical conduct in Media:<br>- ASCI<br>- AAAI<br>- BCCC<br>- IBF<br>- CENSOR BOARD FOR FILMS<br>- Press Council | 1. To study about ethics to be followed in advertising.<br>2. Learning about the perspective related to certain category of advertising.<br>3. Understanding about certain government and non-government bodies maintaining codes of ethics. | |

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| **Module -V**<br>Unfair Trade Practices & the Competition Act 2002: (i) Unfair Trade Practices & Restrictive Trade Practices to Consumers:<br>- False Promises<br>- Incomplete Description<br>- False & Misleading Comparisons<br>- Bait & Switch offers<br>- Visual Distortions<br>- False Testimonials<br>- Partial Disclosures<br>- Small print Clarifications<br>(ii) Unfair Trade Practices & Restrictive Trade Practices to other organizations in the industry<br>(iii)The role of the Commission of the Competition Act 2002 in resolving cases of Unfair &<br>Restrictive Trade Practices. | 1. To study about the unfair selling of products to the customers and the action can be taken on the manufacturer. | |
| **Module -VI**<br>Consumer Protection: Government initiatives including Standardization, Consumer Law & Non-Government Initiatives:<br>(i) Consumerism – The rising need for consumer guidance& awareness<br>(ii)Government Initiatives:<br>-Standardization- Meaning, Relevance in today's Globalized World in Total Quality Management<br>- Standardization Bodies in India- AGMARK, BIS, FSSAI & FPO<br>- International Bodies- ISO, FDA, CMMI, Six Sigma & CE<br>- Standardization marks- ISI, AGMARK, BIS- Hallmark (Gold), Silkmark, Woolmark, Cotton, Forever mark (Diamonds)<br>Laws:<br>(i)Essential Commodities Act 1955<br>(ii) Consumer protection Act 1986<br>(iii)Standards of Weights & Measures Act<br>(iv)Standards of Weights & Measures (Packaged Commodities) Act<br>(v)Prevention of Food Adulteration Act<br>Other Initiatives:<br>- PDS- Ministry of Civil Supplies (Public Distribution System or Ration Shops)<br>- Consumer Co-operatives | 1. To study about consumer protection on buying an appropriate product with various signs and symbols as an indication for making a purchase.<br>2. Government initiatives to support the citizens with respect to foodgrains.<br>3. To learn about customers care centres. | |

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| Non- Government initiatives:<br>- CGSI<br>- CFBP<br>- CERC<br>- Grahak Panchayat<br>- Customer care centres | | |
| **Module -VII**<br>Advertising & Society:<br>A. Socio- Economic Criticisms of advertising<br>- Increasing prevalence of Materialism<br>- Creating Artificial Needs<br>- Idealizing the "Good Life"<br>- Stressing Conformity with Others<br>- Encouraging instant gratification & a throwaway society<br>- Promoting the good of the individual over the good of society<br>- Creating Unrealistic Ideal characterizations<br>- Using appeals that prey on feelings of inadequacy<br>- Manipulation by advertising<br>B. Advertising & social responsibility - Advertising as a moulder of thought, opinion & values | 1. To study on how advertising influence customers thought process. | |
| **Module- VIII**<br>Critique of Advertising<br>- A study of Vance Packard- The Hidden Persuaders (1957)<br>- A study of Jean Kilbourne – Can't buy My love<br>- A study of Naomi Klein – No Logo<br>- A study of Naomi Woolf- The Beauty Myth<br>- A study of Noam Chomsky- Understanding Power | | |

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**LAXMI CHARITABLE TRUST'S**

**SHETH L.U.J. & SIR M.V. COLLEGE OF ARTS, SCIENCE & COMMERCE**

**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Fundamentals of Mass Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I:** Introduction and Overview<br>1. Meaning and importance of Mass Communication.<br>2. Forms of Communication: Intra Personal Communication, Interpersonal Communication, Group Communication, Mass Communication: Electronic, Satellite, Interactive, Digital<br>3. Communication etc.<br>4. Models of Communication: Gerber's Model, Sociological Model, Gatekeeping Model, Defleur's Model of the Taste-differentiated Audience Model, Hub Model, Sadharanikaran. | 1. To understand the need of Mass communication<br>2. Learning of various mass communication models.<br>3. Understanding their functions and barriers of mass communication. | CO1- To introduce students to the history, evolution and the development of mass communication in the world with reference to India.<br>CO2- To study the evolution of mass media as an important social institution.<br>CO3- To understand the development of the mass communication models.<br>CO4- To develop a critical understanding of Mass Media.<br>CO5- To understand the concept of New Media and Media convergence and its implications. |
| **Module II**: History of Mass Communication:<br>1. From Oral to Communication (Kirtan, Davandi, Powada, Nagara)<br>2. From Electric to Electronic communication, From Electric to Digital Communication, Contemporary Scene in Indian Communication Landscape. | 1. Understanding the difference between mass communication and mass media.<br>2. To learn various tools of mass communication.<br>3. Understanding the importance and nature of Audiences. | |
| **Module III**: Major Forms of Mass Media<br>1. Traditional and Folk Media<br>2. Print: Books, Newspapers, Magazines<br>3. Broadcast: Television, Radio<br>4. Films | 1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society. | |

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| 5. Internet | 2. Helping students to understand more clearly with the help of case studies.<br>3. Showing the contribution of various religion reformers in saving their valuable literature. | |
| **Module IV**: Impact of Mass Media on Society:<br>A.I. Social Impact (with social reformers who have successfully used mass communication)<br>II. Political impact (with political leaders who have successfully used mass communication)<br>III. Economic Impact (With how economic changes were brought about by mass communication)<br>IV. Development Impact (With how the government has successfully used in mass communication)<br>B. Impact of mass media on:<br>1. Education,<br>2. Children<br>3. Women<br>4. Culture<br>5. Youth<br>6. Development. | 1. Understanding media and its convergence; how new mass media is a back bone to society.<br>2. To understand how the new mass media allows a huge increase in the volume of communication.<br>3. In- depth understanding of social media on mass communication. | |
| **Module V**: The New Media and Media Convergence:<br>1. Elements and features of new media, Technologies used in new media,<br>2. Major Challenges to new media Acquisition- personal, social and national,<br>3. Future prospects. | 1. Creating awareness in the masses due to the emergence of technology.<br>2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom.<br>3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies. | |

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**Faculty Name – Ms. Jyothika Naidu**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Current Affairs**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Current National stories:<br>1. Three political stories of national importance.<br>2. Political Leaders: newsmakers of the season (Brief profile of any three)<br>3. One dominating economic / business news<br>4. One dominating environment news stories<br>5. One story of current importance from any other genre. | 1. To learn about political stories of national importance.<br>2. To also know in detail the contributions of political leaders and their history.<br>3. To know the environment more nearly covering genres of news. | CO1- To provide learners with an overview on current developments in various fields.<br>CO2- To generate interest among the learners about burning issues covered in the media.<br>CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news.<br>CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture. |
| **Module 2**: Polity and Governance:<br>1. Ministries of Government of India: Autonomous Government bodies<br>2. Ministry of Home Affairs: Enforcement Organizations, Internal Security, Police<br>3. Communal tensions: Review of latest episodes of communal tensions.<br>4. Tensions in J&K: Background, Political players, Update on the current situation<br>5. Review of any three Central Government projects and Policies. | 1. To introduce and understand the government of India.<br>2. In-depth information about the Home Ministry and its Ministerial Team.<br>3. Covering all the aspects of communalism and communal violence/ tensions.<br>4. To know more about Jammu and Kashmir and its issues.<br>5. Understanding in-depth about Governmental schemes, projects and policies. | |
| **Module 3**: International Affairs:<br>1. Security Council: Structure and role<br>2. Issues that currently engage the SC<br>3. Role of United Nations General Assembly. Other main organs of the UNO.<br>4. Issues that currently engage the UNO | 1. To learn about United Nations Systems.<br>2. To highlight the key functions and roles of the United Nations General Assembly.<br>3. To discuss and understand international issues and conflicts. | |

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| 5. Four conflicts/ issues of international importance. | | |
| **Module 4**: Maharashtra Issues:<br>1. Political parties reach and challenge political leaders.<br>2. An update on the current political dynamics of Maharashtra<br>3. News relating to the marginalized and displaced tribes.<br>4. The latest news on floods and drought, unemployment, health issues, etc<br>5. Update two ongoing state projects | 1. To learn in detail about the history of polity in Maharashtra.<br>2. To also understand past and current situations of politics and their political leaders.<br>3. Introducing students to the marginalized and displaced Tribes.<br>4. Talking about developmental projects of the state. | |
| **Module 5**: Technology<br>1. Mobile Application for Journalists:<br>Mobile apps help in content creation, Examples of Mobile apps used by journalists worldwide<br>2. Artificial Intelligence and Content Automation Tools:<br>Introduction to AI and data science, Introduction to Content Automation tools, Examples of content automation tools in content creation.<br>3. Augmented Reality and Virtual Reality in Media:<br>Introduction to Augmented Reality, Introduction to Virtual Reality, Examples of Augmented Reality games and apps, Examples of Virtual Reality news websites worldwide.<br>4. Digital Gaming Industry:<br>Introduction to Digital Gaming Industry<br>5. Digital Gaming in India:<br>Overview of Indian digital gaming | 1. To highlight the use of mobile applications and strategies to capture the attention of readers.<br>2. To understand the cusp of rapid transformation with digital media.<br>3. To learn some of the content automation tools and its handlings.<br>4. Introducing students to Virtual Reality and Augmented Reality.<br>5. To learn and discuss digital gaming and how it leads to market growth. | |



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**Faculty Name – Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module 1**: Introduction to Communication<br>1. The concept of communication: Communication, its concepts, process Importance of Communication in Media; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication.<br>2. Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication Advantages of verbal communication- Significance of Non-verbal Communication.<br>3. Oral Communication and Media: Anchoring, voice, modulation, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion.<br>4. Listening Skills: Listening Process, Classification of listening; Purpose of Listening; Common Barriers to the Listening Process; Measures to Improving Listening; Listening as an important Skill in Workplace. | 1. To understand and introduce communication<br>2. To understand the process and types of communication<br>3. To enhance the listening skills required to communicate effectively. | 1. To make students aware of the functional and operational use of language in media.<br>understand each type in detail.<br>2. To equip or enhance students with structural and analytical reading, writing and thinking skills.<br>3. To introduce key concepts of communications. |
| **Module 2**: Reading- English, Hindi or Marathi<br>1. Types of Reading: Types of reading -skimming and scanning Reading- examples newspaper/ Magazine article, TV, feature and | 1. Understanding reading and its types.<br>2. Understanding languages and their aspects when communicating through various platforms. | |

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| documentary, radio bulletins, advertising copy, press release in English, Hindi or Marathi. Recognizing aspects of language particularly in media. Importance of spelling.<br>2. Various aspects of language: Recognizing various aspects of language particularly related to media, Vocabulary 100 media words.<br>3. Grammar and Usage: Grammatical structure- spelling, structure of sentences, Active/ Passive voice, tenses, Idioms, Phrases, proper usage of homophones, homonyms etc. | 3. To get deeper and broader knowledge about grammar aspects. | |
| **Module 3**: Thinking and Presentation<br>1. Thinking:<br>1.Types of thinking (rational, logical, critical, lateral, etc.) Errors in thinking, Partialism, Time scale, Egocentricity,<br>2.Prejudices, adversary Thinking.<br><br>2. Presentation: Presentation, its importance, steps in making a presentation; delivering a Presentation. | 1. To make students understand the importance of thinking and its role in communication.<br>2. Understanding types and errors of thinking.<br>3. To understand presentations and the tips on how to deliver and communicate effectively. | |
| **Module 4**: Translation<br>1. Introduction to Translation: Concept, importance, need for translation, challenges in translation, problems and importance of Information and Technology in translation.<br>2. Interpretation: Meaning, Difference between interpretation and translation.<br>3. Role of a translator: Translator and its Role in Media, Qualities, Importance of Translator, Challenges faced by translator. | 1. Understanding the concept, needs, and technologies of translation.<br>2. Understanding the difference between interpretation and translation.<br>3. To understand the translator's perspective for effectively communicating in the media. | |



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**Faculty Name – Mr. Ajay Chauhan**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-I**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Overview of India Society:<br>Understand the Multi-cultural diversity of Indian Society through its demographic composition.<br>Population distribution according to religion, caste, and gender<br>Appreciate the concept of Linguistic diversity in relation to the Indian situation<br>Understand regional variations according to rural, urban and tribal characteristics<br>Understanding the concept of diversity as difference. | 1. To understand the cultural and religion wise composition.<br>2. To learn the classification of Indian Languages.<br>3. To understand the regional variations in India. | CO- 1 To introduce students to the overview of the Indian Society.<br>CO-2 To help them understand the constitution of India.<br>CO-3 To acquaint them with the socio-political problems of India.<br>CO-4 The student will apprehend regional variations according to rural, urban and tribal characteristics.<br>CO-5 Students will become more aware of the political frameworks.<br>CO-6 Learners will comprehend the multi-cultural diversity of Indian society through its demographic composition. Appreciate the concept of linguistic diversity in relation to the Indian situation |
| **Unit-2**<br>Concept of Disparity-1<br>Understand the concept of disparity as arising out of stratification and inequality.<br>Explore the disparities arising out of gender with special reference to violence against women, female feticide (declining sex ratio), and portrayal of women in Media.<br>Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities. | 1. To learn the meaning of Social Inequality.<br>2. To learn about social stratification, its characteristics and its types.<br>3. To understand the class system.<br>4. To understand the declining sex ratio in India.<br>5. To learn about the status and portrayal of women in each era. | |
| **Unit-3**<br>Concept Disparity-2 | 1. To understand the inequalities of the caste system. | |

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| Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof,<br>Understand inter-group conflicts arising out of communalism<br>Examine the causes and effects of conflicts arising out of regionalism and linguistic differences. | 2. To learn about the causes of Communalism in India.<br>3. To learn about the remedial actions to overcome communalism, linguism, regionalism. | |
| **Unit-4**<br>The Indian Constitution;<br>The Structure of the Constitution-the Preamble, Main Body and Schedules<br>Fundamental Duties of the Indian Citizen<br>Tolerance, Peace and Communal harmony as crucial values in strengthening the social fabric of Indian society<br>Basic features of the Constitution. | 1. To understand the meaning of Preamble and its Characteristics.<br>2. To learn the structure of the Indian Constitution.<br>3. To learn about the significance of the Fundamental Duties, its advantages, and disadvantages. | |
| **Unit-5**<br>Significant Aspects of Political Processes:<br>The party system in Indian Politics<br>Local self-government in Urban and Rural areas<br>The 73rd & 74th Amendments and their implications for inclusive politics<br>Role and significance of women in politics. | 1. To learn about the multi-party system of Indian politics and its evolution.<br>2. To understand the working of the local self-government.<br>3. To learn the important features of the Amendments. | |

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**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: History of Media**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction:<br>Evolution of Press in India-<br>a. Newspaper- The Rise of the Voice of India during British Rule.<br>b. India's Freedom Struggle and role of Media.<br>c. Independence and Rise of Newspapers,<br>d. Newspapers- A Social Aspect for Freedom Struggle,<br>e. Press Acts of India.<br>f. Press during the Emergency Period. | 1. To learn about the pointers in History of Newspapers in India.<br>2. To understand about the factors that added to the boom of newspapers in India.<br>3. To learn the role of the press in India's struggle for freedom.<br>4. To deeply understand the different Press acts of India. | CO1- Learner will be able to understand Media History through key events in the cultural history.<br>CO2- TO enable the learner to understand the major developments in Media History.<br>CO3- To understand the history and role of professionals in shaping communications.<br>CO4- To understand the values that's shaped and continues to influence Indian Mass Media.<br>CO5- Learner will develop the ability to think and analyze about Media.<br>CO6. To sharpen the reading, writing, speaking and listening skills that will help the students to understand the development of Media. |
| **Module-II** Language Press:<br>History of Indian Language Press in India-<br>a. Rise of Hindi Language Newspapers (detailed report on Vernacular Press in India referring to Newspapers).<br>b. Regional press and its popularity of Indian Regional Languages in various regions.<br>c. Vernacular Press Act,1876. | 1. To learn about the diversity and growth of Indian Language Newspapers.<br>2. To understand the effect of the vernacular press act on Indian Publishers.<br>3. To learn the difference between English newspapers and Language Newspapers. | |
| **Module-III** Documentaries and Films:<br>History of Documentaries and Films-<br>a. Genesis of Documentaries and Short Films (Screening of a few documentaries is essential- like Hindustan Hamara, Zalala, The Vanishing Tribe). | 1. To learn about different types of Documentaries.<br>2. To learn how to make documentaries.<br>3. To understand about Indian Documentary and the struggle for Indian Independence. | |

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| Role of Documentarians- P.V.Pathy, D.G.Tendulkar, K.S.Hirlekar, Paul Zils and Fali Billimoria, Anand Patwardhan.<br>b. Evolution of Film Making in India- Brief History, Photography to Moving Films.<br>c. Origin of Hindi Cinema.<br>d. Origin of Short films to what it is today, Role of YouTube and WhatsApp.<br>e. Great Masters of World Cinema. | 4. To learn about the New Media and their roles in Movie making. | |
| **Module-IV** Broadcasting: History of Radio and Television in India:<br>a. Radio and Television as Mass Media.<br>b. Radio and Television Broadcasting-<br>c. The beginning of Radio and Television Shows.<br>• A New Era in Broadcasting in India.<br>• Satellite Television and Privatization in Broadcasting.<br>• Advertising in India.<br>d. Internet Protocol Television. | 1. To study the history of Prasar Bharti Act.<br>2. To study the functions and objectives of Radio.<br>3. To study the Business model of the cable TV industry.<br>4. To understand the key recommendations of TRAI. | |
| **Module- V** Media Icons: Role of Media Icons in the History of Indian Media-<br>1. Raja Rammohan Roy<br>2. Bal Gangadhar Tilak<br>3. M.K. Gandhi<br>4. B.R. Ambedkar<br>5. K.P.Kesava Menon<br>6. K.C. Mammen Mapillai<br>7. Maulana Abul Kalam Azad. | 1. To study about the various movements of history.<br>2. To learn about our Media icons who played important role in marking the change. | |

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**Faculty Name - Mrs. Akansha Joshi**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Visual Communication**

**FYBAMMC SEM-I**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module I**: Development to Visual Communication<br>Introduction to Visual Communication:<br>1. History and Development of Visuals<br>2. Need and Importance of Visual Communication<br>3. Visual Communication as a process and as an Expression, Language and Visual Communication<br>4. Visible Concepts:<br>• Plans and Organizational Charts<br>• Maps<br>• Chronologies<br>5. Invisible Concept:<br>• Generalization Theories<br>• Feelings or attitudes | 1. To understand communication and the aspects.<br>2. To introduce students to VISUAL AIDS and the history of visuals.<br>3. Understanding visual communication in detail with various connections.<br>4. To learn about visible and invisible concepts. | CO1- To provide students with tools that would help them visualize and communicate.<br>CO2- Understanding Visual Communication as part of Mass Communication.<br>CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.<br>CO4- To acquire basic knowledge in theories and languages of Visual Communication.<br>CO5- The ability to understand and analyze visual communication from a critical perspective. |
| **Module II**: Theories of Visual Communication<br>Sensual Theories<br>a. Gestalt<br>b. Construction<br>c. Ecological<br>Perceptual Theories<br>a. Semitics<br>b. Cognitive | 1. To extend the knowledge of the students by discussing theories and case studies.<br>2. To make them understand how the visual cortex works to create unified perception.<br>3. Knowing about complexity and multifaceted cognitive processes. | |
| **Module III**: Impact of Colors<br>Colors and Design in Visual Communication<br>1. Color Theory<br>2. Psychological Implications of color | 1. To understand theories related to color for visuals.<br>2. Understanding the psychological influence of color on perception.<br>3. Understanding in detail | |



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| 3. Colors and Visual Pleasure<br>4. Elements of Design | visual plans and designs. | |
| **Module IV**: Channels of Visual Communication<br>Tools/ Mediums of Visual communication:<br>1. Painting and Photography<br>2. Film and Television, Documentaries, Script Writing an Visualization<br>3. Comics and cartoons, Digital Images, Animation and VFX<br>4. News Papers, Advertisements, Photojournalism<br>5. Folk and Performing Arts, Theatre | 1. Understanding of various tools of visual communication.<br>2. Understanding various styles and types of visual communications.<br>3. To strategize visuals for mass appeals.<br>4. To understand the perception and structure of each platform. | |
| **Module V**: Language and Culture in the age of social media<br>Visual Communication in the Age of social media:<br>1. Ethics<br>2. Impact of Language and Culture, Images and Messages, Signs and Symbols (GIF, etc.)<br>3. Audience Behavior<br>4. Citizen Journalism, Going Viral<br>5. Visual Stereotyping in social media | 1. To adapt to new changes with the advent of technologies.<br>2. Understanding the ethics and audience behavior.<br>3. Understanding the role of stereotyping in social media. | |



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**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Advertising**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I** Introduction to Advertising:<br>1. Introduction to Advertising- Evolution, Importance, Features, Benefits, Limitation, Effects and 5 M's of Advertising.<br>2. Types of Advertising- Consumer, Industrial, Retail, Classified, Corporate, Public Service, Generic, National, Global, International, Social (CSR) and Advocacy.<br>3. Ethics and Laws in Advertising- Puffery, Subliminal, Weasel claim, Surrogate, Shocking ads, Controversial, Comparative, Advertising code of ethics, Regulatory bodies, Laws, and regulations.<br>4. Social, Cultural and Economic impact of Advertising- Women and advertising, Children and advertising, Senior citizen and advertising, Pop culture and advertising.<br>5. Theories- Stimulus theory, AIDA, Hierarchy, Means-Ends Theory. | 1. To understand the evolution of advertising<br>2. To relate with the advantages & disadvantages to consumers, traders, manufactures and society.<br>3. To understand advertising laws and ethics<br>4. To understand various types of advertising | CO1- To provide the students with basic understanding of advertising, growth, importance, and types.<br>CO2- To understand effective advertising campaigns, tools, models etc.<br>CO3- To comprehend the role of advertising, various departments, careers, and creativity.<br>CO4- To provide students with various advertising trends, and future. |
| **Module-2** Integrated Marketing Communication and Tools:<br>1. IMC- Emergence, Role, Tools, Communication process, The IMC Planning Process. | 1.To comprehend the concept of IMC<br>2. To understand the role and various tools of IMC<br>3. To be able to understand the | |

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| 2. Print Media and OOH Media- Basic concepts, Types of Newspapers advertising, Advantages and Disadvantages of Newspaper advertising, Magazines, Factors to consider for Magazine advertising, OOH Advertising, On-premise advertising, Transit advertising, Posters, Directory advertising.<br>3. Broadcast Media: Radio advertising Advantages and Disadvantages of Radio advertising, Television advertising and its Advantages and disadvantages, Film advertising and product placement- advantages and disadvantages.<br>4. Public Relation- Meaning of Public Relations, Types of PR, Difference between PR and Advertising, Difference between Publicity and Advertising, advantages and disadvantages of Public Relations, Advantages and Disadvantages of Publicity.<br>5. Sales Promotion and Direct Marketing- Growth and Types of Sales Promotion, Advantages and Disadvantages, Growth of Direct marketing, and its tools Advantages and disadvantages | difference between print media & Outdoor media<br>4. To get basic knowledge about Radio & Television as a means of mass communication and advertising | |
| **Module-3**<br>1. Introduction to Creativity- Importance of Creative process, Creative strategy development determining message theme, big idea, Positioning strategies, Types of Appeals.<br>2. Role of different elements in ads- Logo, Jingle, Company signature, Slogan Tagline, Illustration, Creating Radio commercial- words, sounds, clarity, coherence, etc.<br>3. Elements of copy- Headline, Sub headline, Layout, Body copy, Types of copy and slogan, creating storyboard. | 1. To make students understand the creative process in advertising industry<br>2.To make students comprehend the different elements in an advertisement | |

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| **Module-4** Types of Advertising Agency, Department, Careers and Latest Trends in Advertising.<br>1. Types of Advertising Agency- Full service, Creative Boutique, Media buying agency, In-house agency, Specialized agencies and others.<br>2. Various departments in an agency- Account handling, Production, Art, Copy, Media, Public relation, Human resources, Finance and others.<br>3. Latest Trends- Rural advertising, Ambush advertising, Internet advertising, Email advertising, Advertainment, Advertorial, Mobile Advertising. | 1. To help students understand the different types of ad agencies and their basic difference<br>2. To be able to know the various departments in an ad agency<br>3. To understand the latest trends in career in advertising industry | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Content Writing**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Foundation:<br>1. Grammar Refresher- With special emphasis on use of punctuation, preposition, capital letters and lower case.<br>2. Vocabulary building- Meaning, usage of words, acronyms.<br>3. Common errors- Homophones and common errors in English usage.<br>4. Essentials of Good writing- With emphasis on writing with clarity, logic, and structure. | 1. To learn and revise English grammar.<br>2. To practice vocabulary building in order to understand its aspects and significance.<br>3. Learning about common errors while communicating in the English language and understanding the requirements for good writing.<br>4. In-depth knowledge of creativity exposure in creating phrases and idioms. | CO1- To provide students with tools that would help them communicate effectively.<br>CO2- Understanding crisp writing as part of Mass communication.<br>CO3- The ability to draw the essence of situations and develop clarity of thought. |
| **Module-2** Editing Skills<br>1. Redundant words- Identifying redundant words and phrases and eliminating these. | 1. To understand some editing tips for better writing and encouraging readers to read which helps in publishing well.<br>2. To boost students to write | |

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| 2. Editing sentences- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>3. Editing captions- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>4. Editing Headlines- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors.<br>5. Editing copy- Structuring a story, creating a flow, editing redundant words/ phrases, and replacing wrong words/punctuation/grammatical errors. | and edit captions that are catchy and attractive.<br>3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning.<br>4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story. | |
| **Module-3** Writing Tips and Techniques<br>1. Writing tickers/scrolls- For Television news.<br>2. Writing social media post- Twitter and for other social networks.<br>3. Writing briefs/snippets- News briefs, Lifestyle and Entertainment snippets.<br>4. Caption writing- Picture stories, etc.<br>5. Writing Headlines- News headlines and features headlines | 1. To understand how to write tickers for the television medium.<br>2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks.<br>3. Understanding in detail writing methods for writing headlines and content briefs along with its software's and tools. | |
| **Module-4** Presentation Tools and Techniques<br>1. PowerPoint Presentation:<br>Uses of PowerPoint Tools<br>PowerPoint to Pdf<br>PowerPoint to self-animated presentation<br>Auto-timing of PowerPoint presentation<br>2. Infographic:<br>Color selection<br>Use of Clip art<br>Use of PowerPoint smart Tools | 1. Understanding PowerPoint presentations, their related terms and tools.<br>2. Understanding in detail infographics and their impact while making presentations.<br>3. Tips on how to make a presentation convincing to listeners and viewers.<br>4. To learn terms and concepts related to Google Advanced Search and Plagiarism in detail. | |



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| Minimalist animation for maximum impact<br>3. Three-minute presentation:<br>Content for single slide<br>Uses of phrases<br>Effective word selection<br>Effective presentation<br>4. Google Advanced search:<br>How to select relevant information<br>Locating authentic information<br>How to gather information for domestic and international websites.<br>5. Plagiarism:<br>How to do a plagiarism check<br>Paraphrasing<br>Citation and referencing style | | |
| **Module-5** Writing for the Web<br>1. Content is King- Importance of content<br>2. Less is more- Writing for Print media/social media like Twitter, etc.<br>3. Copywriting- Ad campaigns (Creative, witty and attractive)<br>4. Real Time content- Difference in writing for print vs digital<br>5. Keywords- Designing keywords for Search Engine Optimization. | 1. Understanding content and its essentials.<br>2. To differentiate between print and digital platforms and their content creation.<br>3. To understand the importance of keywords in Digital media. | |

**Faculty Name - Ms. Ms. Namrata Singh**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Effective Communication-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** Writing<br>1. Report Writing:<br>Report Writing (English, Hindi, or Marathi)<br>General report and News report writing- Basics and Format | 1. To learn about report writing and its various elements.<br>2. Understanding in-depth headlines and their features.<br>3. To make students understand the need to | Co1- To make the students aware of the use of language in media and organization.<br>CO2- To equip or enhance students with structural and analytical reading, writing, and thinking skills. |



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| (Headlines, Sub-headline, Various type of Report)<br>2. Organizational Writing:<br>(English, Hindi, or Marathi) Internal communication,<br>E-mail- E-mail Etiquette, Overcoming Problems in E-mail Communication, Stakeholder communication, Circulars- Guidelines for writing a circular- language and writing style of a circular- format of a circular; Notices- Purpose- Format- Important points to remember while writing a notice, Letters of complaint, claim and adjustment, Consumer grievance letters, Letters under the Right to Information Act, Press Release, Letter to the Editor.<br>3. Writing for Publicity Materials:<br>Writing for Publicity Materials<br>(English, Hindi, or Marathi)<br>Headline, Sub-headline, Body copy, Slogan, Jingle, Radio spot. | communicate with internal and external publics of the organization company through types of organizational writing.<br>4. Understanding publicity in detail. | CO3- To introduce key concepts of communication. |
| **Module-2** Editing<br>Editing:<br>(English, Hindi, and Marathi)<br>Principles of Editing, Punctuation, Substitution of words, Restructuring of sentences, Re-organizing sentence sequence in a paragraph, Use of link words,<br><br>(Principles of Coherence and Cohesion), Writing Synopsis, Abstracts, Precis writing, Newspaper Editing and Magazine editing. | 1. To learn the ability to spot mistakes via editing.<br>2. To understand how editing is different from medium to medium.<br>3. To elaborate on grammar aspects for communicating effectively. | |
| **Module-3** Paraphrasing and Summarizing<br>1. Paraphrasing- Meaning, how to use paraphrase in communication, Paraphrase in plagiarism, Translation<br><br>2. Summarization- Summarizing content, the points and sub-points | 1. To understand paraphrasing in writing communication.<br>2. The role of plagiarism while paraphrasing and translations.<br>3. Understanding summarization. | |

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| and the logical connection between the points. | | |
| **Module-4** Interpretation of Technical Data<br>Interpret Technical Data- Read graphs, Maps, Charts, write content based on the data provided. | 1. To learn to interpret data resulting from pies, graphs, maps, and charts. | |

**Faculty Name - Mr. Ajay Chauhan**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Foundation Course-II**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Globalization and Indian Society:<br>Understanding the concepts of Liberalization, privatization & globalization;<br>Growth of Information technology and communication and its impact manifested in everyday life;<br>Impact of globalization on industry-changes in employment and increasing migration;<br>Changes in agrarian sector due to globalization;<br>Rise in Corporate farming and increase in farmer's suicides. | 1. To study the elements of liberalization, its advantages, and disadvantages.<br>2. To study the impact of Globalization on Indian Industries.<br>3. To study the role of IT and Communication. | CO-1: To introduce students to the overview of the Indian Society. CO-2: To help them understand the constitution of India.<br>CO-3: To acquaint them with the socio-political problems of India.<br>CO-4: To understand stress and conflicts.<br>CO-5: To manage stress and conflicts in contemporary society.<br>CO-6: To learn about Contemporary Societal Challenges |
| **Unit-2** Human Rights:<br>Concept of Human Rights; Origin and Evolution of the concept;<br>The Universal Declaration of Human Rights;<br>Human Rights constituents with special reference to Fundamental Rights stated in the Constitution | 1. To study the basic characteristics of Human Rights.<br>2. To understand the evolution of Human rights.<br>3. To study the classification of the provisions of UDHR. | |
| **Unit-3** Ecology: | 1. To study the concept and disciplines of Ecology. | |

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| Importance of Environment studies in the current developmental context;<br>Understanding concepts of Environment, Ecology, and their interconnectedness;<br>Environment as natural capital and connection to quality of human life;<br>Environmental Degradation- causes and impact on human life;<br>Sustainable development- concept and components; poverty and environment. | 2. To study the structure of Ecosystem and causes of environmental degradation.<br>3. To learns about Sustainable development and the global need for the Sustainable development | |
| **Unit-4** Understanding Stress and Conflict:<br>Causes of stress and conflict in individuals and society;<br>Agents of socialization and the role played by them in developing the individual;<br>Significance of values, ethics, and prejudices in developing the individual.<br>Stereotyping and prejudice as significant factors in causing conflicts in society.<br>Aggression and violence as the public expression of conflict. | 1. To learn about the levels of Stress.<br>2. To study about the types of Organizational conflict.<br>3. To understand the measures for resolving aggression and violence in society. | |
| **Unit-V**<br>Managing Stress and Conflict in Contemporary Society:<br>Types of conflicts and use of coping mechanisms for managing individual stress;<br>Maslow's theory of self-actualization;<br>Different methods of responding to conflicts in society: Conflict-resolution and efforts towards building peace and harmony in society. | 1. To learn the assumptions & limitations in Hierarchy of Needs Theory.<br>2. To study the need for peace and harmony in India. | |

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**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Introduction to Journalism**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1** History of Journalism in India:<br>Changing face of Journalism from Guttenberg to New Media.<br>Journalism in India- Earliest Publications.<br>The rise of Nationalist Press, Post 1947<br>The Emergency 1975, Post Emergency<br>Post Liberalization of the Economy boom in Magazines, Niche Journalism<br>How Technology Advancement has helped Media<br>New Media with special reference to Rise the citizen Journalism. | 1. To learn the history and eras of journalism along with challenges.<br>2. To understand the new media and technology advances.<br>3. To briefly understand the news transmission and gathering process.<br>4. To discuss and learn about how the internet led to the rise of citizen journalism along with its pros, risks, and nature. | CO1- To help media students to acquaint themselves with an influential medium of journalism that holds the key to opinion formation and to create awareness. |
| **Module-2** News and its Process:<br>Definitions of News.<br>The News Process from the Event to the Reader<br>What makes a good story?<br>Anatomy of a news story<br>Types of Beats: Crime, Environmental, Entertainment, Educational, Agricultural, Sports, etc. | 1. To get knowledge about news and the process of gathering news.<br>2. Elements required for a good news story.<br>3. Understanding the beats and parts of a news story in detail. | |
| **Module-3** Principles and Format:<br>What makes a Great Journalist- Objectivity, Accuracy, Without fear or favor, Balance Proximity<br>Difference between a PR and a Journalist<br>Criteria for Newsworthiness<br>Hard News/Soft News and blend of the two<br>News Reports, Features Editorials | 1. Understanding the avenues to explore in journalism.<br>2. To learn about journalists/ reporters and their practices on various platforms.<br>3. Understanding the types of news.<br>4. To make students understand the difference between PR and journalism. | |

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| **Module-4** Career in Journalism- Reporter, Feature Writer, Mojo, Data Journalist, Real Time Journalist, Investigate Journalist, Rural Journalist, In-depth Journalist, Lifestyle Journalist. | 1. To learn and understand career prospects in journalism.<br>2. To encourage students to participate in grabbing opportunities related to the field. | |
| **Module-5** Covering an Event (Flip Class)<br>Background Research<br>Finding a News Angle<br>Capturing the Right Pictures for a Photo Feature<br>Writing Headline, Captions and Lead. | 1. To make students understand the importance of a piece of information to convert it into the news.<br>2. The unbiasedness and impartiality objectives must be cleared among the students.<br>3. To make understanding students to cover news from all angles and the format in writing news. | |

**Faculty Name – Ms. Jyothika Naidu**

**Program: Bachelors of Arts in Multimedia & Mass Communication**

**Course: Media, Gender & Culture**

**FYBAMMC SEM-II**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-1 Evolution, Need, Concepts and theories**<br>Evolution, features of cultural studies, Need and significance of cultural studies and media<br><br>Concepts related to culture- Acculturation, enculturation, ethnocentrism, cultural relativism, cultural shock and its relevance in media<br><br>Theories:<br>• Stuart Hall: encoding and decoding. Circuit of culture<br>• John Fiske: culture and industry<br>• Feminism and Post feminism | 1. To understand the evolution of culture and significance of Cultural studies and media.<br>2. Brief learning on the concepts related to culture.<br>3. To learn and understand the various ideologies and theories reflecting the culture, gender, and media. | CO1- To discuss the significance of culture and the media industry.<br>CO2- To understand the association between the media, gender, and culture in the society.<br>CO3- To stress on the changing perspectives of media, gender, and culture in the globalized era. |



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| • Techno culture and risk – Ulrich Beck | | |
| **Module-II** Culture & Media: Construction, commodification, impact and recent trends<br>Construction of culture- social, economic, political, religion and technology<br>2. Culture, industry and media- commodification, memes, representation, articulation, popular culture, power, cyber culture<br>3. Media and its impact on the cultural aspect of the society.<br>4. Culture industry and communication - with reference, to film, TV, social media, advertisements etc.,<br>5. Recent trends in Culture consumption: Changing values, Ideologies & its Relevance in the Contemporary society. | 1. To understand and discuss social constructionism and its terms.<br>2. To understand culture from various aspects such as politics, religion- technology and media.<br>3. Understanding how power is an integral element of culture and features.<br>4. To learn recent trends in culture consumption. | |
| **Module-III** Gender & Media Culture: Role and influence of media<br>1. The influence of the media on views of gender (theme, under representation, Stereotypes, Women & Men, Stereotypes Images, Roles, etc)<br>2. Role of social construction of gender, Changing Attitudes and Behaviour for empowerment of Women: Movements of Change.<br>3.Gender equality and media, Hegemonic masculinity in media.<br>4. Hegemonic Masculinity in Media.<br>5. Gender issues in news media (TV, radio, newspapers & online news). | 1. To have a deeper understanding about influences of media on gender and views.<br>2. To discuss and have better understanding on gender equality with reference to the media.<br>3. To relate the gender challenges on various platforms. | |
| **Module-IV** Globalization & Media Culture: Global, Local, Consumer and the recent trends<br>1. Media imperialism<br>2. Globalisation and Local culture- Issues and Perspectives, threat to regional and local identities, Impact of global culture and its relevance in media and gender<br>3. Consumer culture and media in the era of globalisation. | 1. To know about current trends of globalization.<br>2. To discuss case studies and concepts relation to global culture.<br>3. Understanding about consumer culture and its evolution.<br>4. Elaborating the aspects related to issues and impact of | |

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| 4. Digital Media culture: Recent trends and challenges<br>5. Media and Globalisation: Global economic flows, global cultural flows, homogenization & fragmentation, glocalization, creolization, globalization & power. | cultures along importance in media and gender. | |

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**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Introduction to Public Relations**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| 1. a. Definition of Public Relations (PR)<br>A. Nature<br>B. Scope<br>C. Stakeholders<br><br>b. Evolution of PR. With a special focus on India | 1. To study briefly about public relations.<br>2. To study the scope and benefits of public relations.<br>3. To study how PR helps to build corporate reputation. | CO-1 To prepare students for effective & ethical public communication on behalf of<br>organisations.<br>CO2- To help students acquire basic skills in the practical aspects of Media Relations & Crisis Management.<br>CO3- To equip students with basic skills to write & develop Press Release& other PR<br>communication.<br>CO4- To design a PR campaign. |
| 2. PR, Propaganda, Public Opinion, and Publicity | 1. To study public relations and propaganda.<br>2. To study the publicity measurement. | |
| 3. PR and Marketing PR and Advertising. PR and Branding | 1. To study PR marketing, advertising.<br>2. To study branding through various examples. | |
| 4.<br>Objectives, Functions of PR, Skills needed to be a PR Professional. | 1. To study about crisis communication.<br>2. To study the objectives of public relations.<br>3. To study the functions of public relations.<br>4. To study the qualities of a good PR person. | |

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| 5.<br>a. In-house PR and PR consultancy: Advantages and Disadvantages<br>b. Internal and External PR: With a focus on Corporate Communications | 1. To study the agency business and pitch.<br>2. To study the cost of PR activities and hiring a PR agency.<br>3. To study the external relationship of a PR. | |
| 6.<br>Corporate Image Management | 1. To study about corporate identity.<br>2. To study about the types of corporate identity.<br>3. To study the reasons for Image Management. | |
| 7.<br>PR Tools:<br>I. Media Tools:<br>a. Press Release<br>b. Press conference<br>c. Others<br>II. Non- media:<br>a. Seminars<br>b. Exhibitions/ trade fairs<br>c. Sponsorships<br>d. Others<br>III. Content Development in PR:<br>a. Development of profile: Company/ Individual<br>b. Drafting a Pitch note/ Proposal<br>c. Writing for social media | 1. To study the formats of Press Releases.<br>2. To study content writing in PR.<br>3. To learn about Media briefing. | |
| 8. New age PR: Digital PR (To be Taught with contemporary cases) | 1. To study the factors about new media.<br>2. To study about digital tools.<br>3. To study the use of new media through case studies. | |
| 9.<br>PR process with emphasis on developing a PR campaign | 1. To study PR Campaign planning.<br>2. To study the effectiveness of the PR campaign.<br>3. To study the aim and objectives of the campaign. | |



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| **10.**<br>Crisis communication (With Case Studies)<br>a. Preparing a crisis plan<br>b. Handling Crisis | 1. To study briefly about the crisis in any company.<br>2. To understand the crisis communication team.<br>3. To study about the Collateral materials. | |
| **11.**<br>Social Responsibility and PR (With Case Studies) | 1. To study briefly about the CSR activities.<br>2. To study the barriers to the CSR.<br>3. To study the relation between CSR and Public relations. | |
| **12.**<br>Ethics in PR: Code of conduct (With Case Studies) | 1. To study the code of ethics.<br>2. To study the public relations society of America.<br>3. To study the code of professional standards for the practice of PR. | |

**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Introduction to Creative Writing**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
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| **Section- I**<br>A brief Introduction to Creative Writing<br>Aspects of Creativity in Literature, Media, Public Speeches, Presentations, Interviews<br>1. Formal structure of the short story:<br>a. Theme<br>b. Plot<br>c. Character<br>d. Point of view<br>e. Setting | 1. Brief introduction to creative writing in literature.<br>2. Understanding various aspects of writing a story.<br>3. Analyzing plot of stories through various examples. | **CO1-** To design a PR campaign.<br>CO2- To develop further and build upon the writing and analytical skills acquired in Semesters I & II<br>CO3- To acquaint students with basic concepts in literary writing.<br>CO4- To prepare students to write for the media. |

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| Analyse some short stories preferably contemporary on the basics of each of these formal aspects. | | |
| 2. Formal aspects of Poetry:<br>a. Theme<br>b. Diction<br>c. Tone<br>d. Imagery<br>e. Symbolism<br>f. Figures of Speech: Metaphor, simile, personification, alliteration, onomatopoeia, analyse some poems, on the basis of each of these formal aspects. | 1. Learning to write on various themes of poems.<br>2. Briefly understanding the figures of speech to give literary effects to poems. | |
| 3. Formal aspects of Drama<br>a. Theme<br>b. Plot<br>c. Character<br>d. Dialogue<br>Analyse on play preferably contemporary on the basis of each of these formal aspects. | 1. In this unit, students gain in-depth knowledge on theatrical plays and dramas.<br>2. Different play/drama writings were analyzed for brief understanding. | |
| 4. Publication Aspects:<br>a. Understanding the intended readership<br>b. Revising, editing and proofreading<br>c. Exploring the market for a suitable publisher<br>d. Preparing the manuscript as hard and soft copy<br>e. Intellectual property rights<br>f. The financial aspects of publication | 1. To understand the working of a publication.<br>2. Focusing on making a proper manuscript.<br>3. Learning literary rights as per law. | |
| Section II<br>5. Scripting, Screenplay and dialogue writing focusing on:<br>a. radio<br>b. television<br>c. short film/ documentary/ and film<br>These are to be discussed with special reference to<br>a. the storyboard<br>b. the two-column scripts<br>c. interactive scripts<br>d. narration scripts in the screenplay format | 1. To understand writing for the entertainment and advertising industry.<br>2. Discussion on writings for various scripts. | |

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| 6. Writing for the Internet, with special reference to:<br>a. alerts<br>b. blogs<br>c. news on the net | 1. To learn and understand content writing for the Internet. | |

**Faculty Name - Mr. Ajay Chauhan**

**Program: Bachelors in Mass Media**

**Course: Introduction to Cultural Studies**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Chapter No.1**<br>Introduction to Cultural Studies:<br>a. Evolution, Need and Significance of Cultural Studies:<br>Key concepts in cultural studies- Representation, materialism, non-reductionism,<br>Articulation, Power, Popular culture, Texts and readers, subjectivity and Identity<br>b. Theories and its relevance in Media:<br>Diffusionism- Kroeber<br>Cultural materialism- Raymond Williams<br>Functionalism- Malinowski, and R. Brown<br>Social interaction- G.H. Mead and Cooley<br>Popular and mass culture, circuit of culture, encoding and decoding - Stuart Hall<br>Culture and industry – John Fiske | To introduce to the students to various cultures, concepts and its need in the society.<br>2. Understanding cultural theories and elements on human behaviour of Culture (values, customs, beliefs and attitude)<br>3. To learn Indian as well as Global cultures. | CO-1 To create awareness on cultural theories and its relevance in media<br>CO2- To discuss the importance of cultural studies and its role in mass media.<br>CO3- To understand the cultural concepts and its impact on the media |
| **Chapter- II**<br>a. Construction of Culture<br>Social<br>Economic<br>Political<br>Religion<br>Technology<br>b. Re-presentation and media culture:<br>Language | 1. To understand how to construct aspects of the culture and its impact on society.<br>2. To get in-depth knowledge about socialization and exchange of cultures at various places in the community.<br>3. To create awareness among students how media | |

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| Gender<br>Race<br>Class<br>Ethnicity<br>Kinship and terminology | representations create a real mirror that reflects society and culture. | |
| **Chapter- 3**<br>Globalisation and Cultural Studies:<br>a. Popular Culture- Trends, Transformation and its Impact of Society<br>b. Commodification of Culture and its Impact on Lifestyle<br>c. Changing Values, Ideologies and its Relevance in Contemporary Society<br>d. Global Economic Flow, Global Cultural Flows, Homogenization and Fragmentation, Glocalization, Creolization, Globalization and Power<br>e. Digital Media Culture | 1. To explore the globalization, media and learning of cultures.<br>2. To understand the changes in culture; results changes in lifestyle of the masses.<br>3. To introduce Digital Media culture and media multitasking. | |
| **Chapter -4**<br>Cultural Expressions and Media:<br>Oral traditions- folklore<br>Fashions and fad<br>Cuisine<br>Festivals<br>Sports<br>Art and Architecture. | 1. To understand how mass media is powerful for directing people's values and rules.<br>2. To discuss in-depth the changes in the Contemporary Era.<br>3. To broaden the knowledge about changes throughout being the constant factor. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Understanding Cinema**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Module 1:<br>Introduction to Cinema as a Medium, Language of Cinema, Cinema Narratives, Evolution of Cinema covering Hollywood as well as Indian Cinema | 1. To understand cinema and its transformation.<br>2. Broadening knowledge to know various historical. | CO1- This paper aims to sensitize the students towards Cinema as a medium of Mass Communication and help them to become critical viewers of movies today. |



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| from the early beginnings to its status today | technical and cultural language in films.<br>3.In-depth knowledge on Hollywood and Indian Cinema. | CO2- The students should get to study the similarities and differences between various movie cultures.<br>CO3- The students should get to study Indian cinema through its similarities and differences with both Indian & Western traditions of art and culture. |
| Module 2:<br>Introduction to Genres, Understanding Diverse Film Genres, with a special mention to Italian Neorealism, French New Wave and Indian Parallel Cinema | 1. To learn various classifications, techniques or conventions required in producing a movie<br>2. To study and understand the important movements across globe<br>3. To critically analyze and appreciate cinema as an art. | |
| Module 3:<br>In the Indian Context: Contribution and Impact of Regional Cinema | 1. To trace the history and development in regional cinema.<br>2. "Entertainment" an important contribution by regional cinema<br>3. To cut geographical, social and cross- cultural barriers of Cinema of India. | |
| Module 4:<br>In the Indian Context: Contribution and Impact of Regional Cinema | 1. To highlight the various cultures and deal with local issues.<br>2. To grasp how much the film industry in India has influenced each other behaviors and thoughts<br>3. To connect the Indian Diaspora | |
| Module 5:<br>Basic Introduction to the TECHNOLOGY used in Cinema. | 1. The flexibility and immediacy in film making techniques.<br>2. An in-depth insight about Digital Movies, | |

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| Introduction to few important TECHNIQUES employed by different film makers.<br>Introduction to the BUSINESS with prevailing practices in the production and marketing of films.<br>NOTE: A special mention to be made to the contribution and role of Digital technologies in the Modern Film making Process. | technologies used in virtual reality<br>3. Marketing budgeting and Film promotion important aspects in film making. | |
| Module 6:<br>Introduction and basic discussion to cover a broad range of films: Documentaries, Commercials ads, Corporate Films, Short Films. Newsreels, Public Service Ads and Others. | 1. Understanding the various types of films in detail (Short films, documentaries, etc)<br>2. To learn the production stages in films.<br>3. Encourages students with some departments in real career opportunities. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Introduction to Media Studies**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| Ch.1 a. Relevance of Media Studies in Contemporary Times.<br>b. Historical perspectives to media studies | 1. Learning media and its forms of communication and the representation of knowledge through various channels.<br>2. To learn and understand the moral compass the mass media holds on society.<br>3. An overview of mass media studies and its perceptions hold by the society. | CO1- To make students understand the dynamic role of the media in society<br>CO2- To introduce students to the study of contemporary forms of mediated communication<br>CO3- To introduces students to a variety of analytical perspectives and theories related to media |

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| | | CO4 - To understand the impact of media on individual attitude, values, behavior and geopolitics<br>CO5- To study the impact of new media technologies and pop culture in the field of advertising<br>CO6- To understand the impact of globalization on media |
| **Ch.2.**<br>The Mid- 20th Century Media Evolution Theory:<br>a. Agency Setting<br>b. Uses and Gratification<br>c. Two-Step How<br>d. McLuhan- Medium is the message<br>e. Foucault- Power & Authority<br>f. Propaganda Model | 1. To study the democratic society as an instrument for public opinions.<br>2. Understanding various theories by theorists for the welfare of mass media and society.<br>3. To get in-depth knowledge about professionalism in the field of news and news | |
| **Ch.3.**<br>Media and Globalisation:<br>a. Division and contradiction in the Global Information infrastructure<br>b. Racist Ideologies and the Media (Stuart Hall)<br>c. Media and Diaspora<br>d. New Media Theory<br>e. Cognitive Theory | 1. Understanding the new technologies transforming the world of media.<br>2. To study the technological era- a boon to society across the globe.<br>3. To learn various theories in relation to the media and its future. | |
| **Ch.4.**<br>Media and its Commercial Impact:<br>a. Advertising Magazine Culture and the new man<br>b. Trends in Media<br>c. Feminist Strategies of Detection<br>d. Media Power and Political Culture | 1. To learn that media and corporate are closely related.<br>2. To explore the currents in the media.<br>3. To understand and discuss a comparative study on media and political culture and impact on audiences. | |
| **Ch.5.**<br>Constituents of Media:<br>a. Language<br>b. Religion<br>c. Discourse | 1. Students get in-depth knowledge about social changes and its impact on change in language. | |



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| d. Technology | 2. To learn about mythologies and how transmitted through various forms of media.<br>3. To understand how media are the extensions of human perceptions. | |
| **Ch.6.**<br>Challenges to Contemporary Media:<br>a. Media and Consumerism<br>b. Intellectual Property and New Media<br>c. Young People as consumers of Advertising Art | 1. To understand and get an overview of challenges faced by the media industry.<br>2. Students get knowledge about media and consumerism and impact on masses.<br>3. To foster an environment in creativity and innovation. | |

**Faculty Name - Mr. Sohrabh Vakharia**

**Program: Bachelors in Mass Media**

**Course: Advanced Computers**

**SYBMM SEM-III**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>Basics of Online Marketing<br>Building an online marketing foundation.<br>Planning and Building the Website.<br>Content Marketing.<br>Blogging<br>Social Media Marketing.<br>Web Analytics. (Google Analytics).<br>Search Engine optimization / How Google Works.<br>Online Advertising / Search Engine Marketing. (Google Adwords). | 1. Learning eMarketing and its importance.<br>2. To understand how Google Search Engine Works and its types.<br>3. Learn ORM, SEO, Affiliate Marketing, and Content Marketing.<br>4. Learning Blogging, Blog SEO, Podcast, and Vodcast.<br>5. Introduction to PPC, PPC Strategy. | Co1- To equip the students with a understanding of industry knowledge required to make a career in the field of print and Advertising, Digital Marketing, Television media, Film etc.<br>CO2- To train them with the software knowledge required in the above-mentioned Industries. |

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| □ Email Marketing / Webinar.<br>□ Online Public Relation.<br>□ Managing Multitasking Web Marketing. | | |
| **Unit-II**<br>Basics of Animation<br>□ Understanding Animation (Adobe Flash may be used).<br>□ Working with Fills and Outline, Layers and Pen tool.<br>□ Understanding Layers and Symbols.<br>□ Working with Text and Mask Layers.<br>□ Creating Frame by Frame Animation.<br>□ Motion Tweeningand Motion Editor.<br>□ Classic tweening and Shape tweening.<br>□ Working with Sound and Video and Publishing a Movie. | 1. Understand Adobe WorkSpace.<br>2. Create an Animation using Adobe Flash.<br>3. Explore all Flash Tools.<br>4. Making Butterfly Animation.<br>5. To understand Motions Graphics, Sound, and Video. | |
| **Unit-III**<br>HTML 5 with CSS<br>□ Introduction to the Web.<br>□ Introduction to HTML5.<br>□ Formatting Text Using Tags.<br>□ Creating Hyperlinks and Anchors.<br>□ Introduction to CSS3.<br>□ Formatting Using Style Sheets.<br>□ Displaying Graphics and CSS3 Animation.<br>□ Creating Navigational Aids and Division Based Layout.<br>□ Creating Tables.<br>□ HTML Forms. | 1. To understand WWW (World Wide Web), Domain, and How to register a Domain name?<br>2. Learn HTML Structure, HTML List, Anchor Tag, and Table Tag.<br>3. Student will learn Align page, Cell Spacing, Width of Table, and Adding Images.<br>4. Learning to ad video and Audio to the website.<br>5. Understanding JavaScript, Syntax and JavaScripts function. | |

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| HTMLS Audio and Video. | | |
| **Unit-IV**<br>Web Designing<br>Getting Started with Web Designing (Dreamweaver CS 6 may be used).<br>Working with Lists, Tables, Links and Frames.<br>Forms, CSS, Behaviors and Snippets.<br>Working with Multimedia Objects.<br>Testing a website.<br>Working with Dynamic Websites. | 1. To understanding Dreamweaver Welcome Screen and Workspace.<br>2. Learning PHP, Cold Fusion, Active Server Page, Java EE, and ASP.NET.<br>3. Creating HTML Page. | |
| **Unit-V**<br>Basics Of Audio / Video Editing<br>Introduction to Adobe Audition.<br>Working with Audio Editing.<br>Working with Multi-track Editor and Recording Audio.<br>Working with Audio Effect.<br>Introduction to Digital Video Editing.<br>Starting with Adobe Premiere Pro CS6.<br>Capturing Clips and Using Tools.<br>Video Editing.<br>Animating, Effects, Transitions and Exporting Video.<br>Working with Audio.<br>Creating Titles and Superimposing.<br>Previewing & Rendering Output. | 1. To learning Recording Audio, Editing the Audio and Audio Mixing with the help of Audion.<br>2. To understanding Adobe Premier Pro.<br>3. Learning capturing footage, Capturing DV or HDV Video.<br>4. Editing video and audio and effects plug-ins. | |

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| **Unit-VI**<br>Basics of 3D Animations<br>Overview.<br>Working with Objects.<br>Transforming and Grouping.<br>Shapes and Modifiers.<br>Compound Objects.<br>Low Poly Modeling.<br>High Poly Modeling.<br>Creating Models with Nurbs.<br>Patch Modeling and Surface Tool.<br>Modifying Objects.<br>Integration of Various Modeling Techniques.<br>Creation of Morph Targets. | 1. Understanding Animation Production.<br>2. Understanding 3D Max, Maya, NewTek LightWave 3D, Cinema 4D, and SideFX Houdini 3D Animation Software.<br>3. Understanding the Vision of Digital India initiative. | |

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## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Organizational Behavior**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| 1. Nature of Organisational Behaviour:<br>Definition of Organisation & Types.<br>Concept of OB & its scope.<br>Models of Organisational Behaviour. | 1. To study about organization, its meaning and types.<br>2. To study the fundamental concepts of Organizational behavior.<br>3. To study the goals of Organizational behavior. | CO1- To impart knowledge of the basic concepts and facets of organisational behaviour.<br>CO2- To highlight the role of psychological factors & process at work.<br>CO3- To foster management skills among students. |
| 2. Organizational Structure and its Environment:<br>Organisation and its environment.<br>Formal Organisation: Design & Structure.<br>Divisions of work and task interdependence. | 1. To study the elements of Organizational structure.<br>2. To study the factors influencing Organizational structure.<br>3. To study the employee behviour with respect to Organizational structure. | |
| 3. Organization Culture:<br>Sources of Organisational Culture.<br>Types of Organisational Culture.<br>Manifestation & Managing Organisational Culture.<br>Work force diversity - Gender, Ethnic & Community issues & personality factors. | 1. To study the characteristics of Organizational culture.<br>2. To study the functions of Organizational culture.<br>3. To study the effects and changing of Organizational culture. | |
| 4. Motivation:<br>Theories of Motivation – Need & Process Theory.<br>Application of Motivation Theories. | 1. To study the application of the motivation theories.<br>2. To study the relationship between different theories of | |

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| | motivation and global implications. | |
| 5. Group Dynamics in Organisation:<br>Concepts of group & types of groups.<br>Group norms & Group cohesion.<br>Concept of team work. | 1. To study the stages of Group development.<br>2. To study about the properties of the group.<br>3. To study about the types of teams and the creative effective teams. | |
| 6. Decision making:<br>Decision making – definition & process.<br>Group Think, risky shift & Polarisation.<br>Techniques for improving decision making- MIS (Management Information System). | 1. To study the varieties of Organizational decisions.<br>2. To study group decision making, its advantages and disadvantages.<br>3. To study different techniques of group decision making. | |
| 7. Leadership:<br>Importance & Characteristics of control.<br>Qualities of an effective Leader.<br>Leadership Style & effective Communication. | 1. To study the various theories of leadership.<br>2. To study about charismatic and transformational leadership.<br>3. To study women and leadership. | |
| 8. Dynamics of Stress:<br>Concept.<br>Causes & effect.<br>Coping Strategies. | 1. To study the nature of Stress.<br>2. To study the organizational inside and outside stressors.<br>3. To study stress in dual-career families. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Introduction to Advertising**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>A brief history of Advertising and the Current Status of Advertising | 1. To understand advertising and current trends. | CO-1 To introduce Students to the basic steps in advertising |

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| The Basic Characteristics of Advertising<br>The Limitations of Advertising<br>Effects of Advertising on the Economy, on Society<br>The Ethical Issues in Advertising<br>The Criticism of Advertising | 2. To study the impact of advertising on economy, society and masses.<br>3. To introduce students to learn and understand Ethical issues and Criticism of Advertising. | CO2- To help students understand the creations of an ad campaign<br>CO3- To understand the structure of an Ad Agency |
| **Unit-II**<br>The Advertising Agency<br>Structure of an Ad Agency<br>The Role of an Ad Agency<br>The various Departments of an Ad Agency, Account Planning, Research, Art Dept. (Elements of Copywriting and Visualisation- Layout) Media Dept. and Production Dept.<br>The Functions of each Department (in brief) | 1. To introduce students in the real world of Advertising Agencies<br>2. To understand the structure of an Advertising Agency<br>3. To learn the functioning of each department of an Advertising Agency in brevity | |
| **Unit-III**<br>The Role of Advertising in the Marketing Mix<br>The Communication Process<br>The Steps Involved in Creating an Advertising Strategy<br>(The Marketing Brief, Pre-Campaign Research, Copy Brief and Media Brief)<br>Post-Campaign Research | 1. To learn and understand the role of advertising in Marketing Mix.<br>2. To study steps involved in creating an Advertising Strategy.<br>3. To study and gain knowledge on Campaign Research (Pre, During campaign and Post) | |
| **Unit-IV**<br>Concepts: IMC- Dagmar- USP- AIDA | 1. To study about IMC and concepts overview<br>2. To study IMC and its importance in mass media<br>3. To study various models, theories related to marketing and consumer decision-making process. | |
| **Unit-V**<br>The need for Research<br>Copy Research, Pre- Testing, Post Testing, Concept Testing, Product Research, Media Research | 1. To learn about research and its need.<br>2. To understand various techniques used in Copy Research<br>3. To understand media and its platforms for effective advertising through Media Research | |

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| **Unit-VI**<br>The Advertising Budget<br>How the Agency earns its income<br>The Relationship between the Client-Agency- Media- Consumers. | 1. To study Advertising budget and its related concepts.<br>2. To understand revenue generation techniques of an Agency.<br>3. To understand internal and external stakeholder's relationships | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Introduction to Journalism**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| 1. Changing the face of Journalism from Guttenberg to New Media | 1. To learn the history of journalism<br>2. To study various aspects in journalism<br>3. To understand journalism and its changing trends from old to current | CO1- To help media students to acquaint themselves with an influential medium of journalism which holds the key to opinion formation & create awareness. |
| 2. Journalism in India:<br>Earliest publications<br>The rise of nationalist press<br>Post 1947<br>The emergency 1975<br>Post Emergency<br>Post liberalization of the economy boom in magazines niche journalism<br><br>How Technology Advancement has helped Media? | 1. To understand practise of journalism in India<br>2. To understand in depth the hurdles faced by journalist during Indira Gandhi governance<br>3. To learn the advancement in technology and its impact on media | |

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| 3. New Media with special reference to rising the Citizen Journalism | 1. To understand Citizen journalism and its key concepts<br>2. Discussing how citizen journalism has changed journalism<br>3. Factors rising citizen journalism | |
| 4. Definition of News; Hard News/ Soft News and Blend of the two | 1. To understand news and its importance in society<br>2. To learn various types of news<br>3. To also learn and discuss the on-going scenario as case studies and examples | |
| 5. The news process from the event to the reader | 1. Understanding news and its definitions<br>2. To understand its importance in masses and its sustainability<br>3. Understanding its process from event to how it reaches the reader | |
| 6. Criteria for newsworthiness | 1. To understand news value<br>2. To study how source credibility also matters<br>3. To study in depth newsworthiness and its related concepts | |
| 7. News Reports; Features; Editorials | 1. To learn news reports<br>2. To learn its features<br>3. To study about editorials and its role | |
| 8. Components of a News Story<br>- Finding a new angle<br>- Writing a lead<br>- Types of Lead<br>- Inverted pyramid format | 1. To study what is a news story<br>2. To learn how to investigate and new angles to the story<br>3. To learn leads in news story and its types | |
| 9. Role of Journalism with special emphasis on its Role to Educate:<br>- Interpretation<br>- Transmission of values<br>- Development | 1. To learn and introduce in the world of journalism<br>2. To learn its responsibilities towards educating and other aspects to the society | |

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| Entertainment | 3. To understand its impact on society | |
| 10. Principles of Journalism<br>Objectivity<br>Accuracy<br>Without fear or favour<br>Balance | 1. To study journalism and its core values<br>2. To learn principles in journalism to be followed strictly<br>3. learning about regulatory videos in Press | |
| 11. The basic difference in Writing for Print, Television, and Online Journalism | 1. To learn in detail online journalism<br>2. To learn how journalism can be carried on various platforms<br>3. To learn and understand difference in writing for different media platform | |
| 12. Jobs in Journalism | 1. To understand and Media industry<br>2. To study the scope and areas of work in print media, broadcast, Corporate Communication (PR and NGOs)<br>3. To excel skills as a journalist | |
| 13. Latest trends and issues in journalism | 1. To understand the practise of journalism and its difference in older days<br>2. The issues faced by the journalist in practicing journalism<br>3. To understand how to follow trends and its changes and impact on society | |
| 14. Short notes on<br>Press Council of Media Students<br>Audit Bureau of Circulation | 1. To study the regulatory bodies of Press in journalism<br>2. To learn PCI and its regulations for Press, news agencies and journalists<br>3. To learn ABC (Audit Bureau of Circulations) and its functions. | |

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**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Mass Media Research**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-1**<br>Relevance, Scope of Mass Media Research, and Role of Research in the Media | 1. To study what is research and its concepts<br>2. To study the scope and relevance of mass media<br>3. To understand the role of research in the media | CO1- To introduce students to debates in Research approaches and equip them with tools to carry on research<br>CO2- To understand the scope and techniques of media research, their utility and limitations |
| **Unit-2**<br>Steps involved in the Research Process | 1. To revise an initial research plan.<br>2. To study the steps/ procedure in systematic research<br>3. To produce high quality written work for a competitive market. | |
| **Unit-3**<br>Qualitative and Quantitative Research | 1. To learn the techniques used in data gathering in research.<br>2. To explore facts, ideas, etc in research by using Qualitative research<br>3. To quantify the problem by gathering numericals i.e. Quantitative research and its levels. | |
| **Unit-4**<br>Discovery of Research Problem; Identifying Dependent and Independent Variables, Developing Hypothesis | 1. Discovering Research problem<br>2. To learn errors in Research process<br>3. Deeper understanding and importance of hypothesis in research | |
| **Unit-5**<br>Concept, Types, and Uses of Research Designs: | 1. To understand research design and its key concepts. | |

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| Exploratory<br>Descriptive<br>Casual | 2. To study the types of research design.<br>3. To evaluate the uses of research design in a research. | |
| **Unit-6**<br>Data- Collection Methodology:<br>a. Primary Data- Collection Methods:<br>i. Depth Interviews<br>ii. Focus Group<br>iii. Surveys<br>iv. Observations<br>v. Experimentations<br>b. Secondary Data Collection Methods<br>c. Literature Review | 1. To understand in-depth the data collection methods (primary & secondary methods)<br>2. To learn its implication while practicing research.<br>3. To understand and learn extensive literature surveys. | |
| **Unit-7**<br>Designing Questionnaire and Measurement Techniques:<br>a. Types and Basics of Questionnaire<br>b. Projective Techniques<br>c. Attitude Measurement Scales | 1. To study the criteria for designing a questionnaire.<br>2. To study the process of designing questionnaire<br>3. To study the measurement techniques. . | |
| **Unit-8**<br>Sampling Process | 1. To understand sample, sample size and concepts.<br>2. To learn the purpose of sampling<br>3. To get knowledge about the sampling methods (probability and non-probability) | |
| **Unit-9**<br>Data Tabulation and Research Report Format | 1. To study the essential parts of a table<br>2. To learn about proper format of presentation and analysis<br>3. To understand the research report format | |
| **Unit-10**<br>Application of Research in Mass Media | 1. To understand the research phases in media<br>2. To learn the research procedures<br>3. Understanding the topic relevance and validity in research methods. | |
| **Unit-11**<br>Introduction to Semiology: | 1. To understand semiology and its related concepts. | |

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| a. The Semiotic Approach to the Construction of Meaning<br>b. Barthes Primary Level and Secondary Level Signification<br>c. Semiotic Analysis | 2. The semiotic approaches<br>3. To understand Barthes level of signification<br>3. To learn about semiotic analysis | |
| **Unit-12**<br>Content Analysis:<br>a. Definition and Uses<br>b. Quantitative and Qualitative Approach<br>c. Steps in Content Analysis<br>d. Devising Means of a Qualification System<br>e. Limitations of Content Analysis | 1. To understand content analysis and its uses along with limitations<br>2. To study its types of approaches<br>3. To learn the steps involved in content analysis. | |

**Faculty Name - Mr. Hitesh Gadhia**

**Program: Bachelors in Mass Media**

**Course: Print, Production, and Photography**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>**Photography**<br>Basic Photography:<br>1. History of Photography<br>2. Loading the film and shooting<br>3. Operation of a film and shooting<br>4. Care and maintenance of camera equipment | 1. To learn photography and its history<br>2. To understand in detail films, shooting and their mechanisms<br>3. To learn the camera and its equipment. | CO1- To help students understand the principles and practice of photography.<br>CO2- To enable students to enjoy photography as an art. |
| **Unit-II**<br>Basic Principles:<br>1. Properties of light, reflection, transmission, refraction, different types of light sources and their sources and properties, controlling light, types of light, forms of light.<br><br>2. Types of Cameras, virtual image formation, Lens (various types of lenses) - Wide Angle, Tele, Normal, Zoom) | 1. To study all about lights and its concepts<br>2. To learn various sources of lights<br>3. To learn various types of camera and lenses<br>4. To learn about photosensitive materials | |

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| 3. Photosensitive material, Celluloid, Film & ISO, Types of Film, Colour film - C41 process | | |
| **Unit-III**<br>Exposure:<br>1. Mechanism of aperture, shutter and ISO<br>2. Correct exposure<br>Concepts of composition<br>Digital Capture<br>Various types of Digital Capture and Image<br>Total Sessions: 35 of 50 minutes each | 1. To study various types of films and its process<br>2. To learn exposure and its importance in handling camera | |
| **Unit-IV**<br>**Print Production**<br>Major landmarks in history and development of 'print technology'<br>Basic print: processes, contact, projection, composition, in- printer, special effect printer, Print machines, and image carriers<br>+ Letterpress, offset, silkscreen, digital print<br>DTP<br>Future trends in print technology<br>Awareness of Photo-editing Softwares (Possibilities and Limitations) | 1. To learn about print technology and its basics<br>2. To learn machinery used in prints and its types<br>3. To understand the future trends in print technology | |
| **Unit-V**<br>Softwares:<br>Adobe Photoshop, Adobe Lightroom, Colour Correction, Processing, High Dynamic Range, Illustrator. | 1. To introducing students in the world of software<br>2. Understanding each practically<br>3. Making students job and industry ready with practical knowledge of software. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Radio and Television**

**SYBMM SEM-IV**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>Introduction<br>- A Short History of Radio & TV in India 6<br>- All India Radio<br>- Doordarshan<br>- Prasar Bharti main points<br>- Convergence trends | 1. Learning about the history of Radio and Television.<br>2. Understanding the working of the stations.<br>3. Key actions of Prasar Bharati that marked a change in Broadcasting. | CO1- To acquaint students with the working of two powerful media i.e. radio and television. The content is useful for both advertising and journalism students in order to further their careers in their respective fields. |
| **Unit-II**<br>Introduction to Sound for both TV and Radio<br>- Types of Sound: Natural, Ambient, Recorded 10<br>- The Studio Setup<br>- The Sound Equipment: Mixer, Control Panel<br>- Tape Recording<br>- Digital Recording<br>- Outdoor Recording<br>- Types of Microphones<br>- The Editing suite The Editing Suite | 1. Learning the use and importance of foley sounds in the creating audio and video creative.<br>2. To understand the requirements of important elements for setting up a Studio. | |
| **Unit-III**<br>Introduction to Visuals<br>- The Power & Influence of Visuals 6<br>- The Video-camera: types of shots, camera positions, shot sequences, shot length<br>- Lighting: The importance of lighting<br>- Television setup: The TV studio, difference between Studio & on-location shoots | 1. Learning various camera angles and shots, for narration of a story.<br>2. Importance of lighting for creating visualization. | |

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| **Unit-IV**<br>Introduction to Radio Formats: broad guidelines-classifications<br>- News<br>- Documentary<br>- Feature<br>- Talk Show<br>- Music shows<br>- Radio Drama<br>- Sports broadcasting | 1. Learning various radio show formats by listening to radio programmes. | |
| **Unit-V**<br>Introduction to Television Programming:<br>broad guidelines-classifications<br>- News<br>- Documentary<br>- Feature<br>- Talk Shows<br>- TV serials & soaps<br>- Sports<br>- Reality<br>- Animation | 1. To understand different television programmes.<br>2. Understanding the categories and formats of the programming. | |
| **Unit-VI**<br>Different Roles<br>-Community Radio-role and importance<br>- Contribution of All India Radio<br>- The Satellite and Direct to Home challenge | 1. Learning about community radio in detail and its importance in shaping society.<br>2. To understand satellite transmission of the channels on television. | |
| **Unit-VII**<br>Other Requirements<br>-Story board<br>-On-line editing<br>- Educational TV with reference to Jamia-milia, etc. virtual classrooms | 1. Learning about online platforms with respect to education.<br>2. Understanding various educational television channels of the central university. | |
| **Unit-VIII**<br>Broadcast Production<br>- Pre- Production<br>- Production<br>- Post- Production | 1. Learning various stages of production of any programme. | |

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## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Brand Building**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Brand:<br>Definition, Importance of branding, Difference between brand & product, Process of Branding. | 1. To learn and understand brand and its related concepts<br>2. To study importance of branding and its process<br>3. To distinguish between a brand and a product. | CO1- To study the concept of Brands<br>CO2- To study the process of building brands<br>CO3- To study its importance to the consumer and advertisers |
| **Module -II**<br>Brand Identity:<br>Core Identity, Extended Identity, Brand Identity Traps. | 1. To understand the concept of brand identity.<br>2. to be aware of the various mistakes a brand makes due to which a brand can be trapped in its own identity. | |
| **Module -III**<br>Brand Positioning:<br>Definition, Importance of Brand Positioning, Perceptual Mapping. | 1. To understand the concept of positioning and its various types | |
| **Module -IV**<br>Brand Personality:<br>Importance of creating Brand Personality, Attributes that affect Brand Personality, Factors that affect Brand Personality.<br>Brand Personality Models-<br>Relationship Model, Self-expressive Model, Functional Benefit Model<br>The Big Five, User Imagery | 1. To understand the role of building brand personality and its impact on consumer behavior<br>2.to understand the visual imagery and the difference brand personality can create between brands that sell similar products. | |
| **Module -V**<br>Brand Leverage:<br>User Extension, Brand Extension, | 1.To understand the extension & expansion strategies a brand undertakes. | |

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| Moving Brand up/down, Co-branding. | | |
| **Module -VI**<br>Brand Strategies:<br>The Three perspectives of Brand Strategic customer analysis, Completion self-analysis, Multi-Product Branding, Multi Branding, Mix Branding, Brand Licensing, Brand Product Matrix, Brand Hierarchy, Brand Building Blocks | 1.To understand the extension & expansion strategies (horizontally & vertically) a brand undertakes.<br>2.Various types of branding strategies with examples. | |
| **Module -VII**<br>Brand Repositioning:<br>Meaning, Occasion of use, falling sales, Making the brand contemporary, new customers, Changed Marketing conditioning, Differentiating brands from competitors (Case study such as Vicks Vapour, Milkmaid, etc) | 1.To understand why brands reposition.<br>2. Case studies gives insights on the reasons for the change and process | |
| **Module -VIII**<br>Brand Equity:<br>Definition, Steps in creating Brand Equity, Awareness, Perceived Quality, Brand Association, Brand Loyalty, Other Brand Assets. | 1.To understand how good will a brand is generated and maintained.<br>2. Equity evaluating models | |
| **Module -IX**<br>Brand Equity Management Models:<br>Brand Equity Ten, Y&R (BAV), Equi Trend, Interbrand. | 1.To understand how good will a brand is generated and maintained.<br>2. Equity evaluating mode | |
| **Module -X**<br>Brand Building Imperative:<br>Coordination across the organization, coordination across media, coordination strategy & tactics across markets. | 1. To understand how corporate brand share business.<br>2. To coordinate brand building activities across diverse media options like events, sponsorship, PR and promotions. | |

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**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Consumer Behaviour**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>a. Introduction to Consumer Behavior:<br>• Concepts,<br>• Need to Study Consumer Behavior,<br>• Factors Influencing Consumer Behavior,<br>• Changing Trends in Consumer Behavior.<br>2. Consumer Behavior & Marketing:<br>• Marketing Segmentation-VALS,<br>• Components, Process of Marketing Communication,<br>• Message,<br>• Persuasion-Need & Importance (ELM, Appeal.) | 1. To study the components of consumer behavior.<br>2. To study the external and internal variables influencing consumer behavior.<br>3. To study the components of communication.<br>4. To study the theories of persuasion. | CO1- To understand the role of marketing in influencing consumer behavior.<br>CO2- To analyze the role of marketer & the consumer in advertising.<br>CO3- To sensitize the students to the changing trends in consumer behavior. |
| **Module -II**<br>Relevance of Perception & Learning in Consumer Behavior:<br>a. Concepts, Elements in Perception, Subliminal Perception.<br>b. Learning: Elements of Consumer Learning, Cognitive Theory- Social Learning, Behavioral Learning-Classical, Instrumental Theory. | 1. To study the three aspects of persuasion.<br>2. To study the different types of subcultures.<br>3. To study the factors influencing non-verbal communication.<br>4. To study the theories of learning. | |
| **Module-III**<br>Psychological Determinants & Consumer Behavior:<br>a. Motivation- Needs, Types, Theories- Role of Motivation in Consumer Behavior.<br>b. Personality & Attitude- Theories of Personalities & its application. Freudian, Trait, Jungian, Self-Concept. | 1. To study the important characteristics of attitude.<br>2. To study the models of attitude.<br>3. To study the types of motives.<br>4. To study the nature and characteristics of personality. | |

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| c. Formation of Attitude- Theories and its relevance in Consumer Behavior. Cognitive Dissonance, Tricomponent, Changing attitude in Consumer Behavior. | | |
| **Module -IV**<br>Social & Cultural Aspects of Marketing & its impact on Consumer Behavior.<br>• Family<br>• Social Stratification- class, age, gender<br>• Group- Reference group<br>• Culture- Subculture<br>• Changing Indian Core Values. | 1. To study the value and lifestyle segmentation.<br>2. The basic characteristics of social class.<br>3. To study the classification of groups.<br>4. To study the reasons for the popularity of reference groups.<br>5. To study the family life cycle, & family purchase decision. | |
| **Module -V**<br>a. Consumer Decision Making<br>• Process<br>• Models<br>• Levels'<br>• Opinion leaders and Consumer decision making<br>b. Diffusion & Adoption process | 1. To study the characteristics of opinion leaders.<br>2. To study the types of consumer decisions.<br>3. To study the category of innovation.<br>4. To study the adoption process. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Advertising in Contemporary Society**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Change in the Environment: Policy Post-Independence, Policy 1990 Onwards. | 1. To study surrogate advertising.<br>2. To study the objectives and missions of the regulatory bodies.<br>3. To study the rules and restrictions implemented on the advertisements. | CO1- To understand the environment in Contemporary Society<br>CO2- To understand Liberalization and its impact on the economy<br>CO3- To study contemporary advertising and society |

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| **Module -II**<br>Study of Environment Post-independence and Post 1991 Liberation Policy:<br>Effects of Liberation on- Economy, Business, Employment, Advertising, Lifestyle. | 1. To study the measures initiated as a part of liberalization and globalization.<br>2. To study about globalization in the Indian economy.<br>3. To study the objectives of Privatization. | |
| **Module -III**<br>International & Global Advertising & Marketing:<br>The Environmental Analysis of all Foreign Countries, The use of this Analysis in Marketing & Advertising. | 1. To study the growth of Global commerce.<br>2. To study the challenges of Global advertising.<br>3. To study the impact of culture on Globalization.<br>4. To study the elements of culture.<br>5. To study the promotions for international markets. | |
| **Module -IV**<br>Social Marketing:<br>Definition Need for social Marketing, The difficulties of Social Marketing, The various subjects for Social Marketing, Effects of Social Marketing | 1. To study the planning process for social marketing.<br>2. To study the additional marketing P's.<br>3. To study the effects of social marketing. | |
| **Module -V**<br>Advertising:<br>Advertising & Children, Advertising and Old People, Controversial Advertising, Gender Bias, Advertising and Popular Culture, Social Implication of Advertising, The role of Advertising on the Economy. | 1. To study the effect of Advertising on society.<br>2. To study the negative impacts of Advertising.<br>3. To study the positive and negative impact of advertising on the economy. | |
| **Module -VI**<br>Types of Advertising:<br>Political Advertising, B to B Advertising, Consumer Advertising, Retail Advertising, Industrial Advertising, and Financial Advertising. | 1. To study the positive and negative impact of political advertising.<br>2. To study the different categories of financial advertising.<br>3. To study the categories of consumer advertising. | |
| **Module -VII**<br>Internet: | 1. To study the tools of digital marketing. | |

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| Digital Marketing | 2. To study the advantages & disadvantages of Internet marketing. | |

**Faculty Name - Ms. Jyothika Naidu**

**Program: Bachelors in Mass Media**

**Course: Copy Writing**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module- I**<br>Introduction to Copywriting:<br>• Basics of Copywriting.<br>• Responsibility of Copywriter. | 1. To understand the role and importance of copywriting.<br>2. Various responsibility of a copywriter | CO1- To familiarize the students with the concept of copywriting as selling through writing<br>CO2- To learn the process of creating original, strategic, compelling copy for various media<br>CO3- To train students to generate, develop and express ideas effectively<br>CO4- To learn the rudimentary techniques of advertising - headline and body copywriting. |
| **Module -II**<br>Creative Thinking:<br>• How to inculcate a 'creative thinking attitude',<br>• Left brain thinking; Right brain thinking.<br>• Conscious mind; unconscious mind,<br>• Role of Heuristics and assumptions in creative thinking.<br>• Five steps of the creative process. | 1. Developing critical thinking for learning creative writing.<br>2. Understanding the psychology of the brain and its role in developing the skills for writing. | |
| **Module -III**<br>Idea Generation Techniques: | 1. Learning idea generation techniques through various | |

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| • Theories of Ideation,<br>• Idea generation techniques<br>a. (Brainstorming,<br>b. Triggered brain walking,<br>c. Questioning assumptions,<br>d. Picture prompts,<br>e. scamper,<br>f. Observation,<br>g. Referencing,<br>h. Interaction,<br>i. Imagination,<br>j. Dreams &<br>k. Creative Aerobics.) | prompts which helps in structuring the content. | |
| **Module -IV**<br>Trans creativity:<br>• Introduction,<br>• Purpose | 1. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source. | |
| **Module -V**<br>Briefs:<br>• Marketing Brief,<br>• Creative Brief. | 1. Learning about the structure and formats of the briefs.<br>2. Understanding the client brief for proper execution of the content. | |
| **Module -VI**<br>Writing persuasive copy:<br>• The CAN Elements (connectedness, appropriates & novelty),<br>• Getting Messages to 'Stick' simplicity, Unexpectedness, Concreteness, Credibility, Emotionality, and Storytelling. | 1. How to write appealing content by considering various elements and through the art of storytelling. | |
| **Module -VII**<br>Writing copy for various Media:<br>a. Print: Headlines, sub-headlines, captions, body copy, and slogans.<br>b. Television: Storyboard, Storyboarding techniques, Balance between words and visuals, Power of silence, formats of TV's<br>c. Outdoor posters<br>d. Radio<br>e. Digital: email, web pages. | 1. Learning to write copy for various advertising and marketing media.<br>2. To add various elements to balance a copy and convey the marketing message. | |

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| **Module -VIII**<br>Writing copy for various audiences:<br>a. Children,<br>b. Youth,<br>c. Women,<br>d. Senior Citizens &<br>e. Executives. | 1. Understanding the thought process of different categories of audiences.<br>2. Learning to persuade the audience through the copy. | |
| **Module -IX**<br>How to write copy for:<br>a. Direct mailers,<br>b. Classified,<br>c. Press releases,<br>d. B2B,<br>e. Advertorial, and<br>f. Infomercial. | 1. To learn writing the copy for personal medium and mass medium. | |
| **Module -X**<br>Various types of Advertising appeals and execution styles:<br>a. Rational appeals,<br>b. Emotional appeal Humor, Fear, Sex appeal,<br>and<br>c. Various advertising execution techniques. | 1. Understanding various writing appeals to connect a chord with the specific audience through storytelling. | |
| **Module -XI**<br>The techniques Evaluation of an Ad Campaign:<br>a. Evaluate the ad in terms of its efficacy, i.e. to what extent the campaign has achieved its set objectives,<br>b. Learn to appreciate the aesthetic aspects of the ad, how the ad looks, its layout, color scheme, typography, balance, etc. | 1. Evaluating the writings by understanding the reach of the advertising message.<br>2. Learning about campaign objectives.<br>3. Learning the final output of an advertising copy. | |

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**Faculty Name – Mr. Ajay Chauhan**

**Program: Bachelors in Mass Media**

**Course: Media Planning & Buying**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Introduction to Media Planning & Selection:<br>1. An Overview of Media Planning<br>2. Basic Terms and Concepts<br>3. The function of Media planning in advertising<br>4. Role of Media planner<br>5. Challenges in Media planning<br>6. Media Brief<br>7. Media Audit<br>8. NCCS Grid | 1. Learning the concepts of Media planning.<br>2. Key role of a Media planner. | CO1- To develop knowledge of various characteristics of media.<br>CO2- To understand procedures, requirements, and techniques of media planning and buying.<br>CO3- To learn the various media mix and its implementation<br>CO4- To understand budget allocation for a Media plan |
| **Module -II**<br>Sources of Media Research:<br>1. Nielson Clear Decision (NCD for Print)<br>2. Broadcast Audience Research Council<br>3. Audit Bureau of Circulation<br>4. RAM<br>5. Comscore - Digital | 1. Understanding the individual reach of media through various measurement bodies. | |
| **Module -III**<br>Media Planning Process:<br>1. Situation analysis and Marketing strategy plan<br>2. Setting Media objectives<br>3. Determining Media strategy<br>4. Selecting broad Media classes<br>5. Selecting Media within classes<br>6. Budget and Media Buying<br>7. Evaluation. | 1. To learn the step-by-step process for selection of media.<br>2. Understanding different strategies taken for an effective selection of media. | |
| **Module -IV** | 1. Calculating the revenue expenditure spent on each | |

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| Criteria for selecting Media Vehicles:<br>• Reach<br>• Frequency<br>• GRPS/GVT Ratings<br>• TVT Ratings<br>• Cost efficiency<br>• Cost per thousand<br>• Cost per rating<br>• Waste<br>• Circulation<br>• Pass-along rate (print) | media cycle and execution of the budget on the right media. | |
| **Module -V**<br>Selecting suitable Media options & Media Buying<br>1. Newspaper<br>2. Magazine<br>3. Television (National, Regional and Local)<br>4. Radio<br>5. Outdoor and out of home<br>6. Cinema Advertising<br>7. Digital Advertising | 1. Learning about various media and different mediums for advertising.<br>2. Understanding the pros and cons of each medium. | |
| **Module -VI**<br>Communication Mix:<br>• Events<br>• Sponsorship<br>• Merchandising<br>• Point of purchase<br>• In film advertising<br>• Mobile advertising<br>• Word of mouth<br>• Ambient advertising | 1. Learning about the IMC and its tools.<br>2. To study innovative ways for advertising and marketing of the product. | |
| **Module -VII**<br>Negotiation Skills in Media Buying:<br>1. Negotiation Strategies<br>2. Laws of Persuasion | 1. To study the negotiation skills for proper buying of media.<br>2. To study the various laws for learning consumers perspective in making a purchase. | |
| **Module -VIII**<br>Digital Media Planning:<br>1. Various Digital channels<br>a. Search Engine Optimisation | 1. To study about online platforms and available spaces used for advertising.<br>2. Understanding various | |

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| b. Search Engine Marketing<br>c. Email marketing – (Cost per email open (CPO), Cost per email sent (CPS), Cost per Visit, Cost per click, cost per transaction, cost per form fill or cost per lead (CPL)<br>d. Targeting/Remarketing<br>e. Mobile advertising (WAP & APP)<br>2. Various types of digital<br>a. Display Advertising ads and its various Ad formats<br>b. Video Advertising and its various Ad formats<br>c. Types of social media (Text + Visual, FB, Twitter, Instagram, Snap<br>Chat etc). | advertising formats with respect to social media and video advertising. | |
| **Module -IX**<br>Digital Media Buying:<br>1. Buying Digital Advertising: An Overview Paid media, owned media and Earned media).<br>2. Direct buys from the websites<br>3. Programmatic Buying: [DSP (Demand side platform) or RTB (Real time bidding)]<br>4. a. Cost per action (CPA), or pay per action (PPA)<br>b. cost per conversion or Revenue sharing or cost per sale,<br>5. Advertising via Premium Publishers<br>6. Advertising via Networks and Exchanges<br>7. Affiliate Network (Clickbank, Commission junction, adfuncky, 7search.com)<br>8. The Local Publishing Market | 1. To study the difference between the owned, paid and earned media.<br>2. Understand in detail about Affiliate marketing.<br>3. To Learn the buying process for Online platforms. | |

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**Faculty Name – Ms. Sheetal Gogri**

**Program: Bachelors in Mass Media**

**Course: Advertising Design**

**TYBMM SEM-V**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| 1. Introduction to Agency Departments & Role of each department.<br>a. Basic depts.:<br>i. Account Dept: Client handling/ Servicing/ Strategy planning/ Creative brief.<br>ii. Media Dept: Media research/ Media planning/ Media booking, buying.<br>iii. Creative Dept: Idea generation/ Brainstorming/ Mind-mapping/ Ad-CW duo/ Illustrator/ Graphic designer/ Storyboarding/ Web tree<br>iv. Production Dept: In house or outsource. Production<br>1. Print: Hoardings/ Brochures/ Packaging etc<br>2. Video: Storyboard/ Casting/ Location/ Costume/ Editing/ Dubbing<br>3. Photography: In-house or location/ Model/ Costume/ Shoot/ Editing | 1. To study about the agency and its departments who handle an advertising campaign of a brand.<br>2. To study about the production stage of the campaign.<br>3. To study the idea generation process for any creative. | CO1- To make students understand the process of planning & production of advertisement<br>CO2- To highlight the importance of visual communication<br>CO3- To provide practical training in the field of advertising |
| 2. Understanding Design: Design as a language of emotions/ Communication.<br>a. Introducing to students to: Elements of design (as vocabulary).<br>i. Point/ Line/ Shape/ Tone/ Colour/ Texture<br>b. Introducing to students to: Principles of Design: (grammar of design Language)<br>i. Proportion/ Contrast/ Harmony/ Balance/ Rhythm/ Unity<br>c. Introducing students to the Rules: Gestalt principles | 1. To learn about the elements of designing.<br>2. To study the Gestalt principle which helps to create perspective through designs. | |

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| i. Proximity/ Closure/ Similarity/ Continuation/ Figure & ground | | |
| 3. Introduction to Negative space & its use: Creative use/ Finding shape within/<br>Adding a meaning. | 1. To learn how negative space in a figure-ground is creative and give new shapes and vision and adding meaning to the brand. | |
| 4. Introduction to Optical illusions:<br>a. Influence of surrounding shapes on shape & size<br>b. Influence of surrounding colour/ tone on object colour & tone<br>c. Appearance of space & depth/ form | 1. To learn the shapes and symbols from our surroundings.<br>2. To study the effects and beauty of colors from nature and use it in the creative. | |
| 5. Introduction to Word expression: (Expressive words)<br>a. How word meaning is expressed through the appearance of word/ visual impact.<br>b. Calligraphy & graceful typography. | 1. Understanding different fonts and typefaces of an ad-copy.<br>2. Learning meaning and tone form the typography. | |
| 6. Logo unit: Understanding Logo as a company face/ Brand identity/ Character/ Class<br>a. Elements of Logo: Shape/ Typeface/ Treatment/ Colours/ Symbol or symbolism used to fulfill the impression.<br>b. Tagline: typeface/ alignment/ placement etc. | 1. To study different types of logos and its meaning.<br>2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience. | |
| 7.Introduction to Layout:<br>Choosing right format/ right canvas/ Optical<br>center/ Equilibrium<br>a. Types of Layouts: All text/ Text dominant/ Picture dominant/ Picture window<br>b. Stages of Layout: Thumbnail sketches/ Rough layout/ Finished rough/ Comprehensive | 1. To study the focal point of an advertising and using this idea in making the creatives.<br>2. Learning about the types of layouts used in creating copies.<br>3. Understanding the process of creating layouts. | |
| 8. Use of picture (visual) as means to select Target audience | 1. To understand the right use of visuals for justifying the | |



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| a. Choosing a picture<br>i. Expression of Problem (Hair-fall, toothache etc.)<br>ii. Expression of benefit (Glowing face, fitness etc.)<br>iii. Irresistible presentation of product (Watch/Car etc.) class<br>iv. Dramatization (Cold drinks/ Mentos etc.)<br>v. Association of ideas<br>b. Headline size/ break/ highlight/ two tone head<br>c. Subhead size/ style<br>d. Body copy type: Descriptive/ pointer/ bulleted | copy message.<br>2. To learn the presentation of the products to persuade the audience with the visuals.<br>3. Understanding the writing tone as per target audience. | |
| 9. Introduction to Typography & Text treatment: (2 Lectures)<br>a. Classification of typefaces & combinations.<br>b. Size/Weight/posture etc. | 1. To study about the typeface and various fonts used in a copy. | |
| 10. Layout: Putting all together: What goes together must be placed together. Grouping the relevant elements to have 2 to 3 groups for easier to understand | 1. Learning the principle of grouping and creating a thought process through the copy for Visuals and words. | |
| 11. Introduction to Art direction for diff media: (4 Lectures) Role of an Art Director<br>a. Diff in design for Magazine Ad & N Paper Ad (Considering Factors: paper Q/ Printing Q/ Life/ reading habits etc<br>b. Outdoor & indoor ad: Time available for reading/ spotting frequency etc<br>c. Transit ad: Psychology & mindset of the TA/ State of mind at the spot etc<br>d. TVC/ Radio: Advantage of Music/ Voice modulation etc, Demonstration on TV<br>e. Web ad: Advantage of pop up/ Key word SEO etc | 1. Understanding the use of minimum and maximum words to write the advertising message.<br>2. To learn and understand in writing persuasive copy based on different media and different platforms.<br>3. Learning the pros and cons of various mediums. | |

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| f. Direct mailers: Advantage of prior knowledge/ prior relation etc | | |
| 12. Campaign planning: Rest of the lectures in guiding the students through developing the campaign Introduction to the process of Idea generation (Brainstorming/ Mind-mapping)<br>a. Understanding Brand (Brand building)<br>b. Understanding TA's favorite place, shows, reading (Media research/ planning)<br>c. Understanding buying motives/ habits/ influences (Consumer behaviour)<br>d. Understanding product/ Market (demo-psycho)/ Client/ deriving message/ Creative brief<br>e. Arriving to a Big idea/Copy platform (Copy writing) considering all the factors above.<br>f. Layout stages & final design | 1. To study the execution of an advertising campaign through various existing ad-campaign examples.<br>2. Learning various important stages in advertising campaigns. | |
| 13. Corporate stationary & Brand manual (Logo design philosophy | | |
| 14. Ad Campaign (system work) Prints & presentation | | |

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**DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069**

## Unit and Course Outcome A.Y 2019-2020

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: Agency Management**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE I**<br>Advertising Agencies:<br>• their role, Functions, Organization and Importance<br>• different types of ad agencies | 1. To study the evolution of Advertising Agency.<br>2. To study the role & Functions and services offered by the Agency.<br>3. To study the types of advertising agencies. | CO1- To acquaint the students with concepts, techniques for developing an effective advertising campaign.<br>CO2- To familiarize students with the different aspects of running an ad agency<br>CO3- To inculcate competencies to undertake professional work in the field of advertising. |
| **MODULE -II**<br>Client Servicing:<br>• The Client - Agency Relationship<br>• 3P's of Service: Physical evidence, Process and People<br>• The Gaps Model of service quality<br>• Stages in the client-agency relationship<br>• How Agencies Gain Clients<br>• Why Agencies Lose Clients<br>• Evaluation Criteria in Choosing an Ad Agency<br>• The roles of advertising Account executives | 1. To study the characteristics of services.<br>2. To study the stages & principles in client-agency relationships.<br>3. To study the factors that influence the success or failure of an advertising agency. | |
| **MODULE -III**<br>Account Planning:<br>• Role of account planning in advertising<br>• Role of Account Planner<br>• Account Planning Process | 1. To study about the account planning process.<br>2. To study the attributes of an account planner.<br>3. To study the 5M of advertising programme | |

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| **MODULE -IV**<br>Advertising campaign management:<br>• Means-End chaining and the Method of Laddering as guides to Creative Advertising Formulation<br>• Digital Advertising Strategy / Campaigns | 1. To study the campaign development process.<br>2. To study digital advertising strategies and campaigns.<br>3. Briefly learning through the specimens of Digital Advertising Campaigns. | |
| **MODULE -V**<br>Ad Film making:<br>• Converting story board to TVC<br>• Editing and post production | 1. To study the process of converting a storyboard into TVC.<br>2. To study the complete process of Ad-film making. | |
| **MODULE -VI**<br>Marketing Plan of the Client:<br>• The marketing brief, Marketing Audit, Marketing Objectives, Marketing Problems and OpportMODULEies Review, STP, Executing the plan, Evaluating the plan | 1. To study marketing strategy.<br>2. To study the process of developing a marketing plan.<br>3. To study the constraints in strategy implementation. | |
| **MODULE -VII**<br>The Response Process:<br>• Traditional Response Hierarchy Models: AIDA<br>• Sales-Oriented Objectives<br>• Communications Objectives<br>• DAGMAR: An Approach to Setting Objectives | 1. To study the objectives of communication and advertising.<br>2. To study the stages of buying behavior.<br>3. To study about IMC and its tools. | |
| **MODULE -VIII**<br>Setting up an Agency: Business Plan Introduction, Various Stages in Setting up a New Agency | 1. To study the nature of agency business.<br>2. To study the components of the business environment.<br>3. To study a business plan for an advertising agency. | |
| **MODULE -IX**<br>Agency Compensation: Various Methods of Agency Remunerations. | 1. To study about the expenditure heads of the agency.<br>2. To study the financial planning of leading ad agencies.<br>3. To study the AAAA regulation | |
| **MODULE -X** | 1. To study the agency | |

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| Growing the Agency:<br>• The Pitch: request for proposal, speculative pitches, Pitch Process<br>• References, Image and reputation, PR. | business management and development.<br>2. To study customer relationship management.<br>3. To understand the prospecting for new businesses. | |
| **MODULE -XI**<br>Sales Promotion Management:<br>• The Scope and Role of Sales Promotion<br>• Reasons for the Increase in Sales Promotion<br>• The psychological theories behind sales promotion<br>• Consumer Franchise-Building versus Nonfranchise-Building Promotions<br>• Designing Loyalty, continuous and frequency programs<br>• Objectives of Trade-Oriented Sales Promotion<br>• Techniques of Trade-Oriented Sales Promotion<br>• Objectives of Consumer-Oriented Sales Promotion<br>• Techniques of Consumer-Oriented Sales Promotion | 1. To study the advantages and limitations of sales promotion.<br>2. To study pull and push strategy.<br>3. To study about CFB promotion and Non-CFB promotion. | |

**Faculty Name - Mrs. Manisha Sayani**

**Program: Bachelors in Mass Media**

**Course: The Principles and Practices of Direct Marketing**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module -I**<br>Introduction to Direct Marketing:<br>• Meaning & Introduction to Marketing<br>• Traditional versus Direct Marketing Techniques. | 1. To understand Direct marketing in depth.<br>2. To understand Traditional techniques<br>3. Analyzing real- world strategies for marketing. | CO1 - To understand the concept and importance of Direct Marketing<br>CO2- To understand the various techniques of direct marketing and its advantages |

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| **Module -2**<br>Basics of Direct & Interactive Marketing:<br>• Meaning, Definitions, Importance of Direct Marketing,<br>• Advantages & Disadvantages of Direct Marketing,<br>• Approaches of Direct Marketing,<br>• Reasons for the Growth of Direct Marketing,<br>• Economics of Direct Marketing,<br>• 3 Tasks of Direct & Interactive Marketing, customer acquisition, development & retention. | 1. To introduce the basic and key concepts used in Direct Marketing<br>2. To understand and identify the tasks relevant in Direct Marketing.<br>3. To create potential consumers for the brand. | |
| **Module -3**<br>Customer Relationship Management:<br>• What is Customer Relationship Management,<br>• Importance of CRM,<br>• Planning & Developing CRM,<br>• Customizing Products to different needs,<br>• Studying the customers mix & managing the key customers,<br>• Relationship Marketing-Customer Loyalty | 1. To understand CRM how it is useful in decision making of a customer.<br>2. To give students an insight about features and functionality of CRM.<br>3. To study how to manifest and engage customers' loyalty towards product and brand. | |
| **Module -4**<br>Database Management:<br>• Meaning, Importance, Functions of Database sources & uses of E-databases,<br>• Techniques of Managing Database- Internal/External,<br>• Steps in developing a database. | 1. Introducing and evaluating new concepts used in Database Management.<br>2. To understand the process of Data management<br>3. To get insight on advantages and disadvantages of Database management.<br>4. To understand the importance of strategies in using Direct marketing as a | |

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| • Advantages & Disadvantages of Database Management.<br>Direct Marketing Strategies:<br>• Meaning of Marketing Strategies- Why it is needed,<br>• Internal & External Analysis,<br>• Objectives of Strategies,<br>• Creating a Direct Marketing Budget.<br>Direct Marketing Research & Testing:<br>• What is customer Lifetime value (LTV),<br>• Factors affecting lifetime value,<br>• How we use LTV,<br>• LTV- sums (3 methods- Present/Historical & Discounted),<br>• Using LTV analysis to compare the effectiveness of various marketing strategies.<br>Direct Marketing Analysis:<br>• List Selection, Prospecting,<br>• Market Segmentation,<br>• Product Customization,<br>• Response Modeling & Experimentation,<br>• Mail order, Lead generation, Circulation, Relationship/Loyalty programs, Store traffic/Site traffic generation,<br>• Fund raising, Pre-selling, selling (Cross selling, Up selling), & post-selling. | tool for communication and marketing.<br>5. How to analyze the results, feedback, and so on, creating and maintaining loyalty through loyalty programs.<br>6. Students will understand Customer life cycle and how it helps in research and its calculations. | |
| **Module -5**<br>Direct Marketing as an Integral Part of Integrated Marketing Communication:<br>• Meaning, Introduction of IMC, | 1. To introduce IMC and its concepts.<br>2. It helps in expanding the knowledge for advertising industry along with various campaigns of brand | |

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| • Role of IMC in Marketing Process,<br>• Relationship of IMC with Direct Marketing,<br>• Importance of IMC,<br>• Tools of IMC- Advantages, Sales, Promotion, Publicity, Personal Selling, etc,<br>• Person to person, Group Selling, Direct Mail,<br>• Direct response Television (DR-TV),<br>• Direct Response Print Advertising,<br>•, Catalogs, Inserts, Videos, E-mail, Trade shows. | 3. It also helps to understand and compare direct marketing being an Integral part of IMC. | |
| **Module -6**<br>Future of Direct Marketing Scenario:<br>• Growth of Direct Marketing in Future,<br>• Indian & Global Perspective in Direct Marketing | 1. To make students ready for future scope of Direct marketing with practical reality<br>2. Understanding not only Indian markets but Global | |
| **Module -7**<br>Direct Marketing Case Study:<br>• Product offering, re-generation, database management & methodology. | 1. To discuss few case studies according to the topics covered<br>2. To study the methods involved in creating and maintaining the database and how to manage it along with re-generation. | |

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**Faculty Name – Ms. Jyotika Naidu**

**Program: Bachelors in Mass Media**

**Course: Advertising & Marketing Research**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE-I**<br>Fundamentals of research:<br>1. Research (definitions), importance and objectives of research.<br>2. Terms and concepts in research such as variables, qualitative and quantitative<br>3. Literature Review and its role in research<br>4. Stages in Research process | 1. To study the basic concepts of research.<br>2. To learn the process of research.<br>3. To study the importance and objectives of a research in detail. | CO1- To inculcate the analytical abilities and research skills among the students.<br>CO2- To understand research methodologies – Qualitative vs Quantitative<br>CO3- To discuss the foundations of Research and audience analysis that is imperative to successful advertising.<br>CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility. |
| **MODULE-II**<br>Hypothesis:<br>Meaning, Nature, Significance, Types of Hypothesis, | 1. To learn the nature of hypothesis.<br>2. To learn the formation of the hypothesis through research questions.<br>3. To study various other types of hypothesis and its uses in the research. | |
| **MODULE -III**<br>Research Design:<br>1. Meaning, Definition, Need and Importance, Scope of Research Design<br>2. Types- Descriptive, Exploratory and Causal. | 1. To learn how research design works as a blueprint for a research.<br>2. Learning types of research design. | |
| **MODULE -IV**<br>Sampling:<br>1. Meaning of Sample and Sampling,<br>2. Process of Sampling<br>3. Methods of Sampling: | 1. To study different ways through which research samples are collected.<br>2. To learn methods of sampling. | |

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| i) Non- Probability Sampling – Convenient, Judgment, Quota, Snow ball.<br>ii) Probability Sampling – Simple Random, systematic, Stratified, Cluster, Multi Stage. | | |
| **MODULE -V**<br>Data Collection:<br>1. Types of data and sources- Primary and Secondary data sources<br>2. Methods of collection of primary data:<br>a. Observation<br>b. Experimental<br>c. Interview Method:<br>i) Personal Interview<br>ii) focused group,<br>iii) In- depth interviews -<br>d. Survey<br>e. Survey instrument –<br>i) Questionnaire designing,<br>f. Scaling techniques-<br>i) Likert scale,<br>ii) Semantic Differential scale, iii) Staple scale,<br>iv) Constant sum scale<br><br>Projective Techniques<br>a. Association,<br>b. Completion, c. Construction d. Expressive | 1. To understand the basic idea on data collection.<br>2. Understanding the types of data collection. | |
| **MODULE -VI**<br>Report Writing:<br>1. Essential of a good report,<br>2. Content of report,<br>3. Steps in writing a report,<br>4. Footnotes and Bibliography | 1. Learning Basic format of research report writing. | |
| **MODULE -VII**<br>Advertising Research:<br>1. Introduction to Advertising Research<br>2. Copy Research: a. Concept testing.<br>b. Name testing.<br>c. Slogan testing | 1. Learning about advertising research in detail.<br>2. To study different other types of copy testing.<br>3. Learning various other steps in pre-testing.<br>4. Briefly understanding the | |

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| 3. Copy testing measures and methods:<br>a. Free association,<br>b. Direct questioning,<br>c. Direct mail tests,<br>d. Statement comparison tests, e. Qualitative interviews,<br>f. Focus groups<br>4. Pretesting:<br>A. Print Pretesting:<br>a. Consumer Jury Test,<br>b. Portfolio test, c. Paired comparison test, d. Order- of-merit test, e. Mock magazine test, f. Direct mail test.<br>B. Broad casting Pretesting:<br>a. Trailer tests, b. Theatre tests, c. Live telecast tests, d. Clutter tests<br>C. Challenges to pre-testing<br>Example: The Halo effects<br>4. Post testing: a. Recall tests, b. Recognition test,<br>c. Triple association test,<br>d. Sales effect tests,<br>e. Sales results tests,<br>f. Enquires test<br><br>Neuroscience in Advertising Research<br>1. Neuroscience: A New Perspective<br>2. When to use Neuroscience<br><br>Physiological Rating Scales<br>1. Pupil Metric Devices<br>2. Eye-movement Camera<br>3. Galvanometer<br>4. Voice Pitch analysis<br>5. Brain Pattern Analysis | concept of Neuroscience and its applications. | |
| **MODULE -VIII**<br>Marketing Research:<br>1. Advertising Research introduction<br>2. New product Research<br>3. Branding Research<br>4. Pricing Research<br>5. Packaging Research<br>6. Product Testing | 1. Learning different marketing processes in details. | |

**Faculty Name - Ms. Jyotika Naidu**

**Program: Bachelors in Mass Media**

**Course: Contemporary Issues**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE -I**<br>Ecology and its related concerns:<br>• Climate change and Global warming- causes, consequences and remedial measures<br>• Deforestation- causes, consequences and remedial measures<br>• Costal regulatory Zone- need and importance, CRZ Act<br>• Sustainable development- concept, need and significance<br>• Movements related to environmental protection. | 1. To study about the Ecological system.<br>2. To study the Hippo effect.<br>3. To study renewable and non-renewable resources and its types. | CO1- To understand and analyze some of the present day environmental, political, economic and social concerns and issues.<br>CO2- To highlight the importance of human rights and its implementation in India.<br>CO3- To understand the present-day problems and challenges and its implications on development. |
| **MODULE -II**<br>(a) Human Rights:<br>• UDHR and its significance<br>• CRC and CEDAW<br>• DRD<br>(b) Legislative Measures with reference to India:<br>• Women: Constitutional Rights and legal safeguards, Domestic and Family<br>Violence Act of 2012, Sexual Harassment Act at the Work Place 2013. The<br>Criminal Law (Amendment) Act of 2013<br>• Child: Protection of Children from sexual offence Act -2012 (POCSO), Child Labour Act with new amendments, Juvenile Justice (Care and Protection of<br>Children Act) 2000. | 1. To study human rights.<br>2. To study the principle of Substantive equality.<br>3. To study the POSCO act.<br>4. To study the objectives of health policy. | |

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| • Education: Right to Education Act 2009<br>• Health: National Health Policy of 2015, Transplantation of Human organs Act of 2002. Prenatal Diagnostic Technique Regulation and prevention of Misuse amendment rules of 2003, Prohibition of sale of cigarettes and other tobacco products around educational institutions 2004. | | |
| **MODULE -III**<br>Political Concerns & Challenges:<br>• Crime and Politics<br>• Corruption: Causes and remedial measures. RTI Act, Lok Pal Bill.<br>• Whistle Blowers- Whistle Blowers protection act 2011.<br>• Anti- State violence- Naxalism and its Impact.<br>• Insurgency with reference to North East – Issues involved, ULFA, Nagas, Manipur issue, AFSPA and its impact.<br>• Terrorism- causes, consequences and remedial measures | 1. To study the analysis of Lok Sabha election.<br>2. To study the top corruption scams in India.<br>3. To study the salient features of Jan Lokpal Bill.<br>4. To study the role of NNC, NFA and NFG. | |
| **MODULE -IV**<br>Economic Development & Challenges:<br>• The Role of MIDC in the economic development of Maharashtra<br>• Special Economic Zone: Its role and significance in Maharashtra<br>• Food Security Act 2013<br>• Agrarian issues: rural indebtedness, farmers' suicides and its implications. | 1. To study the contribution of MIDC in economic sectors.<br>2. To study about the Mid day meal rule, 2015<br>3. To study the benefits of the farmers. | |
| **MODULE -V**<br>Social Development & Challenges:<br>• Tribal Issues: Marginalisation of the Tribals, Forest Rights Act, Land Acquisition Act. | 1/ to study the causes of the trial movement and its type.<br>2. To study the categorization of the tribal movements.<br>3. To study the controversy | |

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| • Police reforms: Problems faced by Police and the Need for Reforms<br>• Illegal immigration from Bangladesh: Challenges and impact<br>• Developmental Issues: Displacement and rehabilitation | over the Land Acquisition Bill. | |

**Faculty Name - Mr. Sohrab Vakharia**

**Program: Bachelors in Mass Media**

**Course: Digital Media**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **MODULE -I**<br>Introduction to Digital Media:<br>1. Understanding Digital Media<br>2. Principles<br>3. Key Concepts<br>4. Evolution of the Internet<br>5. Traditional v Digital | 1. Introduction to Digital media and its key concepts<br>2. To learn about its evolution and principles.<br>3. To differ traditional media and digital media. | CO1- Understand digital marketing platform<br>CO2- Understand the key goals and stages of digital campaigns<br>CO3- Understand the of use key digital marketing tools<br>CO4- Learn to develop digital marketing plans |
| **MODULE -II**<br>Search Engine Optimization (SEO):<br>1. What are Search Engines:<br>• Types of Search Engines,<br>• How Search Engines work and how they rank websites based upon a search term?<br>2. Introduction to SEO and what it involves:<br>• What is the importance of search for websites?<br>• What are the areas of operation for Search Engine Optimization Professionals?<br>• How do you search for the right keywords that will help bring in the most traffic? | 1. To understand SEO (On-page and Off- page) in detail<br>2. Importance of websites and keywords<br>3. To study the algorithms and its mechanisms. | |

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| 3. What is On-Page Optimization?<br>• Keyword Research with Google Keyword Planner, Page Naming {URL Structuring}<br>and Folder Naming, What are Meta Tags, Redirection Tags,<br>4. What is OFF-Page Optimization?<br>• What are Backlinks?, How to Get Backlinks?<br>• What is Google Page Rank? How to Increase Page Rank?<br>5. Search Engine Algorithms:<br>What is Search Engine's Algorithms? How Algorithms Works? Page Rank Technology, Why a Search Engine penalizes a Website, Google Panda Update, | | |
| **MODULE -III**<br>Social Media:<br>1.Introduction:<br>Definition of social media, Types of social media, how social media is affecting Google Search,<br>Integrating social media into websites and blogs.<br>2. Using Facebook:<br>What can You do with Facebook, Facebook Features, Facebook Fan Pages, Facebook Pages. How to promote your Facebook page,<br>Creating Facebook Application / Widget, Linking with YouTube, Creating Events, Building content Calendar.<br>3. Using Twitter:<br>Following And Listening, Tools for managing your Tweets,<br>Finding People and Companies on Twitter, Twitter Tools, Reputation Management, Keyword Research, Hashtags and Trends Tools | 1. To introduce students to the social world and medium of communication<br>2. Learning various platforms of social media and its tools used in evaluating campaigns analysis.<br>3. To understand blogging and create blogs, as a tool for communication to the online audiences. | |

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| Influence on Twitter: TweetDeck, Klout, PeerIndex.<br>4. Using LinkedIn:<br>Lead Generation through Individual Profiles, Lead Generation as Enterprise: Company Page Ads, Developer API, Groups.<br>5. Using Blogs:<br>How Blogging can be used as a tool. | | |
| **MODULE -IV**<br>Tools and Trends:<br>1. Key terms and concepts<br>2. Web analytics<br>3. Tracking Tools to enhance lead nurturing Tracking and Collecting Data: Log file analysis, Page tagging. | 1. To introduce students to online marketing channels.<br>2. To understand Google Ad-words and PPC (Pay per Click)<br>3. Understanding web analytics and its tools. | |
| **MODULE -V**<br>Features of a Website:<br>1. Homepage<br>2. Links<br>3. Navigation<br>4. Multimedia | 1. To introduce students to websites along with its concepts and how it helps businesses to get business.<br>2. To explain in detail the features of a website.<br>3. HTML & HTTP | |
| **MODULE -VI**<br>Content Writing:<br>1. Blog<br>2. Twitter<br>3. Mobile | 1. To create appropriate content for utilization on the internet.<br>2. Learning skills and qualities required for content writing on various online sites, applications and websites. | |
| **MODULE -VII**<br>New Challengers:<br>1. Cyber Crime and Challenges of the new media | 1. To understand cybercrimes and its types.<br>2. Challenges of new media / Digital media<br>3. To create an awareness in students related to pros and cons of new media. | |
| **MODULE -VIII**<br>Cyber Laws: | 1. To learn about cyber laws<br>2. Case studies related to each | |

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| 1. Information Technology Act<br>2. Copyrights and its importance<br>3. Ethics<br>4. Digital Security | law so as to better understand the real world.<br>3. Ethics in Digital Media. | |

**Faculty Name - Mr. Ajay Chauhan**

**Program: Bachelors in Mass Media**

**Course: Financial Management for Marketing & Advertising**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Unit-I**<br>Introduction of Financial Management:<br>Meaning of Financial Management, Definition, Goals, Functions, Role of Finance in Marketing and Advertising. Types of Finance, Owned and Borrowed, Long term and Short- Term Finance, Sources of Long Term and Short-Term Finance. | 1. To study the features of Corporate Finance.<br>2. To study the objective of financial management.<br>3. To study the relationship between finance function and production function.<br>4. To study the emerging role of Finance Manager in India. | CO1- To provide a brief overview of the basic concepts, goals functions and types of finance available for new and existing business and marketing units.<br>CO2- To enable the understanding of the need for financial planning through Budgets and their benefits.<br>CO3- To enable students to evaluate the financial implications of marketing decisions through simple<br>analytical tools. |
| **Unit-II**<br>Financial Planning and Budgets:<br>1. Financial Planning for a Marketing Unit through budgets, Pro Forma Financial Statements and Spreadsheets.<br>2. Budgeting, Types of Budgeting, Functional Budgets, Master budget, Zero based budget, Sales Budget, Cash Budget (Application from Sales Budget and Cash Budget only)<br>3. Elements of Marketing Budgets, Advertising Agency Budget, | 1. To learn in detail business plan and financial plan along with its techniques.<br>2. To learn Budgetary Control and its steps<br>3. To study various budgeting types (Sales & Cash) and elements involved in marketing budgets<br>4. To solve problems/ sums in class to get the organizational finance clearer. | |

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| Budgeting for Films, Broadcast Print and Electronic Media. | | |
| **Unit-III**<br>Working Capital Estimation:<br>Working Capital- Concept of Operating Cycle, Types of Working Capital, Factors influencing Working Capital, Methods of Calculating Working Capital (Theory and Basic Application) | 1. To study working capital and concepts of Operating cycles<br>2. Capital Financing approaches and factors influencing Working Capital<br>3. To study and practice during lectures various methods of calculating Working Capital | |
| **Unit-IV**<br>Financial Statements and Ratio Analysis:<br>1. Vertical Financial Statements, Financial Decision making using Financial Statement Analysis.<br>2. Ratio Analysis- Debt Equity Ratio, Current Ratio, Proprietary Ratio, Stock to Working Capital Ratio, Gross Profit Ratio, Net profit ratio, Operating Ratio, Debtors Turnover Ratio, Creditors turnover Ratio, Selling Expenditure Ratio. | 1. To understand Financial Statements, Balance- sheet and parties interested in financial statements<br>2. To study Ratio analysis of the operations of an enterprise.<br>3. To solve Illustrations in class during for better understanding (Theory and Applications) | |
| **Unit-V**<br>Introduction of Costing<br>1. Costing- Types of Cost- their Relevance in Marketing Decision making.<br>2. Classification of costs- Traceability, Functionality and Level of Activity.<br>3. Estimation of Profit/ Loss using Cost Volume Profit Analysis- Break Even Analysis, Calculation of Profit Volume Ratio, Break- even Point, Margin of Safety, Sales required in Units and Rupees (Theory and Application) | 1. To understand and learn Cost, importance of costing in marketing decisions and Cost Accounting.<br>2. To classify cost into three (3) different parameters.<br>3. Estimating Profit/ Loss on the basis on analysis of cost volume<br>4. Solving sums boosts students' calculations techniques and better understanding of topics and subjects. | |

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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Advertising Ethics and Legal Environment**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Legal Environment:<br>(i) The importance & the relationship between Self –Regulation, Ethics & the Law<br>(ii) The laws of the land:<br>- Constitutional Laws – Fundamental Rights<br>- Personal laws- Criminal & Civil laws<br>- Corporate laws<br>- Consumer laws<br>- Laws pertaining to Media<br>(iii) Laws of Defamation & Contempt of Court with respect to cases specific to Media | 1. To understand the legal environment and its regulation.<br>2. To learn about the basic fundamental human rights.<br>3. To study about various laws in detail, learning with examples. | CO1- To acquaint students to the Legal Environment in contemporary India highlighting the relevance of the same with reference to Advertising media.<br>CO2- To emphasise & reiterate the need to have ethical practices in the field of advertising media both in India & internationally.<br>CO3- To appreciate the role of advertising in contemporary consumerism, the need for consumer awareness & consumer protection.<br>CO4- Advertising as a profession today & how to protect it the future of advertising<br>a. The socio – economic criticisms<br>b. Why Advertising needs to be socially responsible?<br>c. The need for Critiques in Advertising<br>CO5- The syllabus has been redesigned to include advertising in both traditional & New Media. |
| **Module -II**<br>Government Policies & Cyber Laws:<br>(i) Government Policies governing advertisements<br>(ii) The role of Prasar Bharati for advertisements in Public Broadcast Services<br>(iii) Cyber laws including Section 66; Laws pertaining to advertising in cyber space.<br>(iv) The Question of Net Neutrality & its relevance in Media<br>(v) Right to Information Act | 1. Learning about cyber law and cyber securities.<br>2. To study about broadcasting body in detail and its role in smooth running of broadcasting.<br>3. Understanding the Internet cyberspace and RTI act. | |

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| **Module -III**<br>Laws pertaining to Media:<br>(i) Standard Contract between Advertiser & Agency<br>(ii) Laws:<br>- Drugs & Cosmetics Act<br>- Drugs & Magic Remedies (Objectionable Advertisements) Act<br>- Drugs Price Control Act<br>- Emblems & Names (Prevention of Improper Use) Act<br>- Indecent Representation of Women's Act<br>- Intellectual Property Rights-<br>-Copyright Act<br>- Trademarks Act<br>- Patents Act | 1. To study media laws and the format of media agency contract.<br>2. Understanding government laws for drugs and magical remedies.<br>3. Brief study about the citizenship, title and emblem. | |
| **Module -IV**<br>A. Ethics in Advertising:<br>(i) What is Ethics? Why do we need Ethics?<br>(ii) The philosophy of Ethics- Absolutist & Situational<br>(iii) Ethics in Advertising &Stereotyping:<br>- Religious minorities<br>- Racial minorities<br>- Ethnic groups<br>- Cultural Minorities<br>- Senior Citizens<br>- Children<br>- Women<br>- LGBT<br>(iv) Advertising of Controversial products<br>(v) Surrogate & Subliminal Advertising<br>(vi) Political Advertising<br>(vii) Manipulation of Advertising Research<br>B. Bodies helping to maintain a Code of Ethical conduct in Media:<br>- ASCI<br>- AAAI<br>- BCCC<br>- IBF<br>- CENSOR BOARD FOR FILMS<br>- Press Council | 1. To study about ethics to be followed in advertising.<br>2. Learning about the perspective related to certain category of advertising.<br>3. Understanding about certain government and non-government bodies maintaining codes of ethics. | |
| **Module -V**<br>Unfair Trade Practices & the Competition Act 2002: (i) Unfair Trade Practices & Restrictive Trade Practices to Consumers: | 1. To study about the unfair selling of products to the customers and the | |



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**Faculty Name - Ms. Namrata Singh**

**Program: Bachelors in Mass Media**

**Course: Advertising Ethics and Legal Environment**

**TYBMM SEM-VI**

| Unit No. & Name | Unit Outcomes | Course Outcomes |
|---|---|---|
| **Module-I**<br>Legal Environment:<br>(i) The importance & the relationship between Self –Regulation, Ethics & the Law<br>(ii) The laws of the land:<br>- Constitutional Laws – Fundamental Rights<br>- Personal laws- Criminal & Civil laws<br>- Corporate laws<br>- Consumer laws<br>- Laws pertaining to Media<br>(iii) Laws of Defamation & Contempt of Court with respect to cases specific to Media | 1. To understand the legal environment and its regulation.<br>2. To learn about the basic fundamental human rights.<br>3. To study about various laws in detail, learning with examples. | CO1- To acquaint students to the Legal Environment in contemporary India highlighting the relevance of the same with reference to Advertising media.<br>CO2- To emphasise & reiterate the need to have ethical practices in the field of advertising media both in India & internationally.<br>CO3- To appreciate the role of advertising in contemporary consumerism, the need for consumer awareness & consumer protection.<br>CO4- Advertising as a profession today & how to protect it the future of advertising<br>a. The socio – economic criticisms<br>b. Why Advertising needs to be socially responsible?<br>c. The need for Critiques in Advertising<br>CO5- The syllabus has been redesigned to include advertising in both traditional & New Media. |
| **Module -II**<br>Government Policies & Cyber Laws:<br>(i) Government Policies governing advertisements<br>(ii) The role of Prasar Bharati for advertisements in Public Broadcast Services<br>(iii) Cyber laws including Section 66; Laws pertaining to advertising in cyber space.<br>(iv) The Question of Net Neutrality & its relevance in Media<br>(v) Right to Information Act | 1. Learning about cyber law and cyber securities.<br>2. To study about broadcasting body in detail and its role in smooth running of broadcasting.<br>3. Understanding the Internet cyberspace and RTI act. | |

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| - False Promises<br>- Incomplete Description<br>- False & Misleading Comparisons<br>- Bait & Switch offers<br>- Visual Distortions<br>- False Testimonials<br>- Partial Disclosures<br>- Small print Clarifications<br>(ii) Unfair Trade Practices & Restrictive Trade Practices to other organizations in the industry<br>(iii)The role of the Commission of the Competition Act 2002 in resolving cases of Unfair &<br>Restrictive Trade Practices. | action can be taken on the manufacturer. | |
| **Module -VI**<br>Consumer Protection: Government initiatives including Standardization, Consumer Law & Non-Government Initiatives:<br>(i) Consumerism – The rising need for consumer guidance& awareness<br>(ii)Government Initiatives:<br>-Standardization- Meaning, Relevance in today's Globalized World in Total Quality Management<br>- Standardization Bodies in India- AGMARK, BIS, FSSAI & FPO<br>- International Bodies- ISO, FDA, CMMI, Six Sigma & CE<br>- Standardization marks- ISI, AGMARK, BIS- Hallmark (Gold), Silkmark, Woolmark, Cotton, Forever mark (Diamonds)<br>Laws:<br>(i)Essential Commodities Act 1955<br>(ii) Consumer protection Act 1986<br>(iii)Standards of Weights & Measures Act<br>(iv)Standards of Weights & Measures (Packaged Commodities) Act<br>(v)Prevention of Food Adulteration Act<br>Other Initiatives:<br>- PDS- Ministry of Civil Supplies (Public Distribution System or Ration Shops)<br>- Consumer Co-operatives<br>Non- Government initiatives:<br>- CGSI<br>- CFBP<br>- CERC | 1. To study about consumer protection on buying an appropriate product with various signs and symbols as an indication for making a purchase.<br>2. Government initiatives to support the citizens with respect to foodgrains.<br>3. To learn about customers care centres. | |

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| - Grahak Panchayat<br>- Customer care centres | | |
| **Module -VII**<br>Advertising & Society:<br>A. Socio- Economic Criticisms of advertising<br>- Increasing prevalence of Materialism<br>- Creating Artificial Needs<br>- Idealizing the "Good Life"<br>- Stressing Conformity with Others<br>- Encouraging instant gratification & a throwaway society<br>- Promoting the good of the individual over the good of society<br>- Creating Unrealistic Ideal characterizations<br>- Using appeals that prey on feelings of inadequacy<br>- Manipulation by advertising<br>B. Advertising & social responsibility - Advertising as a moulder of thought, opinion & values | 1. To study on how advertising influence customers thought process. | |
| **Module- VIII**<br>Critique of Advertising<br>- A study of Vance Packard- The Hidden Persuaders (1957)<br>- A study of Jean Kilbourne – Can't buy My love<br>- A study of Naomi Klein – No Logo<br>- A study of Naomi Woolf- The Beauty Myth<br>- A study of Noam Chomsky- Understanding Power | | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

F. Y. B.Sc. BIOTECHNOLOGY Semester – I (A.Y. 2022-23)

**USBT101- Core Subject- Fundamentals of biotechnology-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. **Introduction and scope of biotechnology**<br><br>**What is biotechnology?** Biotechnology –an interdisciplinary biological science; Biotechnology – definition; History & Introduction to Biotechnology; Traditional and Modern Biotechnology; Scope and importance of biotechnology;<br>**World of Biotechnology-** Pharmaceutical Biotechnology, Plant Biotechnology, Industrial Biotechnology, Marine Biotechnology, Animal Biotechnology, Medical biotechnology, Environmental Biotechnology.<br>**Biotechnology in India** – Bio-business in India, booming biotech market, success story of biotech market, policy initiatives; and global trends; Biotechnology research in India.<br>**Potential of modern biotechnology;** Achievement of biotechnology; Prevention of misuse of biotechnology; Biotechnology Institutions in India (Publicand Private Sector); Public Perception of Biotechnology.**Case study: Serum Institute of India and its products.** | UO1: To understand the history of biotechnology.<br><br>UO2: To get familiarised with the scope and importance of biotechnology.<br><br>UO3: To gain insight about research and public perception of biotechnology. | Course Objective:<br><br>To familiarize the students with the potential and different applications of biotechnology.<br><br>CO1: To develop an understanding of developments in various fields of Biotechnology<br><br>CO2: To be able to relate to applications and benefits of Biotechnology in the fields of agriculture, livestock, human health and environment<br><br>CO3: To discuss the basics of fermentation. |

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| **2. Applications of biotechnology.**<br><br>Applications of biotechnology: -<br>**Agriculture:** GM fruits- GM papaya, GM tomato, Insect resistant transgenic plants – Bt cotton, Btbrinjal, Modifications in nutrient quality – starch, oilseed protein, golden rice<br>**Livestock:** Growth, disease resistance, product quality, pharmaceuticals and nutritional supplements, industrial applications.<br>**Human welfare:** Cloned genes for production of - Insulin; recombinant vaccine for Hepatitis B virus, Molecular farming, Edible vaccines and their advantages **Environment** - Pollution abatement through GMOs<br>**Bioethics, Case study:** Genetically modified microbes for bioremediation of oil spills in marine environments. | UO1: To highlight uses of biotechnology in agriculture.<br><br>UO2: To develop insight about insect resistant plants and livestock.<br><br>UO3: To study the role of biotechnology in human welfare and environment. | |
| **3. Fermentation technology.**<br>**Introduction to fermentation processes:**<br>Microbial biomass, Microbial enzymes, Microbial metabolites, recombinant products, transformation processes.<br>Development of fermentation Industry<br>**Component parts of fermentation process.**<br>**Screening:** Definition, Primary screening and its methods, Secondary screening and its methods<br>**Fermenter design:**<br>Definition of a fermenter, aerated stirred tank batch fermenter-Typical design, Construction materials used, aeration and agitation.<br>**Basic introduction to process parameters:**<br>Temperature control, Foam production and control pH measurement and control, CO2 and O2 control<br>**Fermentation medium:**<br>Basic requirements of industrial media, Criteria for use of raw materials in media, Examples of raw materials used, Growth factors, Water, Carbohydrate sources, Protein source<br>**Product: A typical process of Ethanol production and Antibiotic production** | UO1: To study the introduction to fermentation processes<br><br>UO2: To gain insight about the fermentor design<br><br>UO3: To understand the process parameters and fermentation medium<br><br>UO4: To study the production of ethanol and penicillin | |

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USBT102 -Core Subject- Microbiology-I

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1. Introduction to microbiology.**<br><br>**Fundamentals, History and Evolution of Microbiology:**<br>Discovery of Microorganisms, Conflict over spontaneous generation, Role of microorganisms in disease<br>**Classification:** The place of Microorganisms in the living world, Classification Whittaker's five kingdom classification, Introduction to Bergey's Manual, Groups of Microorganisms, Applications of microbiology in various fields<br>**Nutrition, Cultivation and Maintenance of microorganisms:** Nutritional categories of microorganisms, Design and Types of Culture Media, methods of isolation. | UO1: To gain insight into the history and evolution of microbiology<br><br>UO2: To study the classification of microorganisms<br><br>UO3: To gain knowledge about the nutrition, cultivation and maintenance of microorganisms | Course Objective:<br><br>To build firm foundation in microbiology, sterilization techniques and staining.<br><br>CO1: To develop an understanding of cultivation of microorganisms.<br><br>CO2: To develop skills towards use of microscopy and staining techniques<br><br>CO3: To understand the role of sterilization and disinfection in the field of microbiology |
| **2. Sterilization techniques**<br>**Introduction:**<br>Definition and concept of Sterilization and Disinfection.<br>**Types and Applications:**<br>Dry Heat, Steam under pressure Gases, Radiation and Filtration<br>**Chemical Agents and their Mode of Action:** Aldehydes, Halogens, Quaternary Ammonium Compounds, Phenol and Phenolic Compounds, Heavy Metals, Alcohol, Dyes, and Detergents.<br>**Disinfectant:**Ideal Disinfectant. Examples of Disinfectants and Evaluation of Disinfectant | UO1: To understand the definition concept of sterilization and disinfection<br><br>UO2: To study the different types and applications of sterilization<br><br>UO3: To gain knowledge about the chemical agents and their mode of action<br><br>UO4: To gain knowledge about disinfectants | |

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| **3. Microscopy and stains**<br>**Simple and Compound Microscope:** General principles of optics; various parts and their functions- objectives – numerical aperture, resolving power, depth offocus, working distance, aberrations; oculars; condensers.<br>**Dark Field Microscope; Phase Contrast Microscope and Fluorescent Microscope, TEM, SEM, Applications of microscopes**<br>**Stains and Staining Solutions-** Definition of Dye and Chromogen: acidic and basic dyes; functions and types of chromophore and auxochrome groups. Theories to explain staining. Definition and function of stain; mordant, intensifiers and fixative Natural and Synthetic Dyes. Simple Staining, Differential Staining – Gram staining and Acid Fast Staining with specific examples. | UO1: To gain knowledge about simple and compound microscope<br>UO2: To study the different types of microscopes and their applications<br>UO3: To gain insight about the stains and staining solutions | |

**USBT103 -Core Subject- Basic Chemistry-1**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Nomenclature and Chemical bonds.**<br>**Classification and Systematic Nomenclature of organic compounds** (few examples)<br>**Chemical Bonds:** Types and transition between the main types of bonding.<br>**Ionic Bond:** Nature of Ionic Bond, factors influencing the formation of Ionic Bond. Structure of NaCl and CsCl.<br>**Covalent Bond:** Nature of Covalent Bond, Types of covalent bond (Polar and Coordinate covalent bonds). Structure of CH4, NH3, H2O. Shapes of BeCl2, BF3.<br>**Hydrogen Bond:** Theory of Hydrogen Bonding and Types of Hydrogen Bonding (with examples of RCOOH, ROH, Salicylaldehyde, Amides and Polyamides). | UO1: To clear the concepts and basics of nomenclature.<br>UO2: To develop an understanding among students about the types of chemical bonds.<br>UO3: To acquaint the students with the different theories related to chemical bonds with the help of examples. | Course Objective:<br>To acquaint the students with basic concepts of Chemistry like nomenclature, chemical bonds, titrimetric, gravimetry, stereochemistry etc.<br>CO1: To develop an understanding of chemical bonds.<br>CO2: To develop skills towards use of titrimetric and gravimetric analysis<br>CO3: To be able to differentiate between chiral and achiral molecules and different enantiomers. |

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| 2. **Titrimetric and gravimetry.**<br>**Titrimetric Analysis:**<br>Titration, Titrant, Titrand, End Point, Equivalence Point,Titration Error, Indicator, Primary and Secondary Standards.Characteristics and examples.Types of Titrations – Acid –Base, Redox. Precipitation,Complexometric Titration. Acid – Base Titration – StrongAcid Vs Strong Base. Theoretical aspects of Titration Curveand End Point Evaluation.<br>Theory of Acid –Base Indicators, Choice and Suitability ofIndicators.<br>**Gravimetric Analysis:**<br>Solubility and Precipitation, Factors affecting Solubility,Nucleation, Particle Size, Crystal Growth, Colloidal State, Ageing/Digestion of Precipitate.Co-Precipitation and Post-Precipitation. Washing, Drying andIgnition of Precipitate. | UO1: To develop an understanding among students about terms related to titrimetry and gravimetry.<br>UO2: To explain the students about various types of titrations graphically and theoretically.<br>UO3: To develop an understanding among students about types and methods of gravimetric analysis and its applications. | |
| 3. **Stereochemistry**<br>**Isomerism:** Types of Isomerism: Constitutional Isomerism (Chain, Position and Functional) and Stereoisomerism, Chirality.<br>**Geometric Isomerism and Optical Isomerism:**Enantiomers, Diastereomers, and Racemic mixtures Cis-Trans,Threo, Erythro and Meso isomers. Diastereomerism (Cis-Trans Isomerism) in Alkenes and Cycloalkanes (3 and 4membered ring)<br>**Conformation:** Conformations of Ethane. Difference between Configuration and Conformation.<br>**Configuration:** Asymmetric Carbon Atom, Stereogenic/ Chiral Centers,Chirality Representation of Configuration by ¯Flying Wedge Formula<br>**Projection formulae:** Fischer, Newman and Sawhorse. The Inter-conversion of the Formulae. | UO1: To familiarize the students about types of projection formulae and their interconversions.<br>UO2: To acquaint them with the difference between conformation and configuration.<br>UO3: To teach them about the types of isomerism and solve problems based on that.<br>UO4: To acquaint the students with different types of nomenclature in stereochemistry such as R/S and solve problems based on the same. | |

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USBT104 -Core Subject- Biochemistry: Concept of Biomolecules-I

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Water, Standard solutions and Buffers.**<br><br>Structure, Properties and functions:<br>Water. **Preparation of standard Solutions:**<br>Concept and significance of Chemical and Biological solutions.<br>Normality, Molarity, Molality, Mole fraction, Mole concept, Solubility, Weight ratio, Volume ratio, Weight to Volume ratio, ppb, ppm, millimoles, milliequivalents (Numericals expected).<br>Primary and Secondary Standards: Preparation of Standard Solutions, Principle of Volumetric Analysis.<br>**Concept of pH:**<br>Buffer solutions –Concept of Buffers,<br>Derivation of Henderson -Hasselbach equation for Acidic and Basic buffers. Buffering capacity<br>**Biological buffers:**<br>Significance of biological buffers. pH of body fluids like blood and saliva. Blood buffer systems: E.g.: Carbonate, Acetate and Phosphate buffers. Protein buffers (Introduction) Significance of TRIS buffers (Introduction) | UO1: To clear concepts of water, solubility and volumetric analysis.<br><br>UO2: To learn theories of acids and bases and ionic product of water.<br><br>UO3: To gain insights about different buffer systems, with its equations and examples. | Course Objective:<br><br>To acquaint the students with different concepts of biomolecules.<br><br>CO1: To develop skills towards preparation of standard solutions in the laboratory.<br><br>CO2: To understand the role of buffers<br><br>CO3: To discuss the basics of carbohydrate and lipid biochemistry. |

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| **2.Basics of Carbohydrate Chemistry.**<br>Carbohydrates: Introduction, definition and general formula.<br>**Classification of carbohydrates:**<br>**Monosaccharides:**Two Families of Monosaccharides. Aldo series and keto series;(Triose - Glyceraldehyde and Dihydroxyacetone. Tetrose- Erythrose and Erythrulose. Pentose- Xylose, Xylulose, Ribose,Ribulose, Hexose- Glucose, Galactose, Mannose, Heptose sedoheptose and Sedoheptulose (structures to be taught )<br>Concept of Enantiomers, Mutarotation, Anomeric carbon andEpimers of glucose.<br>**Biologically important Derivatives of Hexoses:** Glucosamine,Gluconic acid, uronic acid, NAGA, NAMA<br>**Chemical reactions of monosaccharides**<br>**Concept of glycosidic bond.**<br>**Disaccharides:**Maltose, Lactose, Sucrose, Cellobiose (structures to be taught, biological significance, structure and bond type)**Polysaccharides:** Homopolysaccharides and Heteropolysaccharides; Structural and Storage Polysaccharides. E.g., of polysaccharides -: starch (amylose and amylopectin),Glycogen, Peptidoglycan, Cellulose, chitin (structure and bond type)Examples of Reducing and non reducing carbohydrates. Industrial applications of carbohydrates: Fermentation, Pharmaceutical and Food industry. | UO1: To study properties and classification of carbohydrates.<br>UO2: To understand structures, properties of various monosaccharides, disaccharides and polysaccharides.<br>UO3: To highlight concept of epimers, enantiomers and mutarotation. | |

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| **3.Basics of Lipid Chemistry**<br>**Introduction to Lipid Chemistry:** Definition and Biological functions of fats and Lipids. Definition of Fatty acids.<br>**Classification of Fatty acids: Saturated Fatty Acids:** C2- C20 (Examples with trivial name, Biochemical names and Structures)<br>**Unsaturated Fatty Acids:** Definition of MUFA and PUFA. C16- C20. Palmitolic, Oleic, Linoleic, Lenolenic, Arachidonic acid (Structures expected)<br>**Storage Lipids:** AcylGlycerols (Simple and Mixed)Mono, Di and Triacylglycerols. (Structures expected) **Properties of Triacylglycerols:** Hydrolysis, Saponification, Antioxidant, Rancidity, Acid number, RM number, Action of lipase.<br>**Structural lipids:** Phosphatidic acid and Membrane Phospholipids E.g.: Phosphatidylethanolamine, Phosphatidylserine, Phosphatidylcholine, Cardiolipin<br>**Action of Phospholipase**<br>**Steroids:** Definition and functions Eg: Cholesterol | UO1: To learn biological functions of lipids and fatty acids with its classification.<br>UO2: To study structures and properties of storage lipids.<br>UO3: To understand the significance of structural lipids and steroids. | |

USBT105 -Core Subject- Genetics

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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| **1.Genetics fundamentals.**<br>**Introduction to genetic and sub-disciplines of genetics:** Transmission genetics, Molecular genetics, Population genetics and Quantitative genetics. **Basic Terminologies in genetics**<br>**Mendelian Genetics:**<br>Monohybrid Crosses and Mendel's Principle of Segregation. Representing crosses with a Branch Diagram. Confirming the principle of Segregation: The use of Test crosses. Dihybrid crosses and Mendel's Principle of Independent<br>Assortment.<br>**Extensions of and Deviations from Mendelian Genetic Principles:** Multiple Alleles - ABO Blood groups<br>Modifications of Dominance Relationships: Incomplete Dominance and Codominance. Essential Genes and Lethal Alleles.<br>Effects of the environment on Gene expression.<br>**Gene Interactions and Modified Mendelian Ratios:**<br>Epistatic and non-epistatic interactions.<br>**Mendelian Genetics in Humans:** Pedigree Analysis.<br>Examples of Human Genetic Traits | UO1 : To introduce Genetics and Sub-disciplines of Genetics.<br><br>UO2 : To understand Mendelian Genetics<br><br>UO3 : To know the Extensions and Deviations from Mendelian Genetics Principles.<br><br>UO4 : To understand Gene Interactions and Mendelian Ratios.<br><br>UO5 : To study Mendelian Genetics in Humans. | Course Objective:<br><br>To provide insight to students on fundamental concepts of Mendelian genetics, microbial genetics and<br><br>population genetics<br><br>CO1: To develop an understanding of fundamental concepts of mendelian genetics<br><br>CO2: To discuss the different processes in microbial genetics and their role in mapping genes<br><br>CO3: To understand the relevance of population genetics. |

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| 2. **Microbial genetics**<br>**Genetic analysis in Bacteria:**Prototrophs, Auxotrophs.<br>**Genetic Mapping in Bacteria by Conjugation:**<br>Discovery of Conjugation in E.coli, The sex factor F, High-Frequency Recombination Strains of E.coli, F' Factors, Using conjugation to map bacterial genes- Interrupted-mating. **Genetic mapping in bacteria by Transformation**<br>**Genetic mapping in Bacteria by Transduction:**<br>Bacteriophages - Lytic and Lysogenic pathway.<br>Transduction Mapping of Bacterial Chromosomes – Generalized Transduction and Specialized Transduction. | UO1 : To study the Genetic Analysis in Bacteria<br><br>UO2 : To understand the Genetic mapping in Bacteria by Conjugation.<br><br>UO3 : To understand the Genetic mapping in Bacteria by Transformation.<br><br>UO4 : To understand the Genetic mapping in Bacteria by Transduction.<br><br>UO5 : To know the Lytic and Lysogenic Pathway of Bacteriophages.<br><br>UO6 : To understand the transduction mapping of Bacterial Chromosomes | |
| **3.Population genetics.**<br>Genetic Structure of Populations:<br>Genotypic Frequencies and Allelic Frequencies,<br>Hardy- Weinberg Law and its Assumptions ,<br>Genetic Variations in Populations.<br>**Forces responsible for change in gene frequencies in population:**<br>Natural Selection., Genetic Drift, Migration,<br>**Speciation**<br>**Role of Population Genetics in Conservation Biology** | UO1 : To understand the Genetic structure of Populations.<br><br>UO2 : To know the forces responsible for the change in gene frequencies in population.<br><br>UO3 : To understand Speciation.<br><br>UO4 : To learn the role of Population Genetics in Conservation Biology | |

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**USBT106- Core Subject- Molecular biology-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Chromosome structure, composition and packing.**<br>The Composition and structure of DNA and RNA: Nucleotide and Nucleoside, Structure of nucleotides.<br>Structure of DNA. DNA double helix – Watson and Crick's Model. Structure of RNA. Types of RNA.<br>**Organization of DNA in chromosome:**<br>Viral and Prokaryotic Chromosomes. Eukaryotic Chromosomes. Histone and Non-histone proteins. Nucleosome Structure. Packaging of DNA into Chromosomes. Euchromatin and Heterochromatin. Centromeres and Telomeres<br>**Chromosome Banding Techniques.**<br>**Karyotype and Idiogram** | UO1 : To study the composition and structure of DNA and RNA.<br><br>UO2 : To learn the organization of DNA in chromosomes.<br><br>UO3 : To know chromosome banding techniques<br><br>UO4 : To develop Karyotype and Idiogram | Course Objective:<br>To build a firm foundation of molecular biology<br>CO1: To develop an understanding of structure and organization of the hereditary material<br>CO2: To diseuss the different processes involved in replication of DNA<br>CO3: To understand the relevance of physical, chemical and biological factors in mutations |
| **2. DNA replication**<br>Models of DNA Replication<br>Evidence of Semi-conservative DNA replication- Messelhson and Stahl's experiment, DNA Polymerases and its role. **DNA Replication in Prokaryotes**: E.coli Chromosome Replication, Semi-discontinuous replication. Bidirectional Replication of Circular DNA molecules. Rolling Circle Replication, **DNA Replication in Eukaryotes. Enzymes and proteins involved in DNA replication.** | UO1 : To study the models of DNA replication<br><br>UO2 : To learn DNA Replication in Prokaryotes.<br><br>UO3 : To learn DNA Replication in Eukaryotes<br><br>UO4 : To know enzymes and proteins involved in DNA Replication | |
| **3.Mutation And repair.**<br>**Definition and concept of Mutations:**<br>Classification of mutations, Types of Point Mutations, Types of Spontaneous and induced mutations, Mutagenesis and types of Mutagens. (Examples of Physical, Chemical and Biological Mutagens)<br>**DNA repair:** Photoreversal, Base Excision Repair, Nucleotide Excision Repair, Mismatch Repair, SOS Repair. | UO1 : To study the classification of mutations.<br><br>UO2 : To learn the concept of mutagenesis and types of mutagens<br><br>UO3 : To learn DNA Repair | |

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**USBT107 - Ability Enhancement Course-Communication skills**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. **Academic skills**<br>**Essentials of Grammar:** Parts of speech, Articles, Modals, Sentences and their types., Punctuation marks<br>**Employment Communication:** Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter, Email Writing<br>**Professional Presentation:** Nature of Oral Presentation, planning Presentation, Preparing the Presentation, Delivering the Presentation. **Job Interviews:** Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interview **Group Discussion:** Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits. | UO1: To teach the students about the importance of grammar and its applications in day to day life.<br>UO2: To prepare students for the corporate world by instilling in them skills and etiquettes.<br>UO3: To highlight the importance of communication skills and resume for their help in job interviews. | Course Objective:<br>To acquaint the students with different aspects of communication skills.<br>CO1: To develop an understanding of communication skills required to excel in real work environment and corporate life.<br>CO2: To gain insight into technical and non-technical qualities in career planning<br>CO3: To learn about Leadership, team building, decision making and stress management. |
| 2. **Soft skills**<br>Introduction to Soft Skills and Hard Skills,<br>**Personality Development:** Knowing Yourself, Positive Thinking, Johari's Window, Communication Skills, Non-verbal Communication, Physical Fitness<br>**Emotional Intelligence:** Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence<br>**Etiquette and Mannerism:** Introduction, Professional Etiquette, Technology Etiquette<br>**Communication Today:** Significance of Communication, GSC's 3M Model of Communication, Vitality of the Communication Process, Virtues of Listening, Fundamentals of Good Listening, Nature of Non-Verbal Communication, Need for Intercultural Communication, Communicating Digital World | UO1: To assist the students in personality building by guiding them into positive thinking and helping them in polishing their communication skills.<br>UO2: To develop a sense of understanding towards the importance of etiquettes and mannerisms.<br>UO3: To explain to the students about importance of communication skills with the help of models and examples. | |

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| **3. Professional skills**<br>**Creativity at Workplace**: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method<br>**Ethical Values**: Ethics and Society, Theories of Ethics, Correlation between Values and behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics.<br>**Capacity Building**: Need and Importance of Capacity Building, Elements of Capacity Building Zones of Learning Ideas for Learning Strategies for Capacity Building<br>**Leadership and Team Building**: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams<br>**Decision Making and Negotiation**: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts<br>**Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress | UO1: To teach students ethical values required at the workplace.<br>UO2: To instill in students the need and importance of capacity building.<br>UO3: To develop the qualities of team building and leadership among students.<br>UO4: To help students with stress management in everyday life. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

F. Y. B.Sc. BIOTECHNOLOGY Semester – II (A.Y. 2022 – 23)

USBT201 Core Subject- Fundamentals of biotechnology-II

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1. Food Biotechnology**<br>**Introduction to food biotechnology:**<br>History of microorganisms in food science and key developments, Applications of biotechnology in fermented food products<br>**Introduction to Unit Operations and Processes:**<br>Basic unit operations, food processing & packaging<br>(canning & bottling), Production of cultures<br>**Fermented food products:**<br>Bread, Vinegar, Sauerkraut, Single Cell Protein (SCP),<br>Probiotics<br>**Food spoilage, food deterioration, food contamination**<br>**and Food Adulteration**<br>**Methods of food preservation**<br>**Indicators of Food Microbial Quality & Safety:**<br>HACCP, FSSAI & FDA | UO1: To study role of biotechnology in food processing and fermented food products.<br>UO2: To learn concepts of food spoilage and contamination.<br>UO3: To study indicators of food microbial quality and safety. | Course Objective:<br>To acquaint students with the applications of biotechnology in the field of food, medicine and<br>Fermentation.<br>CO1: To develop an understanding of the application of biotechnology in the food industry.<br>CO2: To gain insight into details of genetic engineering.<br>CO3: To discuss tools and techniques used in medical biotechnology |

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| **2. Medical biotechnology**<br>**Introduction to Medical Biotechnology and its applications**<br>**Vaccines**<br>Types of vaccines<br>General vaccine production<br>Large scale production of vaccine<br>Trends in Vaccines Research<br>Issues related to vaccine research<br>**Synthetic peptides as vaccine**<br>**Antibody Production**<br>**Gene therapy**<br>**Organ transplant cloning**<br>**Stem cells -Sources and applications** | UO1 : To study Vaccines.<br><br>UO2 : To study Antibody Production.<br><br>UO3 : To learn Gene Therapy<br><br>UO4 : To know the Organ Transplant Cloning.<br><br>UO5 : To introduce to Stem cells | |

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| **3.Genetic engineering**<br>**What is Genetic engineering:**<br>Definition and developments<br>What is gene cloning?<br>Strategy for cloning<br>How to clone a gene?<br>How to construct r DNA?<br>Source DNA [insert], Isolation of DNA from bacterial<br>cell, Introducing insert into cloning vector<br>**Enzymes in genetic engineering:**<br>Restriction endonuclease; DNA ligase; Enzymes to<br>modify ends of DNA molecules - exonuclease; endonuclease; S1 nuclease; alkaline phosphatase;<br>polynucleotide kinase; DNA polymerase and klenow<br>fragment; reverse transcriptase; terminal deoxynucleotidyl transferase<br>**Vectors:**<br>Role as agents of transfer<br>Features of plasmid vectors, Plasmid vectors - pBR322,<br>pUC<br>BAC<br>Plant virus vectors and Animal virus vectors<br>Shuttle vector; Expression vector<br>**Host cells:**<br>*E. coli; Bacillus subtilis; Saccharomyces cerevisiae*;<br>Xenopus oocytes; Mammalian fertilized egg cell<br>**Introducing vector into host:**<br>Prokaryote<br>Eukaryote<br>**Identification of recombinant clones.** | UO1 : To study Genetic Engineering<br><br>UO2 : To study enzymes in GE<br><br>UO3 : To learn Vectors<br><br>UO4 : To study how to introduce vector into host<br><br>UO5 : To study identification of rembinant clones. | |

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**USBT202 Core Subject Cell biology and Microbiology - II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1. Ultra-structure ofprokaryoticand eukaryotic cell.**<br><br>Ultrastructure of Prokaryotic Cell: Concept of Cell shape, size and arrangement. Bacterial structures external to cell wall: Flagella,Pilli, Fimbrine, Capsule, Slime Layer, Sheath<br>**Cell Wall (Gram Positive and Negative)**<br>**Structures internal to cell wall:** Cell Membrane, nucleoid, Cytoplasm and cytoplasmicinclusion bodies and vacuoles, Genetic Material spores and cysts.<br>**Ultrastructure of Eukaryotic Cell:**Cell wall; Plasma membrane, Cytoplasmic Matrix,Nucleus –Nuclear Structure, nuclear envelope, nucleoplasm, Nucleolus; cytoplasmic structures –cytoplasmic inclusions, cytoplasmic organelles -Endoplasmic Reticulum; Golgi Apparatus; Mitochondria; Chloroplasts; Ribosomes; Lysosome - Endocytosis, Phagocytosis, Autophagy; Peroxisomes.<br>**External Cell Coverings,** Cilia and Flagella<br><br>**Comparison of Prokaryotic and Eukaryotic Cells** | UO1: To study structures and cell organelles in prokaryotic cell with its functions.<br><br>UO2: To understand the structures and cell organelles in eukaryotic cell with its functions.<br><br>UO3: To diffrentiate between prokaryotic and eukaryotic cells. | Course Objective:<br><br>To build a firm foundation of concepts related to cell biology and microbiology<br><br>CO1: To discuss the ultrastructure, function and location of organelles in prokaryotic and eukaryotic cells.<br><br>CO2: To develop an understanding of microbial growth and enumeration<br><br>CO3: To gain insight in to the basics of virology |
| **2. Microbiology.**<br>**Microbial Growth**<br>Definition of Growth<br>Mathematical and expression of growth<br>Growth curve<br>Measurement of growth<br>Efficiency of growth yield<br>Synchronous growth<br>Effect of nutrient on growth rate<br>Continuous Culture of microorganisms<br>Chemostat and Turbidostat<br>**Enumeration of Microorganisms-** Direct and IndirectMethods<br>**Preservation and Maintenance of cultures** | UO1: To gain indepth knowledge about microbial growth<br><br>UO2: To study about enumeration of microorganisms<br><br>UO3: To understand about the preservation and maintenance of cultures | |

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| **3. Virology**<br>**Introduction to virology:** Historical perspective,<br>**General Characteristics of Viruses:** Host Range, Viral Structure- Nucleic Acid, Capsid and Envelope<br>General Morphology- Helical, Polyhedral, Enveloped, Complex.<br>**Taxonomy of Viruses**<br>**Viral Multiplication:** Multiplication of Bacteriophages and Animal Viruses<br>**Isolation, Cultivation, and Identification of Viruses:** Growing Bacteriophages and animal viruses in the Laboratory, Viral Identification<br>**Case studies-** TMV, Influenza COVID-19 (Self learning) | UO1: To gain knowledge about the general characteristics of viruses<br>UO2: To gain in depth knowledge about taxonomy and multiplication of viruses<br>UO3: To study the isolation, cultivation and identification of viruses | |

**USBT203 Core Subject Basic Chemistry-II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Thermodynamics**<br>Thermodynamics:<br>System, Surrounding, Boundaries<br>Sign Conventions,<br>State Functions, Internal Energy and Enthalpy:<br>Significance, examples.<br>(Numericals expected.)<br>**Laws of Thermodynamics and its Limitations:**<br>Mathematical expression.<br>Qualitative discussion of Carnot Cycle for ideal Gas and Mechanical Efficiency.<br>Laws of Thermodynamics as applied to Biochemical Systems.<br>**Concept of Entropy, Entropy for Isobaric, Isochoric and Isothermal Processes.** | UO1: To learn concepts of thermodynamics and its laws.<br>UO2: To understand principles of carnot cycle and its limitations.<br>UO3: To study principles of entropy for various processes. | Course Objective:<br>To acquaint the students with some core aspects of physical chemistry<br>CO1:To develop an understanding of thermodynamics<br>CO2: To learn about reaction kinetics and order of reaction.<br>CO3: To gain insight in to the details of oxidation and reduction reactions |

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| **2. Chemical Kinetics**<br>**Reaction Kinetics:**<br>Rate of Reaction, Rate Constant, Measurement of Reaction Rates Order & Molecularity of Reaction, Integrated Rate Equation of First and Second orderreactions (with equal initial concentration of reactants).(Numericals expected)<br>**Determination of Order of Reaction:**<br>a) Integration Method<br>b) Graphical Method<br>c) Ostwald's Isolation Method<br>d) Half Time Method. (Numericals expected). | UO1 : To learn concepts of rate of reaction, order and moleculnrity.<br>UO2: To understand rate equation.<br>UO3: To study methods for determining order of reaction. | |
| **3.Oxidation Reduction reactions.**<br>Principles of Oxidation & Reduction Reactions: Oxidising and Reducing Agents Oxidation Number, Rules to assign Oxidation Numbers with examples Ions like Oxalate, Permanganate and Dichromate.<br>**Balancing Redox Reactions:**<br>Ion Electron Method Oxidation, Reduction, Addition and Substitution & Elimination Reactions. | UO1 : To demonstate principles of oxidation and reduction reactions.<br>UO2: To study concept of oxidation number.<br>UO3: To learn to balance redox reactions. | |

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**USBT204 Core Subject Biochemistry: Concept of Biomolecules – II and Basic analytical techniques**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Proteins and amino acids**<br>**Amino acids:**<br>General introduction, Classification and structures,<br>properties (physical & chemical)<br>Amino Acids as drugs.<br>Titration Curve of Amino Acids.<br>Concept of Isoelectric pH, Zwitterion<br>**Reactions of Amino Acids:**<br>Sorenson's Titration, Ninhydrin Test **Proteins:**<br>Introduction, definition and functional classification.<br>**Classification of Proteins:**<br>Simple- Fibrous and Globular<br>Conjugated- Nucleoprotein, Lipoprotein, Glycoprotein,<br>Phosphoprotein, Chromoprotein, Metalloprotein,<br>Derived- Primary and Secondary<br>**Peptide bond:** Features Example of Dipeptide, tripeptide, Nonapeptide e.g., Oxytocin, Vasopressin Amino acid composition of Bovine Cytochrome C andBovine Chymotrypsinogen<br>**Three-dimensional Structure of proteins:**<br>Concept of Monomeric, dimeric and multimeric proteins<br>Primary structure - Peptide linkage, Native<br>Secondary structure - Alpha Pleat and Beta fold; Spatialarrangements of adjacent amino acid residues<br>Tertiary structure – Three Dimensional arrangement<br>Quaternary structure Di and Multimeric proteins E.g., structure of human Insulin<br>**Properties of proteins:**<br>Solubility, Molecular weight, Shape, Iso electric pH, Salting out of proteins for purification.<br>**Protein Denaturation and Folding.** Denaturing agents and properties of denatured proteins. | UO1: To gain insight about classification, properties, structure and function of amino acids.<br><br>UO2: To understand nature of peptide bond and 3D structure of proteins.<br><br>UO3: To study concepts of protein denaturation and folding. | Course Objective:<br><br>To build a firm foundation on the fundamentals of biochemistry and analytical techniques.<br><br>CO1: To learn about fundamental structures and functions of amino acids & proteins.<br><br>CO2: To develop an understanding of protein biochemistry and enzymology.<br><br>CO3: To develop skills towards the principle, working and applications of different analytical techniques. |

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| **2. Introduction to Enzymes**<br>**Properties of Enzymes**<br>Substrate, Optimum conditions, Co-substrate, Coenzyme,<br>Cofactors<br>**Classification and Nomenclature** ( one reaction per<br>class)Mechanism of Enzyme Action, Active Sites, Enzyme<br>Specificity,<br>**Factors affecting enzyme activity** (Effect of pH, Temperature, Substrate Concentration, Enzyme concentration)<br>**Enzyme Kinetics:**<br>Derivation of Michaelis - Menten Equation, Lineweaver - Burk plot, Concept of km<br>**Types of Enzyme Inhibitions:**<br>Irreversible & Reversible (Competitive, Uncompetitive,<br>Non-Competitive)<br>**Isoenzymes** (LDH, Alkaline Phosphatase, Creatine Phosphokinase)<br>Allosteric Modulators, Co-Factors, Zymogens, Enzymeunits<br>Enzymes as Biomarkers and diagnostic tools. (SGPT,SGOT, LDH, CPK)**Industrial Applications of Enzymes** | UO1: To learn properties, classification and nomenclature system of enzymes.<br><br>UO2: To demonstrate factors affecting enzyme activity.<br><br>UO3: To understand concepts of enzyme kinetics and enzyme inhibitors along with industrial applications of enzymes. | |
| **3.Basics of Analytical techniques**<br>**Methods of Separation:**<br>Precipitation, Filtration, Distillation and SolventExtraction<br>**Analytical Techniques**<br>**Chromatography:**Definition, Principles, Chromatographic performanceparameters, Types Paper Chromatography, Thin Layer Chromatography,Column Chromatography (Principle and Applications)**Spectroscopy - Colorimetry:**Properties of electromagnetic radiation, interaction withmatter, lasersColorimetric assays - Principle, Beer-Lambert's Law,Measurement of Extinction, Derivation of E = kcl,<br>Limitations of Beer-Lambert's Law, Filter Selection, Examples of colorimetric and UV absorption assays<br>**Electrophoresis:**<br>General principles, Factors affecting electrophoresis,Types of support media used, Types of electrophoresis<br>(Agarose gel electrophoresis, PAGE) | UO1: To elaborate principles, working and applications of various separation and purification methods.<br><br>UO2: To study principles, working of different types of chromatography.<br><br>UO3: To illustrate concepts of spectroscopy and electrophoresis. | |

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**USBT205 Core Subject Physiology and Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Plant Physiology**<br>**Photosynthesis:**<br>Hill's Reaction and its Significance, Light Reactions, Cyclic and Non-Cyclic Photoinduced Electron Flow, Energetics of Photosynthesis, Dark Phase of Photosynthesis, Calvin Cycle, C-3, C-4, CAM pathways, Rubiscooxygenase activity<br>**Plant hormones:**<br>Auxin, Gibberellins, Cytokinins, Ethylene, Abscisic acid<br>**Introduction to Secondary Metabolites** | UO1: To study mechanisms of photosynthesis along with Hill's reaction.<br>UO2: To elaborate light and dark reactions of photosynthesis along with energetics.<br>UO3: To understand the role of plant hormones, types and significance of various secondary metabolites. | Course Objective:<br>To provide an insight in to the different physiological processes of plants and animals.<br>CO1: To gain insights into the Physiological Processes of Plants and functions of plant growth regulators.<br>CO2: To develop a comprehensive and deep understanding of the vital physiological processes of animals.<br>CO3: To understand the concept of immunity and role of antigens and immunoglobulins in the immune system. |
| **2. Animal Physiology**<br>**Introduction to physiology:**<br>Concept of homeostasis.<br>**Body fluids:** Major types of Body fluid.<br>**Blood:** Functions of blood, general properties of blood, Composition of blood. Thrombocytes or Platelets. Coagulation of blood. Theories of Coagulation. Haemolysis.<br>**Respiratory system:**<br>Phases of Respiration, Principle of gases exchange, Mechanism of breathing.<br>**Digestion and absorption:**<br>Mode of nutrition, Digestion; Digestion of foodstuffs, Digestion in humans. Absorption.<br>**Excretion**: Organs of excretion. Types of excretory products. Excretion in vertebrates - Human<br>**Kidney:** Structure of kidney, Structure of nephron, Function of kidney, Urine formation, Dialysis | UO1: To explain fundamentals of homeostasis and types of body fluids.<br>UO2: To learn concepts about blood and respiratory system.<br>UO3: To elaborate physiology/mechanism of digestion, absorption and excretion. | |

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| **3.Immunology**<br>**Introduction to Immunology:** Overview of Immune Systems, Innate Immunity, Mechanisms of innate immunity, Acquired Immunity, Local and Herd Immunity, Humoral and Cellular Immunity - Factors Influencing and Mechanisms of each.<br>**Antigens:** Immunogenicity Versus Antigenicity, Factors That Influence Immunogenicity, Epitopes, Haptens, Superantigens<br>**Antibodies:** Basic Structure of Antibodies, Antibody-Mediated Effector Functions, Antibody Classes and Biological Activities, Antigenic Determinants on Immunoglobulins. | UO1 : To learn the concepts of immunology<br>UO2: To gain in depth knowledge about antigens<br>UO3: To gain insights about the knowledge of antibodies | |

**USBT206 Core Subject Basic Computers and Biostatistics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Introduction to computers**<br>Overview and functions of a computer system, Input and output devices, Storage devices.<br>Modern computers: The workstation, The Minicomputer,<br>Mainframe Computers, Parallel processing Computer &<br>The Super Computer<br>**Introduction to operating systems:**<br>Operating System concept, Windows, Unix/Linux & servers<br>**Word Processing:**<br>Basic Operations, Creating and Editing documents, Formatting documents.<br>**Spreadsheet:**<br>Creating and editing workbook, Organizing and formatting worksheets; Data analysis and management;<br>Using formulas and functions<br>**Presentation Graphics:**<br>Creating and Editing Presentations, Designing and Enhancing Presentation, Delivering Presentation, Advanced Presentation Graphics. | UO1: To get acquainted with computers<br>UO2: To gain insights into the operating systems<br>UO3: To gain in depth knowledge about word, excel and powerpoint | Course Objective:<br>To develop the students' understanding of computer and biostatistics<br>CO1: To develop an understanding of computer networking and internet<br>CO2: To develop skills to use word processing, spreadsheet, presentation software.<br>CO3: To gain insights about the use of statistics in the field of biotechnology. |

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| **2.Computer networking**<br>**Introduction to networking:**<br>Various terminologies Associated hardware devices, gadgets (Router, Switch) tools, services, and resources<br>Network Topologies and Protocols, LAN, WAN and MAN World Wide Web (WWW)<br>Network security: fire walls<br>**Computer viruses:**<br>An overview of Computer viruses; What is a virus? Virus<br>signs, how do they get transmitted? What are the dangers?<br>General Precautions<br>**The Internet and Internet Services:**<br>Introduction, History of Internet, Internetworking Protocol, The Internet Architecture, Managing the Internet, Connecting to Internet, Internet Connections: Dial-up Access, Leased Line, Integrated Services Digital Network (ISDN), Digital Subscriber Line (DSL), Cable, Modem<br>Internet Address Internet Services: World Wide Web (WWW), Web<br>Browser, Uniform Resource Locator (URL), Internet Search Engines, WWW Development Languages, Uses of Internet<br>**Electronic Mail**: E-mail Address, E-mail Message Format, E-mail Services, How E-mail Works File Transfer Protocol (FTP), How<br>FTP Works, Terminal Network (Telnet), News, Internet Relay Chat (IRC), MS Outlook. | UO1: To get acquainted with various terms used in networking.<br>UO2: To study types and significance of computer viruses.<br>UO3: To get overview about internet and internet services like email, WWW, URL,, ISDN, DSL, etc. | |

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| **3.Biostatistics**<br>**Introduction to Biostatistics:**<br>Definition & Importance of Statistics in Biology<br>Variables, Types of variables (Quantitative & Qualitative)<br>Types of Data and data visualization:<br>Concept of Data, Sources of data, **Types of data** (Quantitative & Qualitative), Representation of Data and<br>Graphs (Bar Diagrams, Pie Charts and Frequency distribution, Histogram, Polygon and Curve)<br>Sampling strategies:<br>Population and Sample, Significance of using samples,<br>Sample size, Random variation, Sampling techniques<br>(Simple random sampling, Systematic sampling, Stratified<br>sampling, Cluster sampling, Multiphase sampling) and<br>Non- probability sampling<br>**Types of Statistics:**<br>Introduction to Descriptive & Inferential statistics<br>**Descriptive statistics:**<br>**Measures of central tendency:**<br>Mean, Mode, Median (Ungrouped & Grouped data)<br>**Measures of dispersion:**<br>Range, Variance, Standard deviation (Ungrouped & Grouped data), Coefficient of variation<br>**Measures of location:**<br>Percentiles, Interquartile range (Box-Whisker plot)<br>**Normal/Gaussian distribution, Standard normal deviate, Sampling variation, Standard error of mean** | UO1: To analyse types of data and data representation.<br>UO2: To understand sampling strategies<br>UO3: To learn types of statistics and measures of central tendency and dispersion. | |

**USBT207 Ability Enhancement Course Sustainable development and Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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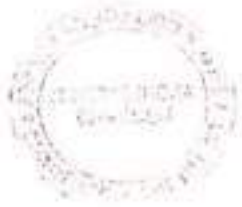
| **1. Ecological interactions and Biodiversity.**<br>**Concept of Ecosystems:**<br>Definition and Components- Structure and function of ecosystem aspects of ecosystems. Food Chain and Food Web, Ecological Pyramids (Energy, Biomass and Number)<br>Aquatic and Terrestrial Ecosystems, Different Abiotic Factors of ecosystem and adaptations to different abiotic factors<br>**Ecological Interactions:**<br>Commensalism, Mutualism, Predation and Antibiosis,<br>Parasitism, competition<br>**Biodiversity and its conservation:**<br>Introduction – definition: genetic, species, ecosystem diversity, biogeographic classification of India, value of biodiversity, biodiversity at global, national and local levels, India as a mega diversity nation, Hotspots of biodiversity, threats to biodiversity, conservation of biodiversity | UO1: To develop an understanding among the students about the concept of ecosystem.<br>UO2: To acquaint the students with the structure of the ecosystem.<br>UO3: To instill in them the values of safeguarding the ecosystem.<br>UO3: To acquaint the students about different types of factors of ecosystems such as biotic and abiotic.<br>UO4: To introduce the students about the different types of biodiversity at national and global level. | Course Objective:<br>To sensitize and create awareness about Ecology, renewable energy and different Environmental Issues.<br>CO1: To develop an understanding of the structure and functioning of the ecosystems.<br>CO2: To gain insights about the concept of pollution, climate change and sustainable development<br>CO3: To understand the relevance of renewable energy sources and conservation of biodiversity |



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| **2. Pollution and climate change**<br>**Environmental Pollution:**<br>Definition, Cause, effects and control measures of- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Role of an individual in prevention of pollution. Pollution case studies.<br>**Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Sustainable development:** Concept, basic principles of sustainable development, post - brundtland world. roots of sustainability, Indicators, paradigm towards new discipline-sustainability science. | UO1: To make the students understand the importance of safeguarding the environment from pollution.<br>UO2: To acquaint the students about types of pollution and measures to control the same.<br>UO3: To make them understand about the severity of climate change and ways to live sustainably. | |
| **3. Renewable Sources of energy**<br>**Introduction:**<br>Renewable and Non-renewable resources. The need for a sustainable lifestyle.<br>**Energy resources:** Types of energy Non renewable energy - Oil, coal and its environmental impacts.<br>**Renewable energy:** Hydroelectric power, Solar energy, Biomass energy, Biogas, Wind power and Geothermal energy.<br>**Biogas technology:** Biogas plant & types, biodigester. Biogas- composition, production and factors affecting production and uses.<br>**Biofuels:** Ethanol production, Microbial hydrogen production, Biodiesel, Petrocrops. | UO1: To make the students understand about renewable and non renewable resources.<br>UO2: To explain the importance to students about sustainable living.<br>UO3: To explain the types of renewable resources and use in daily life.<br>UO4: To teach and make them understand about the production and use of biofuels, ethanol production, microbial production, biodiesel, etc. | |

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S. Y. B.Sc. BIOTECHNOLOGY Semester – III A.Y. 2023-2024

USBT301 BIOPROCESS TECHNOLOGY

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Fermentor design, media and sterilization** | UO1: To understand the types of fermentor.<br>UO2: To highlight roles of media components, carbon and nitrogen source.<br>UO3: To know concepts of sterilization of fermentor and its media. | Course objective: The objective of this course is to understand the basics skills applied in fermentation technology and build a foundation for more advanced studies in bioprocess technology.<br>1. To develop an understanding of the various aspects of bioprocess technology.<br>2. To develop skills associated with screening of industrially important strains.<br>3. To understand principles underlying design of fermenter and fermentation process. |
| **UNIT II Inoculum development and process parameters** | UO1: To study concepts of bacterial and fungal inoculums.<br>UO2: To highlight strategies of scaleup and scale down process.<br>UO3: To gain insight into detailed steps in monitoring of variables. | |
| **UNIT III Fermentation processes-1** | UO1: To impart knowledge about the design of a fermentor<br>UO2: To gain insight about the fermentation media<br>UO3: To discuss about sterilization and the process parameters<br>UO4: To acquaint students about the types of fermentation.<br>UO5: To study the representative fermentation processes . | |

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## USBT302 MEDICAL MICROBIOLOGY

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I General Bacteriology and Bacteria as Human pathogen, Host parasite interactions** | UO1: To discuss the host parasite relationship<br>UO2: To gain insight about infection<br>UO3: To gain knowledge about diseases | Course objective:- The objective of this course is to gain insight into disease factors and processes and diseases caused by microorganisms.<br>1. To list the factors playing a role in causing a disease gain.<br>2. To discuss the various aspects of systemic infections including causative agents, symptoms and prophylaxis.<br>3. To gain the technical capability of handling, isolating and identifying various bacteria. |
| **UNIT II Causative organisms-1** | UO1: To acquaint the students with S. aureus<br>UO2: To study S. pyogenes<br>UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae<br>UO4: To gain knowledge about infections caused by E. coli. | |
| **UNIT III Causative organisms – 2** | UO1: To study the GI tract infections caused by Salmonella and Shigella<br>UO2: To study the sexually transmitted diseases<br>UO3: To discuss nosocomial infections | |

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**USBT303 APPLIED CHEMISTRY-1**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Organic chemistry** | UO1: To study about the different types of organic reactions and their applications<br>UO2: To study about the role of essential and non essential metal ions in biological systems and their significance.<br>UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes<br>UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin.<br>UO5: To study about the metal complexes used in medicines. | Course objective:- The objective of this course is to have a firm foundation in the fundamentals and applications of organic and green chemistry.<br>1. To develop an understanding of the different aspects of organic and green chemistry.<br>2. To discuss the role of organic compounds in biology and synthesis of organic compounds.<br>3. To discuss the role of green chemistry and its application in industry. Understand the basic concept of electrophoresis |
| **UNIT II Chromatography and centrifugation** | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same. | |
| **UNIT III Electrophoresis: Electrophoretic Techniques** | UO1: To get an overview about principles of electrophoresis of different types with suitable examples.<br>UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples.<br>UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis. | |

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**USBT304 FUNDAMENTALS IN BIOPHYSICS**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Optics and Microscopy** | UO1: To learn about the properties of light such as reflection, refraction and their laws and applications.<br>UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum.<br>UO3: To learn about the different analytical techniques such as SEM, TEM, Immuno electron microscopy and Fluorescence microscopy and study about their importance in Biotechnology. | Course objective:- The objective of this course is to have a firm foundation in the fundamentals and applications of current biophysical theories.<br>1. To develop an understanding of the different aspects of classical physics.<br>2. To be able to relate principles of physics to applications and techniques in the field of biology such as microscopy, spectroscopy and electrophoresis |
| **UNIT II Heat, Sound, Magnetism and Fluid Dynamics** | UO1: To understand the concept of heat and temperature and methods of transfer of heat. Also to study about the different thermometers and their applications.<br>UO2: To study about sound and their types based on their properties such as frequencies and understand the applications.<br>UO3: To study about viscosity, surface tension and other surface phenomenon with their application in Biological Sciences | |
| **UNIT III Spectroscopy** | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |

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**USBT305 IMMUNOLOGY**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Cell and organs of immune system, Complement system** | UO1: To discuss haematopoiesis<br>UO2: To acquaint students with the cells and organs of the immune system<br>UO3: To discuss complement system - types, biological effects and deficiencies | Course objective:- The objective of this course is to familiarize students with the immune effector mechanisms and various immunotechniques.<br>1. To understand the role of different types of cells, effector molecules and effector mechanisms in immunology.<br>2. To understand the principles underlying various immunotechniques. |
| **UNIT II MHC and Antigen presentation pathways, TCR/BCR, T cell and B cell Activation.** | UO1: To learn the mechanism of T-cell receptor's activation with its structure.<br>UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II.<br>UO3: To study the mechanism of B-cell receptor's activation with its structure and its interaction with T-cell. | |
| **UNIT III Immunotechniques** | UO1: To acquaint students with the precipitation reactions<br>UO2: To acquaint students with the agglutination reactions<br>UO3: To discuss alternatives to Antigen-Antibody Reactions | |

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**USBT306 MOLECULAR BIOLOGY-III**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Transcription** | UO1: To study the intricate mechanism of Transcription in both prokaryotes and Eukaryotes<br>UO2: To illustrate the details of initiation, elongation and termination of transcription<br>UO3: To develop a brief understanding of the types of polymerases and promoters<br>UO3: To demonstrate the mechanism of splicing and RNA editing | Course objective:- The objective of this course is to have an insight into the mechanism of gene expression and regulation. 1. To discuss the mechanisms associated with gene expression at the level of transcription and translation.<br>2. To discuss the mechanisms associated with regulation of gene expression in prokaryotes |
| **UNIT II Translation** | UO1: To discuss the genetic code, its nature and how it was deciphered<br>UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination.<br>UO3: To demonstrate the various post-translational modifications | |
| **UNIT III Regulation of gene expression in Prokaryotes and Viruses** | UO1: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp<br>UO2: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses<br>UO3: To discuss the various operons in Eukaryotes and the methods of gene silencing | |

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**USBT307 BIOSAFETY**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Introduction to biosafety, GLP** | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | Objective: Learner should understand the concept of GLPs. Learn about routes of microbial contaminants and assays to detect contamination.<br>1. To document laboratory work, calibration records and prepare SOPs.<br>2. To identify the role of the Biosafety Professional in Biomedical Research Laboratories |
| **UNIT II Biosafety in diagnostics labs** | UO1: To demonstrate good diagnostic practices and procedures.<br>UO2: To study strategies involved in decontamination and waste management.<br>UO3: To highlight key features of health transport and maintaining records, training. | |
| **UNIT III Detection and testing of contaminants** | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |

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S. Y. B.Sc. BIOTECHNOLOGY Semester – IV A.Y. 2023-2024

**USBT401 MEDICAL BIOTECHNOLOGY**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Viral and fungal diseases** | UO1:To study pathogenesis of different viral diseases.<br>UO2:To study pathogenesis of different fungal diseases.<br>UO3:To study diseases of different viral and fungal diseases examples. | Course objective:- Learner should • Comprehend pathogenesis and diagnosis process • Understand mechanism of drug action and mode of drug resistance.<br>1. To Demonstrate knowledge for infectious agents and drug action mechanisms<br>2. To identify drug resistance problems in disease treatment. |
| **UNIT II Chemotherapeutic agents I** | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To study the concepts related to antimicrobial assays like MIC, MLC. | |
| **UNIT III Chemotherapeutic agents II** | UO1: To discuss the use and misuse of antimicrobial agents<br>UO2: To acquaint the students with antifungal and antiviral drugs<br>UO3: To gain insight into the mechanisms of drug resistance | |

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## USBT402 CELL BIOLOGY AND CYTOGENETICS

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Cytoskeleton** | UO1: To illustrate significance of microtubules as dynamic cytoskeleton elements with its structure and associated motor proteins.<br>UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin.<br>UO3: To demonstrate the structure, function and different types of intermediate filaments. | Course objective:- The objective of this course is to have a firm foundation in the fundamentals of cell biology and cytogenetics.<br>1. To develop an understanding of the cytoskeleton and cell membrane.<br>2. To discuss the structure of chromosomes and types of chromosomal aberrations.<br>3. To discuss the principles underlying sex determination, linkage and mapping. |
| **UNIT II Cell membrane** | UO1: To understand the principles of membrane transport with examples.<br>UO2: To study different types of cell-cell and cell extracellular matrix junctions.<br>UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition. | |
| **UNIT III Cytogenetics** | UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number.<br>UO2: To analyze the mechanism of sex determination and linkage.<br>UO3: To illustrate the fundamental concepts of linkage, crossing over and chromosomal mapping. | |

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**USBT403 APPLIED CHEMISTRY-2**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Synthesis of organic compounds** | UO1: To study about the different types of synthesis in organic reactions.<br>UO2: To understand the criteria for synthesis that can provide a good yield.<br>UO3: To study the green methods in organic synthesis. | Course objective:- The objective of this course is to have a firm foundation in the fundamentals and applications of current chemical theories for the physical world.<br>1. To develop an understanding of the different aspects of analytical chemistry.<br>2. To gain knowledge of natural product chemistry and related acquired skills.<br>3. To gain an understanding of basic concepts in polymer chemistry and nanomaterials. |
| **UNIT II Natural product chemistry and green chemistry** | UO1: To understand the need for green chemistry in today's day and age.<br>UO2: To study the principles of green chemistry.<br>UO3: To study and understand about the green materials such as reagents, solvents, catalysts, | |
| **UNIT III Nanotechnology** | UO1: To study fundamentals of nanomaterials and nanoparticles.<br>UO2: To highlight features of nanofilms and synthesis of nano materials.<br>UO3: To study applications of nanomaterials. | |

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**USBT404 BIOCHEMISTRY**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Carbohydrate Metabolism, ETS and Energy Rich Compounds Carbohydrate Metabolism :** | UO1: To study carbohydrate metabolism with different pathways such as glycolysis, Fermentation, pentose phosphate pathway, TCA and its energetics, regulation and inhibitors.<br>UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors.<br>UO3: To demonstrate the significance of ATP and other energy rich molecules. | Course objective:- • Understand the order of reactions involved in carbohydrate, amino acid and lipids metabolism. • Learn how the metabolism pathways are regulated at molecular level.<br>1. To be able to illustrate the metabolism of carbohydrates, amino acids and lipids through various metabolic pathways.<br>2. To be able to undertake investigations and perform analysis that provide information about metabolic disorder. |
| **UNIT II Amino acid metabolism** | UO1: To highlight catabolism of amino acid pathways and its regulation.<br>UO2: To study biosynthesis of key hormones and regulators from amino acids.<br>UO3: To analyze deamination, transamination and reactions of urea cycle along with regulation and disorders. | |
| **UNIT III Lipid metabolism** | UO1: To learn mobilization and transport of fatty acids.<br>UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation.<br>UO3: To study ketone body breakdown pathway and highlight catabolism of ketone bodies, odd chain fatty acids | |

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**USBT405 MOLECULAR DIAGNOSTICS**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Basics of molecular diagnostics** | UO1: To develop an in-depth understanding of the brief history of the diagnosis at the molecular level<br>UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins<br>UO3: To analyze and apply the various hybridization techniques such as the blotting methods. | Course objective:- The objective of this course is learning and understanding molecular techniques and utilizing these techniques in diagnosis.<br>1. To gain an understanding of the basic principles used in molecular diagnosis.<br>2. To gain critical thinking and analytical skills to understand new diagnostic methods.<br>3. To apply the knowledge and skills gained in the course should be useful in developing new diagnostic kits. |
| **UNIT II Nucleic acid amplification methods** | UO1: To discuss amplification technique such as the working of PCR<br>UO2: To develop a brief understanding on the various modifications of PCR<br>UO3: To understand the concept of ligase chain reaction | |
| **UNIT III Molecular biology based diagnostics** | UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique.<br>UO2: To briefly discuss the various methods of molecular diagnostics for infectious diseases.<br>UO3: To understand the need of genetic counselling by discussing case studies and to also discuss the ethical social and legal issues associated with genetic testing. | |

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## USBT406 BIOINFORMATICS AND BIOSTATISTICS

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Introduction to Computers and Biological Databases** | UO1: To understand the working principles of computers and the internet.<br>UO2: To state the applications biological databases and its classification.<br>UO3: To analyse the applications of genome information resources and protein structure visualization softwares. | Course objective:- The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.<br>1. To gain an understanding of the basic concepts of Bioinformatics and Biostatistics.<br>2. To understand the tools used in bioinformatics.<br>3. To apply the various statistical tools for analysis of biological data. |
| **UNIT II BLAST and sequence alignment** | UO1: To introduce the concepts of sequencing technique such as BLAST and its types<br>UO2: To study the various alignment methods, namely, global and local<br>UO3: To demonstrate the concept of multiple sequencing alignment and it's associated terminologies | |
| **UNIT III Biostatistics** | UO1: To understand the theory and solve problems based on correlation and regression analysis.<br>UO2: To study the test in studying statistical hypothesis.<br>UO3: To study and solve problems based on z-test, T-test and Chi square test. | |

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**USBT407 RESEARCH METHODOLOGY**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **UNIT I Introduction to Research Methodology and Research Problem** | UO1: To study the meaning, criteria, and objectives of good research.<br>UO2: To learn different types of research and its significance<br>UO3: To identify good research question, methods involved to solve it and challenges faced by researchers while approaching research problem. | Course objective:- The objective of this course is to develop research aptitude, logical thinking and reasoning.<br>1. To understand basic principles of research methodology and identify a research problem.<br>2. To understand a general definition of research design.<br>3. To identify the overall process of designing a research study from its inception to its report. |
| **UNIT II Research Design, Data Collection and processing** | UO1: To understand the necessity of effective research design and its principles.<br>UO2: To demonstrate mechanism of formulating a research plan.<br>UO3: To study different methods of data collection and its applications. | |
| **UNIT III Interpretation and Report Writing** | UO1: To introduce the concept of data interpretation.<br>UO2: To learn principles of report writing and its types.<br>UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report. | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER V (A.Y. 2022-23)

**USBT501 Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cell cycle | UO1: To distinguish between the prokaryotic and eukaryotic cell cycle highlighting the role of MPF and discuss early embryonic cell cycle.<br>UO2: To analyse the significance of yeast's genetics in regulation of cell cycle.<br>UO3: To learn different apoptosis pathways along with regulation of cell division in multicellular animals. | By the end of the course the student will be able to:<br>Gain knowledge about the cell multiplication and death at molecular level.<br>CO1. Understand the molecules involved in cell signaling.<br>CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development.<br>CO3. Gain insight into the biology of cancer cells. |
| 2. Cell Signaling | UO1: To understand the concepts of cell signaling and its types, and G-protein linked cell surface receptor signaling with suitable examples.<br>UO2: To study signaling via Enzyme linked receptors with suitable examples.<br>UO3: To learn principles of target cell adaptation and co-relating computer based signaling network with<br>biological signaling. | |
| 3. Developmental Biology | UO1: To study the importance of developmental biology as an multidisciplinary science along with<br>model organisms.<br>UO2: To elaborate different stages on development and germ layers.<br>UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern<br>formation and morphogenetic movements. | |

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| 4. Cancer Biology | UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process.<br>UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer.<br>UO3: To gain insights about latest techniques and methodology of cancer diagnosis and cancer prevention. | |

**USBT502 Medical Microbiology and Instrumentation**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Virology | UO1: To study properties of viruses along with its structure, classification and taxonomy.<br>UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.<br>UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples.<br>UO4: To study mechanisms of cellular destruction caused due to viral infections with suitable examples and highlighting the significance of novel virus-like species; viroids and prions. | By the end of the course the student will be able to:<br>CO1. Learn th, different type of virus cultivation and enumeration<br>CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.<br>CO3. Get an insight into the various spectroscopic methods used in biological studies.<br>CO4. Understand the principle and applications of chromatographic and tracer techniques. |
| 2. Chemotherapeutic drugs | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To gain insight into the mechanisms of drug resistance<br>UO4: To discuss the use and misuse of antimicrobial agents<br>UO5: To acquaint the students with antifungal and antiviral drugs | |

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| 3. Spectroscopy | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |
| 4. Bioanalytical techniques | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same | |

**USBT503 Genomics and Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetic engineering of plants | UO1: To study the methodologies of genetic engineering with Ti plasmid vectors<br>UO2: To demonstrate the various methods of artificial gene transfer<br>UO3: To learn the types of vectors and how is it used in the improvement of seed quality | By the end of the course the student will be able to:<br>CO1. Use molecular biology tools and techniques in the field of biotechnology.<br>CO2. Gain knowledge regarding recent developments in genome sequencing and editing.<br>CO3. Understand the basis of gene cloning and development of transgenic animals and plants.<br>CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms. |

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| 2. Transgenic Animals | UO1: To understand the development of transgenic mice with the aid of various techniques such as the retroviral method, DNA microinjection, ES, cre-loxp etc.<br>UO2: To gain insights about the various vectors used for animal<br>UO3: To briefly discuss the method of cloning livestock and the concept of green fluorescent fish as well as transgenic fish | |
| 3. Tools in Molecular biology | UO1: To study in-depth the various cloning vectors, its origin and the applications<br>UO2: To discuss and develop an understanding on the various isolation methods, restriction digestion, blotting techniques etc.<br>UO3: To gain knowledge about the various recombinant selection methods and hybridization techniques<br>UO4: To understand the cloning strategies and the construction of DNA libraries along with the concepts of chromosome walking and jumping<br>UO5: To combine the overall learnings and develop an aptitude for its application in various fields | |
| 4. Gene sequencing and editing | UO1: To study the various sequencing techniques<br>UO2: To focus on the human genome mapping in-depth<br>UO3: To understand the various gene editing tools such ZNF, TALENS, CRISPER/cas | |

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USBT 504 Marine Biotechnology

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Marine Biotechnology- Introduction & Bioprospecting | UO1: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats.<br>UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same.<br>UO3: To study diversity of compounds obtained from other marine organisms which are of commercial and ecological value. | By the end of the course the student will be able to:<br>1. Gain insight in the field of marine biotechnology.<br>2. Describe different marine products which can be used as pharmaceuticals.<br>3. Discuss marine functional foods and nutraceuticals and its applications.<br>4. Elaborate on marine bioresources and cosmetics and their applications. |
| 2. Marine Drugs and Enzymes | UO1: To describe different natural products from marine resources and their challenges<br>UO2: To elaborate on marine microbial enzymes.<br>UO3: To describe different pharmaceutical compounds obtained from marine organisms. | |
| 3. Marine Functional foods and Nutraceuticals | UO1: To discuss marine functional foods<br>UO2: To study marine derived ingredients with biological properties<br>UO3: To acquaint the students with marine nutraceuticals | |
| 4. Marine Bioresources and cosmetics | UO1: To gain insight into marine bioresources, marine secondary metabolites, marine proteins, marine lipids<br>UO2: To discuss cosmetics from marine sources<br>UO3: To acquaint the students with products and treatments based on marine resources | |

**Applied Component: Biosafety**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to biosafety | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | CO1: To introduce students to the concepts of biosafety.<br>CO2: To discuss the significance of good lab practices used in the biotechnology industry and research.<br>CO3: To state the possible contaminants in different samples.<br>CO4: To study the applications of rDNA technology and importance of bioethics. |
| 2. GLP | UO1: To discuss the concept of GLP<br>UO2: To acquaint the students with the guidelines of GLP<br>UO3: To gain insight into documentation of laboratory work<br>UO4: To gain knowledge about the calibration and validation methods<br>UO5: To acquaint the students with audits and audit reports | |
| 3. Detection and testing of contaminants | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |
| 4. Biosafety in Biotechnology | UO1: To study the concepts on biosafety in Biotechnology<br>UO2: To discuss rDNA technology<br>UO3: To acquaint the students with regulation of food and food ingredients<br>UO4: To learn about genetically engineered crops<br>UO5: To study about the contemporary issues in Bioethics | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER VI (A-Y. 2022-23)

**USBT601 Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Protein Biochemistry | UO1: To study protein's structure highlighting the principles of denaturation and folding.<br>UO2: To Study the protein's function with suitable examples along with protein purification methods.<br>UO3: To learn the complementary interactions between proteins and ligands with suitable examples.<br>UO4: To briefly understand the mechanism of how the protein's interaction is affected by energy with suitable examples. | CO1. To explain in detail various metabolic pathways, fate and energy production efficiency of carbohydrate and lipid metabolism.<br>CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders.<br>CO3. To study the importance of vitamins, their sources, functions, bioactivity and associated disorders. |
| 2. Metabolism | UO1: To illustrate pathway of bacterial cell wall synthesis.<br>UO2: To learn the metabolic pathways of starch and sucrose and glycogen synthesis and its regulation by various factors.<br>UO3: To demonstrate the reactions of Cholesterol synthesis pathway, its regulation and highlight the pathology of cardiovascular diseases. | |
| 3. Endocrinology | UO1: To understand the classification of hormones into group i and ii and study characteristics of hormones released by anterior and posterior pituitary glands.<br>UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex.<br>UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads. | |

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| 4. Nutrition | UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins.<br>UO2: To explain functions and mode of action of minerals in metabolism.<br>UO3: To highlight the clinical significance of Malnutrition and overnutrition with suitable examples. | |

**USBT602 Industrial Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Dairy technology | UO1: To study milk - normal flora, changes in raw milk and enumeration<br>UO2: To discuss dairy technology preservation methods<br>UO3: To gain insight into starter cultures<br>UO4: To gain knowledge about the different fermented products | CO1: To introduce to various downstream processing technologies for extraction and purification of biological products produced using Bioprocess technology.<br>CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation.<br>CO3: To gain insight in the various processes involved in production of commercially available dairy products.<br>CO4: To have an in-depth understanding of downstream processes. |
| 2. Down-stream Processing (DSP) | UO1: To study DSP<br>UO2: To discuss foam separation and types of precipitation<br>UO3: To gain insight about filtration, centrifugation and chromatography<br>UO4: To describe the cell disruption methods<br>UO5: To acquaint the students about crystallization and whole broth processing | |

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| 3. Fermentation process | UO1: To study inoculation development in bacteria and fungi<br>UO2: To discuss scale up and scale down<br>UO3: To learn fermentation processes of different fermentation products<br>UO4: To discuss biotransformation | |
| 4. QA-QC | UO1: To study the concept of GMP and requirements for GMP implementation<br>UO2: To gain insight into the documentation of GMP practices<br>UO3: To learn the concept of QC and requirements for implementing QC<br>UO4: To acquire knowledge of QA concepts and requirements for implementing the same | |

**USBT603 Basic Pharmacology and Neurochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. General principles of Pharmacology | UO1: To introduce and develop and in-depth understanding about the basics of pharmacology and the mechanism of drug action<br>UO2: To aid in the understanding of drug receptors and its respective responses<br>UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response<br>UO4: To study the concept of effective dose and lethal dose<br>UO5: To gain insights about the potency, intrinsic activity and the phenomenon of drug antagonism | CO1. To understand principles of pharmacology and its role related to biological activity of drugs in the system.<br>CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity.<br>CO3. To understand the effect of allergen, pesticide on systemic physiological functions. Also to discuss steps to be taken in case of nonmedical misuses of chemicals and bioterrorism.<br>CO4. To study in details the structure and functions of neurons and glial cells, mechanism of action potential, role of various channels , and effects of neurotransmitters and neurotoxins |

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| 2. Drug Absorption and Distribution | UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it<br>UO2: To study the absorption of through from lungs and skin<br>UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug<br>UO4: To demonstrate the binding of drugs and also the various physiological barriers. | |
| 3. Basic Toxicology and Regulatory Toxicology | UO1:To understand all the background definitions in-depth<br>UO2: To understand and distinguish between the allergic responses, side effects and adverse effects<br>UO3: To gain knowledge about poisonings and its types<br>UO4: To demonstrate about specific poisons<br>UO5: To discuss about the non-medical use of drugs and incapacitating agents | |
| 4. Neurochemistry | UO1: To understand the anatomy and functioning of the human brain<br>UO2: To demonstrate about the neuronal pathways and the working of nerve impulses<br>UO3: To understand the mechanism of neuronal excitation and inhibitions<br>UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters. | |

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**USBT604 Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Renewable sources of energy | UO1: To get an overview of different renewable sources of energy and its applications.<br>UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications.<br>UO3: To study mode of action, advantages and significance of biofuels with suitable examples. | CO1. To impart knowledge regarding management of industrial, storm and hazardous waste.<br>CO2. To study biological processes used to treat effluent from industries.<br>CO3. To study different methodologies to treat solid and liquid waste from different industries.<br>CO4. To understand the importance of biofertilizers, its types, usage and applications in sustainable agriculture. |
| 2. Industrial effluent treatment | UO1: To study various biological processes involved in treatment of industrial effluents with suitable examples.<br>UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors.<br>UO3: To understand principles of biodegradation with suitable examples.<br>UO4: To analyse the applications of enzymes and microbes used for biodegradation. | |
| 3. Wastewater treatment | UO1: To identify the pollutants causing water pollution and to study about the microorganisms used in its treatment.<br>UO2: To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.<br>UO3: To learn about the heavy metals that cause pollution in water bodies and study about the micro-organisms used for the treatment along with their mechanism | |
| 4. Hazardous waste management | UO1: To learn about water pollution wrt hazardous waste produced by petrochemicals, and manufacturing Industries,<br>UO2: To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries.<br>UO3: To highlight the importance of water treatment due to oil spillage, other green deposits | |

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**Applied Component: Agribiotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Precision Agriculture and Agriculture systems | UO1: To introduce students to different mechanisms of agriculture systems and greenhouse technology.<br>UO2: To elaborate the design, media and applications of greenhouse irrigation systems.<br>UO3: To discuss the significance of phytotrons and precision cultivation systems. | CO1: To get an overview about precision agriculture and management of agriculture systems.<br>CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress.<br>CO3: To highlight the applications of molecular markers used in plant breeding.<br>CO4: To state the eco-friendly use of biofertilizers and biopesticides. |
| 2. Plant stress biology | UO1:To study the concept of abiotic stress, its causes, sources and consequences with suitable examples.<br>UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples.<br>UO3: To understand the principles of biotic stress, its causes, sources and consequences with suitable examples. | |
| 3. Molecular Markers in Plant Breeding | UO1: To study the various genetic markers used in plant breeding technology<br>UO2: To learn the application of molecular markers<br>UO3: To discuss the techniques used in plant DNA barcoding | |
| 4. Biofertilizers and Biopesticides | UO1: To study biofertilizer<br>UO2: To discuss plant growth promotion by fungi<br>UO3: To gain insight about microbial inoculants<br>UO4: To study function of biopesticides. | |

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SHETH L.U.J. & SIR M.V. COLLEGE OF ARTS, SCIENCE & COMMERCE
DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

F. Y. B.Sc. BIOTECHNOLOGY Semester – I (A.Y. 2022-23)

**USBT101- Core Subject- Fundamentals of biotechnology-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. **Introduction and scope of biotechnology**<br><br>**What is biotechnology?** Biotechnology –an interdisciplinary biological science; Biotechnology – definition; History & Introduction to Biotechnology; Traditional and Modern Biotechnology; Scope and importance of biotechnology;<br>**World of Biotechnology-** Pharmaceutical Biotechnology, Plant Biotechnology, Industrial Biotechnology, Marine Biotechnology, Animal Biotechnology, Medical biotechnology, Environmental Biotechnology.<br>**Biotechnology in India** – Bio-business in India, booming biotech market, success story of biotech market, policy initiatives; and global trends; Biotechnology research in India.<br>**Potential of modern biotechnology;** Achievement of biotechnology; Prevention of misuse of biotechnology; Biotechnology Institutions in India (Publicand Private Sector); Public Perception of Biotechnology.**Case study: Serum Institute of India and its products.** | UO1: To understand the history of biotechnology.<br><br>UO2: To get familiarised with the scope and importance of biotechnology.<br><br>UO3: To gain insight about research and public perception of biotechnology. | Course Objective:<br><br>To familiarize the students with the potential and different applications of biotechnology.<br><br>CO1: To develop an understanding of developments in various fields of Biotechnology<br><br>CO2: To be able to relate to applications and benefits of Biotechnology in the fields of agriculture, livestock, human health and environment<br><br>CO3: To discuss the basics of fermentation. |

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| **2. Applications of biotechnology.**<br><br>Applications of biotechnology: -<br>**Agriculture:** GM fruits- GM papaya, GM tomato, Insect resistant transgenic plants – Bt cotton, Btbrinjal, Modifications in nutrient quality – starch, oilseed protein, golden rice<br>**Livestock:** Growth, disease resistance, product quality, pharmaceuticals and nutritional supplements, industrial applications.<br>**Human welfare:** Cloned genes for production of - Insulin; recombinant vaccine for Hepatitis B virus, Molecular farming, Edible vaccines and their advantages **Environment** - Pollution abatement through GMOs<br>**Bioethics, Case study:** Genetically modified microbes for bioremediation of oil spills in marine environments. | UO1: To highlight uses of biotechnology in agriculture.<br><br>UO2: To develop insight about insect resistant plants and livestock.<br><br>UO3: To study the role of biotechnology in human welfare and environment. | |
| **3. Fermentation technology.**<br>**Introduction to fermentation processes:**<br>Microbial biomass, Microbial enzymes, Microbial metabolites, recombinant products, transformation processes.<br>Development of fermentation Industry<br>**Component parts of fermentation process.**<br>**Screening:** Definition, Primary screening and its methods, Secondary screening and its methods<br>**Fermenter design:**<br>Definition of a fermenter, aerated stirred tank batch fermenter-Typical design, Construction materials used, aeration and agitation.<br>**Basic introduction to process parameters:**<br>Temperature control, Foam production and control pH measurement and control, CO2 and O2 control<br>**Fermentation medium:**<br>Basic requirements of industrial media, Criteria for use of raw materials in media, Examples of raw materials used, Growth factors, Water, Carbohydrate sources, Protein source<br>**Product: A typical process of Ethanol production and Antibiotic production** | UO1: To study the introduction to fermentation processes<br><br>UO2: To gain insight about the fermentor design<br><br>UO3: To understand the process parameters and fermentation medium<br><br>UO4: To study the production of ethanol and penicillin | |

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USBT102 -Core Subject- Microbiology-I

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1. Introduction to microbiology.**<br><br>**Fundamentals, History and Evolution of Microbiology:**<br>Discovery of Microorganisms, Conflict over spontaneous generation, Role of microorganisms in disease<br>**Classification:** The place of Microorganisms in the living world, Classification Whittaker's five kingdom classification, Introduction to Bergey's Manual, Groups of Microorganisms, Applications of microbiology in various fields<br>**Nutrition, Cultivation and Maintenance of microorganisms:** Nutritional categories of microorganisms, Design and Types of Culture Media, methods of isolation. | UO1: To gain insight into the history and evolution of microbiology<br><br>UO2: To study the classification of microorganisms<br><br>UO3: To gain knowledge about the nutrition, cultivation and maintenance of microorganisms | Course Objective:<br><br>To build firm foundation in microbiology, sterilization techniques and staining.<br><br>CO1: To develop an understanding of cultivation of microorganisms.<br><br>CO2: To develop skills towards use of microscopy and staining techniques<br><br>CO3: To understand the role of sterilization and disinfection in the field of microbiology |
| **2. Sterilization techniques**<br>**Introduction:**<br>Definition and concept of Sterilization and Disinfection.<br>**Types and Applications:**<br>Dry Heat, Steam under pressure Gases, Radiation and Filtration<br>**Chemical Agents and their Mode of Action:** Aldehydes, Halogens, Quaternary Ammonium Compounds, Phenol and Phenolic Compounds, Heavy Metals, Alcohol, Dyes, and Detergents.<br>**Disinfectant:**Ideal Disinfectant. Examples of Disinfectants and Evaluation of Disinfectant | UO1: To understand the definition concept of sterilization and disinfection<br><br>UO2: To study the different types and applications of sterilization<br><br>UO3: To gain knowledge about the chemical agents and their mode of action<br><br>UO4: To gain knowledge about disinfectants | |

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| **3. Microscopy and stains**<br>**Simple and Compound Microscope:** General principles of optics; various parts and their functions- objectives – numerical aperture, resolving power, depth offocus, working distance, aberrations; oculars; condensers.<br>**Dark Field Microscope; Phase Contrast Microscope and Fluorescent Microscope, TEM, SEM, Applications of microscopes**<br>**Stains and Staining Solutions-** Definition of Dye and Chromogen: acidic and basic dyes; functions and types of chromophore and auxochrome groups. Theories to explain staining. Definition and function of stain; mordant, intensifiers and fixative Natural and Synthetic Dyes. Simple Staining, Differential Staining – Gram staining and Acid Fast Staining with specific examples. | UO1: To gain knowledge about simple and compound microscope<br>UO2: To study the different types of microscopes and their applications<br>UO3: To gain insight about the stains and staining solutions | |

**USBT103 -Core Subject- Basic Chemistry-1**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Nomenclature and Chemical bonds.**<br>**Classification and Systematic Nomenclature of organic compounds** (few examples)<br>**Chemical Bonds:** Types and transition between the main types of bonding.<br>**Ionic Bond:** Nature of Ionic Bond, factors influencing the formation of Ionic Bond. Structure of NaCl and CsCl.<br>**Covalent Bond:** Nature of Covalent Bond, Types of covalent bond (Polar and Coordinate covalent bonds). Structure of CH4, NH3, H2O. Shapes of BeCl2, BF3.<br>**Hydrogen Bond:** Theory of Hydrogen Bonding and Types of Hydrogen Bonding (with examples of RCOOH, ROH, Salicylaldehyde, Amides and Polyamides). | UO1: To clear the concepts and basics of nomenclature.<br>UO2: To develop an understanding among students about the types of chemical bonds.<br>UO3: To acquaint the students with the different theories related to chemical bonds with the help of examples. | Course Objective:<br>To acquaint the students with basic concepts of Chemistry like nomenclature, chemical bonds, titrimetric, gravimetry, stereochemistry etc.<br>CO1: To develop an understanding of chemical bonds.<br>CO2: To develop skills towards use of titrimetric and gravimetric analysis<br>CO3: To be able to differentiate between chiral and achiral molecules and different enantiomers. |

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| 2. **Titrimetric and gravimetry.**<br>**Titrimetric Analysis:**<br>Titration, Titrant, Titrand, End Point, Equivalence Point,Titration Error, Indicator, Primary and Secondary Standards.Characteristics and examples.Types of Titrations – Acid –Base, Redox. Precipitation,Complexometric Titration. Acid – Base Titration – StrongAcid Vs Strong Base. Theoretical aspects of Titration Curveand End Point Evaluation.<br>Theory of Acid –Base Indicators, Choice and Suitability ofIndicators.<br>**Gravimetric Analysis:**<br>Solubility and Precipitation, Factors affecting Solubility,Nucleation, Particle Size, Crystal Growth, Colloidal State, Ageing/Digestion of Precipitate.Co-Precipitation and Post-Precipitation. Washing, Drying andIgnition of Precipitate. | UO1: To develop an understanding among students about terms related to titrimetry and gravimetry.<br>UO2: To explain the students about various types of titrations graphically and theoretically.<br>UO3: To develop an understanding among students about types and methods of gravimetric analysis and its applications. | |
| 3. **Stereochemistry**<br>**Isomerism:** Types of Isomerism: Constitutional Isomerism (Chain, Position and Functional) and Stereoisomerism, Chirality.<br>**Geometric Isomerism and Optical Isomerism:**Enantiomers, Diastereomers, and Racemic mixtures Cis-Trans,Threo, Erythro and Meso isomers. Diastereomerism (Cis-Trans Isomerism) in Alkenes and Cycloalkanes (3 and 4membered ring)<br>**Conformation:** Conformations of Ethane. Difference between Configuration and Conformation.<br>**Configuration:** Asymmetric Carbon Atom, Stereogenic/ Chiral Centers,Chirality Representation of Configuration by ¯Flying Wedge Formula<br>**Projection formulae:** Fischer, Newman and Sawhorse. The Inter-conversion of the Formulae. | UO1: To familiarize the students about types of projection formulae and their interconversions.<br>UO2: To acquaint them with the difference between conformation and configuration.<br>UO3: To teach them about the types of isomerism and solve problems based on that.<br>UO4: To acquaint the students with different types of nomenclature in stereochemistry such as R/S and solve problems based on the same. | |

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USBT104 -Core Subject- Biochemistry: Concept of Biomolecules-I

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Water, Standard solutions and Buffers.**<br><br>Structure, Properties and functions:<br>Water. **Preparation of standard Solutions:**<br>Concept and significance of Chemical and Biological solutions.<br>Normality, Molarity, Molality, Mole fraction, Mole concept, Solubility, Weight ratio, Volume ratio, Weight to Volume ratio, ppb, ppm, millimoles, milliequivalents (Numericals expected).<br>Primary and Secondary Standards: Preparation of Standard Solutions, Principle of Volumetric Analysis.<br>**Concept of pH:**<br>Buffer solutions –Concept of Buffers,<br>Derivation of Henderson -Hasselbach equation for Acidic and Basic buffers. Buffering capacity<br>**Biological buffers:**<br>Significance of biological buffers. pH of body fluids like blood and saliva. Blood buffer systems: E.g.: Carbonate, Acetate and Phosphate buffers. Protein buffers (Introduction) Significance of TRIS buffers (Introduction) | UO1: To clear concepts of water, solubility and volumetric analysis.<br><br>UO2: To learn theories of acids and bases and ionic product of water.<br><br>UO3: To gain insights about different buffer systems, with its equations and examples. | Course Objective:<br><br>To acquaint the students with different concepts of biomolecules.<br><br>CO1: To develop skills towards preparation of standard solutions in the laboratory.<br><br>CO2: To understand the role of buffers<br><br>CO3: To discuss the basics of carbohydrate and lipid biochemistry. |

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| **2.Basics of Carbohydrate Chemistry.**<br>Carbohydrates: Introduction, definition and general formula.<br>**Classification of carbohydrates:**<br>**Monosaccharides:**Two Families of Monosaccharides. Aldo series and keto series;(Triose - Glyceraldehyde and Dihydroxyacetone. Tetrose- Erythrose and Erythrulose. Pentose- Xylose, Xylulose, Ribose,Ribulose, Hexose- Glucose, Galactose, Mannose, Heptose sedoheptose and Sedoheptulose (structures to be taught )<br>Concept of Enantiomers, Mutarotation, Anomeric carbon andEpimers of glucose.<br>**Biologically important Derivatives of Hexoses:** Glucosamine,Gluconic acid, uronic acid, NAGA, NAMA<br>**Chemical reactions of monosaccharides**<br>**Concept of glycosidic bond.**<br>**Disaccharides:**Maltose, Lactose, Sucrose, Cellobiose (structures to be taught, biological significance, structure and bond type)**Polysaccharides:** Homopolysaccharides and Heteropolysaccharides; Structural and Storage Polysaccharides. E.g., of polysaccharides -: starch (amylose and amylopectin),Glycogen, Peptidoglycan, Cellulose, chitin (structure and bond type)Examples of Reducing and non reducing carbohydrates. Industrial applications of carbohydrates: Fermentation, Pharmaceutical and Food industry. | UO1: To study properties and classification of carbohydrates.<br>UO2: To understand structures, properties of various monosaccharides, disaccharides and polysaccharides.<br>UO3: To highlight concept of epimers, enantiomers and mutarotation. | |

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| **3.Basics of Lipid Chemistry**<br>**Introduction to Lipid Chemistry:** Definition and Biological functions of fats and Lipids. Definition of Fatty acids.<br>**Classification of Fatty acids: Saturated Fatty Acids:** C2- C20 (Examples with trivial name, Biochemical names and Structures)<br>**Unsaturated Fatty Acids:** Definition of MUFA and PUFA. C16- C20. Palmitolic, Oleic, Linoleic, Lenolenic, Arachidonic acid (Structures expected)<br>**Storage Lipids:** AcylGlycerols (Simple and Mixed)Mono, Di and Triacylglycerols. (Structures expected) **Properties of Triacylglycerols:** Hydrolysis, Saponification, Antioxidant, Rancidity, Acid number, RM number, Action of lipase.<br>**Structural lipids:** Phosphatidic acid and Membrane Phospholipids E.g.: Phosphatidylethanolamine, Phosphatidylserine, Phosphatidylcholine, Cardiolipin<br>**Action of Phospholipase**<br>**Steroids:** Definition and functions Eg: Cholesterol | UO1: To learn biological functions of lipids and fatty acids with its classification.<br>UO2: To study structures and properties of storage lipids.<br>UO3: To understand the significance of structural lipids and steroids. | |

USBT105 -Core Subject- Genetics

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Genetics fundamentals.**<br>**Introduction to genetic and sub-disciplines of genetics:** Transmission genetics, Molecular genetics, Population genetics and Quantitative genetics. **Basic Terminologies in genetics**<br>**Mendelian Genetics:**<br>Monohybrid Crosses and Mendel's Principle of Segregation. Representing crosses with a Branch Diagram. Confirming the principle of Segregation: The use of Test crosses. Dihybrid crosses and Mendel's Principle of Independent<br>Assortment.<br>**Extensions of and Deviations from Mendelian Genetic Principles:** Multiple Alleles - ABO Blood groups<br>Modifications of Dominance Relationships: Incomplete Dominance and Codominance. Essential Genes and Lethal Alleles.<br>Effects of the environment on Gene expression.<br>**Gene Interactions and Modified Mendelian Ratios:**<br>Epistatic and non-epistatic interactions.<br>**Mendelian Genetics in Humans:** Pedigree Analysis.<br>Examples of Human Genetic Traits | UO1 : To introduce Genetics and Sub-disciplines of Genetics.<br><br>UO2 : To understand Mendelian Genetics<br><br>UO3 : To know the Extensions and Deviations from Mendelian Genetics Principles.<br><br>UO4 : To understand Gene Interactions and Mendelian Ratios.<br><br>UO5 : To study Mendelian Genetics in Humans. | Course Objective:<br><br>To provide insight to students on fundamental concepts of Mendelian genetics, microbial genetics and<br><br>population genetics<br><br>CO1: To develop an understanding of fundamental concepts of mendelian genetics<br><br>CO2: To discuss the different processes in microbial genetics and their role in mapping genes<br><br>CO3: To understand the relevance of population genetics. |

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| 2. **Microbial genetics**<br>**Genetic analysis in Bacteria:**Prototrophs, Auxotrophs.<br>**Genetic Mapping in Bacteria by Conjugation:**<br>Discovery of Conjugation in E.coli, The sex factor F, High-Frequency Recombination Strains of E.coli, F' Factors, Using conjugation to map bacterial genes- Interrupted-mating. **Genetic mapping in bacteria by Transformation**<br>**Genetic mapping in Bacteria by Transduction:**<br>Bacteriophages - Lytic and Lysogenic pathway.<br>Transduction Mapping of Bacterial Chromosomes – Generalized Transduction and Specialized Transduction. | UO1 : To study the Genetic Analysis in Bacteria<br><br>UO2 : To understand the Genetic mapping in Bacteria by Conjugation.<br><br>UO3 : To understand the Genetic mapping in Bacteria by Transformation.<br><br>UO4 : To understand the Genetic mapping in Bacteria by Transduction.<br><br>UO5 : To know the Lytic and Lysogenic Pathway of Bacteriophages.<br><br>UO6 : To understand the transduction mapping of Bacterial Chromosomes | |
| **3.Population genetics.**<br>Genetic Structure of Populations:<br>Genotypic Frequencies and Allelic Frequencies,<br>Hardy- Weinberg Law and its Assumptions ,<br>Genetic Variations in Populations.<br>**Forces responsible for change in gene frequencies in population:**<br>Natural Selection., Genetic Drift, Migration,<br>**Speciation**<br>**Role of Population Genetics in Conservation Biology** | UO1 : To understand the Genetic structure of Populations.<br><br>UO2 : To know the forces responsible for the change in gene frequencies in population.<br><br>UO3 : To understand Speciation.<br><br>UO4 : To learn the role of Population Genetics in Conservation Biology | |

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**USBT106- Core Subject- Molecular biology-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Chromosome structure, composition and packing.**<br>The Composition and structure of DNA and RNA: Nucleotide and Nucleoside, Structure of nucleotides.<br>Structure of DNA. DNA double helix – Watson and Crick's Model. Structure of RNA. Types of RNA.<br>**Organization of DNA in chromosome:**<br>Viral and Prokaryotic Chromosomes. Eukaryotic Chromosomes. Histone and Non-histone proteins. Nucleosome Structure. Packaging of DNA into Chromosomes. Euchromatin and Heterochromatin. Centromeres and Telomeres<br>**Chromosome Banding Techniques.**<br>**Karyotype and Idiogram** | UO1 : To study the composition and structure of DNA and RNA.<br><br>UO2 : To learn the organization of DNA in chromosomes.<br><br>UO3 : To know chromosome banding techniques<br><br>UO4 : To develop Karyotype and Idiogram | Course Objective:<br>To build a firm foundation of molecular biology<br>CO1: To develop an understanding of structure and organization of the hereditary material<br>CO2: To diseuss the different processes involved in replication of DNA<br>CO3: To understand the relevance of physical, chemical and biological factors in mutations |
| **2. DNA replication**<br>Models of DNA Replication<br>Evidence of Semi-conservative DNA replication- Messelhson and Stahl's experiment, DNA Polymerases and its role. **DNA Replication in Prokaryotes**: E.coli Chromosome Replication, Semi-discontinuous replication. Bidirectional Replication of Circular DNA molecules. Rolling Circle Replication, **DNA Replication in Eukaryotes. Enzymes and proteins involved in DNA replication.** | UO1 : To study the models of DNA replication<br><br>UO2 : To learn DNA Replication in Prokaryotes.<br><br>UO3 : To learn DNA Replication in Eukaryotes<br><br>UO4 : To know enzymes and proteins involved in DNA Replication | |
| **3.Mutation And repair.**<br>**Definition and concept of Mutations:**<br>Classification of mutations, Types of Point Mutations, Types of Spontaneous and induced mutations, Mutagenesis and types of Mutagens. (Examples of Physical, Chemical and Biological Mutagens)<br>**DNA repair:** Photoreversal, Base Excision Repair, Nucleotide Excision Repair, Mismatch Repair, SOS Repair. | UO1 : To study the classification of mutations.<br><br>UO2 : To learn the concept of mutagenesis and types of mutagens<br><br>UO3 : To learn DNA Repair | |

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**USBT107 - Ability Enhancement Course-Communication skills**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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| 1. **Academic skills**<br>**Essentials of Grammar:** Parts of speech, Articles, Modals, Sentences and their types., Punctuation marks<br>**Employment Communication:** Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter, Email Writing<br>**Professional Presentation:** Nature of Oral Presentation, planning Presentation, Preparing the Presentation, Delivering the Presentation. **Job Interviews:** Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interview **Group Discussion:** Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits. | UO1: To teach the students about the importance of grammar and its applications in day to day life.<br>UO2: To prepare students for the corporate world by instilling in them skills and etiquettes.<br>UO3: To highlight the importance of communication skills and resume for their help in job interviews. | Course Objective:<br>To acquaint the students with different aspects of communication skills.<br>CO1: To develop an understanding of communication skills required to excel in real work environment and corporate life.<br>CO2: To gain insight into technical and non-technical qualities in career planning<br>CO3: To learn about Leadership, team building, decision making and stress management. |
| 2. **Soft skills**<br>Introduction to Soft Skills and Hard Skills,<br>**Personality Development:** Knowing Yourself, Positive Thinking, Johari's Window, Communication Skills, Non-verbal Communication, Physical Fitness<br>**Emotional Intelligence:** Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence<br>**Etiquette and Mannerism:** Introduction, Professional Etiquette, Technology Etiquette<br>**Communication Today:** Significance of Communication, GSC's 3M Model of Communication, Vitality of the Communication Process, Virtues of Listening, Fundamentals of Good Listening, Nature of Non-Verbal Communication, Need for Intercultural Communication, Communicating Digital World | UO1: To assist the students in personality building by guiding them into positive thinking and helping them in polishing their communication skills.<br>UO2: To develop a sense of understanding towards the importance of etiquettes and mannerisms.<br>UO3: To explain to the students about importance of communication skills with the help of models and examples. | |

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| **3. Professional skills**<br>**Creativity at Workplace**: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method<br>**Ethical Values**: Ethics and Society, Theories of Ethics, Correlation between Values and behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics.<br>**Capacity Building**: Need and Importance of Capacity Building, Elements of Capacity Building Zones of Learning Ideas for Learning Strategies for Capacity Building<br>**Leadership and Team Building**: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams<br>**Decision Making and Negotiation**: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts<br>**Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress | UO1: To teach students ethical values required at the workplace.<br>UO2: To instill in students the need and importance of capacity building.<br>UO3: To develop the qualities of team building and leadership among students.<br>UO4: To help students with stress management in everyday life. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

F. Y. B.Sc. BIOTECHNOLOGY Semester – II (A.Y. 2022 – 23)

USBT201 Core Subject- Fundamentals of biotechnology-II

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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| **1. Food Biotechnology**<br>**Introduction to food biotechnology:**<br>History of microorganisms in food science and key developments, Applications of biotechnology in fermented food products<br>**Introduction to Unit Operations and Processes:**<br>Basic unit operations, food processing & packaging<br>(canning & bottling), Production of cultures<br>**Fermented food products:**<br>Bread, Vinegar, Sauerkraut, Single Cell Protein (SCP),<br>Probiotics<br>**Food spoilage, food deterioration, food contamination**<br>**and Food Adulteration**<br>**Methods of food preservation**<br>**Indicators of Food Microbial Quality & Safety:**<br>HACCP, FSSAI & FDA | UO1: To study role of biotechnology in food processing and fermented food products.<br>UO2: To learn concepts of food spoilage and contamination.<br>UO3: To study indicators of food microbial quality and safety. | Course Objective:<br>To acquaint students with the applications of biotechnology in the field of food, medicine and<br>Fermentation.<br>CO1: To develop an understanding of the application of biotechnology in the food industry.<br>CO2: To gain insight into details of genetic engineering.<br>CO3: To discuss tools and techniques used in medical biotechnology |

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| **2. Medical biotechnology**<br>**Introduction to Medical Biotechnology and its applications**<br>**Vaccines**<br>Types of vaccines<br>General vaccine production<br>Large scale production of vaccine<br>Trends in Vaccines Research<br>Issues related to vaccine research<br>**Synthetic peptides as vaccine**<br>**Antibody Production**<br>**Gene therapy**<br>**Organ transplant cloning**<br>**Stem cells -Sources and applications** | UO1 : To study Vaccines.<br><br>UO2 : To study Antibody Production.<br><br>UO3 : To learn Gene Therapy<br><br>UO4 : To know the Organ Transplant Cloning.<br><br>UO5 : To introduce to Stem cells | |

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| **3.Genetic engineering**<br>**What is Genetic engineering:**<br>Definition and developments<br>What is gene cloning?<br>Strategy for cloning<br>How to clone a gene?<br>How to construct r DNA?<br>Source DNA [insert], Isolation of DNA from bacterial<br>cell, Introducing insert into cloning vector<br>**Enzymes in genetic engineering:**<br>Restriction endonuclease; DNA ligase; Enzymes to<br>modify ends of DNA molecules - exonuclease; endonuclease; S1 nuclease; alkaline phosphatase;<br>polynucleotide kinase; DNA polymerase and klenow<br>fragment; reverse transcriptase; terminal deoxynucleotidyl transferase<br>**Vectors:**<br>Role as agents of transfer<br>Features of plasmid vectors, Plasmid vectors - pBR322,<br>pUC<br>BAC<br>Plant virus vectors and Animal virus vectors<br>Shuttle vector; Expression vector<br>**Host cells:**<br>*E. coli; Bacillus subtilis; Saccharomyces cerevisiae*;<br>Xenopus oocytes; Mammalian fertilized egg cell<br>**Introducing vector into host:**<br>Prokaryote<br>Eukaryote<br>**Identification of recombinant clones.** | UO1 : To study Genetic Engineering<br><br>UO2 : To study enzymes in GE<br><br>UO3 : To learn Vectors<br><br>UO4 : To study how to introduce vector into host<br><br>UO5 : To study identification of rembinant clones. | |

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**USBT202 Core Subject Cell biology and Microbiology - II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1. Ultra-structure ofprokaryoticand eukaryotic cell.**<br><br>Ultrastructure of Prokaryotic Cell: Concept of Cell shape, size and arrangement. Bacterial structures external to cell wall: Flagella,Pilli, Fimbrine, Capsule, Slime Layer, Sheath<br>**Cell Wall (Gram Positive and Negative)**<br>**Structures internal to cell wall:** Cell Membrane, nucleoid, Cytoplasm and cytoplasmicinclusion bodies and vacuoles, Genetic Material spores and cysts.<br>**Ultrastructure of Eukaryotic Cell:**Cell wall; Plasma membrane, Cytoplasmic Matrix,Nucleus –Nuclear Structure, nuclear envelope, nucleoplasm, Nucleolus; cytoplasmic structures –cytoplasmic inclusions, cytoplasmic organelles -Endoplasmic Reticulum; Golgi Apparatus; Mitochondria; Chloroplasts; Ribosomes; Lysosome - Endocytosis, Phagocytosis, Autophagy; Peroxisomes.<br>**External Cell Coverings,** Cilia and Flagella<br><br>**Comparison of Prokaryotic and Eukaryotic Cells** | UO1: To study structures and cell organelles in prokaryotic cell with its functions.<br><br>UO2: To understand the structures and cell organelles in eukaryotic cell with its functions.<br><br>UO3: To diffrentiate between prokaryotic and eukaryotic cells. | Course Objective:<br><br>To build a firm foundation of concepts related to cell biology and microbiology<br><br>CO1: To discuss the ultrastructure, function and location of organelles in prokaryotic and eukaryotic cells.<br><br>CO2: To develop an understanding of microbial growth and enumeration<br><br>CO3: To gain insight in to the basics of virology |
| **2. Microbiology.**<br>**Microbial Growth**<br>Definition of Growth<br>Mathematical and expression of growth<br>Growth curve<br>Measurement of growth<br>Efficiency of growth yield<br>Synchronous growth<br>Effect of nutrient on growth rate<br>Continuous Culture of microorganisms<br>Chemostat and Turbidostat<br>**Enumeration of Microorganisms-** Direct and IndirectMethods<br>**Preservation and Maintenance of cultures** | UO1: To gain indepth knowledge about microbial growth<br><br>UO2: To study about enumeration of microorganisms<br><br>UO3: To understand about the preservation and maintenance of cultures | |

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| **3. Virology**<br>**Introduction to virology:** Historical perspective,<br>**General Characteristics of Viruses:** Host Range, Viral Structure- Nucleic Acid, Capsid and Envelope<br>General Morphology- Helical, Polyhedral, Enveloped, Complex.<br>**Taxonomy of Viruses**<br>**Viral Multiplication:** Multiplication of Bacteriophages and Animal Viruses<br>**Isolation, Cultivation, and Identification of Viruses:** Growing Bacteriophages and animal viruses in the Laboratory, Viral Identification<br>**Case studies-** TMV, Influenza COVID-19 (Self learning) | UO1: To gain knowledge about the general characteristics of viruses<br>UO2: To gain in depth knowledge about taxonomy and multiplication of viruses<br>UO3: To study the isolation, cultivation and identification of viruses | |

**USBT203 Core Subject Basic Chemistry-II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Thermodynamics**<br>Thermodynamics:<br>System, Surrounding, Boundaries<br>Sign Conventions,<br>State Functions, Internal Energy and Enthalpy:<br>Significance, examples.<br>(Numericals expected.)<br>**Laws of Thermodynamics and its Limitations:**<br>Mathematical expression.<br>Qualitative discussion of Carnot Cycle for ideal Gas and Mechanical Efficiency.<br>Laws of Thermodynamics as applied to Biochemical Systems.<br>**Concept of Entropy, Entropy for Isobaric, Isochoric and Isothermal Processes.** | UO1: To learn concepts of thermodynamics and its laws.<br>UO2: To understand principles of carnot cycle and its limitations.<br>UO3: To study principles of entropy for various processes. | Course Objective:<br>To acquaint the students with some core aspects of physical chemistry<br>CO1:To develop an understanding of thermodynamics<br>CO2: To learn about reaction kinetics and order of reaction.<br>CO3: To gain insight in to the details of oxidation and reduction reactions |

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| **2. Chemical Kinetics**<br>**Reaction Kinetics:**<br>Rate of Reaction, Rate Constant, Measurement of Reaction Rates Order & Molecularity of Reaction, Integrated Rate Equation of First and Second orderreactions (with equal initial concentration of reactants).(Numericals expected)<br>**Determination of Order of Reaction:**<br>a) Integration Method<br>b) Graphical Method<br>c) Ostwald's Isolation Method<br>d) Half Time Method. (Numericals expected). | UO1 : To learn concepts of rate of reaction, order and moleculnrity.<br>UO2: To understand rate equation.<br>UO3: To study methods for determining order of reaction. | |
| **3.Oxidation Reduction reactions.**<br>Principles of Oxidation & Reduction Reactions: Oxidising and Reducing Agents Oxidation Number, Rules to assign Oxidation Numbers with examples Ions like Oxalate, Permanganate and Dichromate.<br>**Balancing Redox Reactions:**<br>Ion Electron Method Oxidation, Reduction, Addition and Substitution & Elimination Reactions. | UO1 : To demonstate principles of oxidation and reduction reactions.<br>UO2: To study concept of oxidation number.<br>UO3: To learn to balance redox reactions. | |

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**USBT204 Core Subject Biochemistry: Concept of Biomolecules – II and Basic analytical techniques**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Proteins and amino acids**<br>**Amino acids:**<br>General introduction, Classification and structures,<br>properties (physical & chemical)<br>Amino Acids as drugs.<br>Titration Curve of Amino Acids.<br>Concept of Isoelectric pH, Zwitterion<br>**Reactions of Amino Acids:**<br>Sorenson's Titration, Ninhydrin Test **Proteins:**<br>Introduction, definition and functional classification.<br>**Classification of Proteins:**<br>Simple- Fibrous and Globular<br>Conjugated- Nucleoprotein, Lipoprotein, Glycoprotein,<br>Phosphoprotein, Chromoprotein, Metalloprotein,<br>Derived- Primary and Secondary<br>**Peptide bond:** Features Example of Dipeptide, tripeptide, Nonapeptide e.g., Oxytocin, Vasopressin Amino acid composition of Bovine Cytochrome C andBovine Chymotrypsinogen<br>**Three-dimensional Structure of proteins:**<br>Concept of Monomeric, dimeric and multimeric proteins<br>Primary structure - Peptide linkage, Native<br>Secondary structure - Alpha Pleat and Beta fold; Spatialarrangements of adjacent amino acid residues<br>Tertiary structure – Three Dimensional arrangement<br>Quaternary structure Di and Multimeric proteins E.g., structure of human Insulin<br>**Properties of proteins:**<br>Solubility, Molecular weight, Shape, Iso electric pH, Salting out of proteins for purification.<br>**Protein Denaturation and Folding.** Denaturing agents and properties of denatured proteins. | UO1: To gain insight about classification, properties, structure and function of amino acids.<br><br>UO2: To understand nature of peptide bond and 3D structure of proteins.<br><br>UO3: To study concepts of protein denaturation and folding. | Course Objective:<br><br>To build a firm foundation on the fundamentals of biochemistry and analytical techniques.<br><br>CO1: To learn about fundamental structures and functions of amino acids & proteins.<br><br>CO2: To develop an understanding of protein biochemistry and enzymology.<br><br>CO3: To develop skills towards the principle, working and applications of different analytical techniques. |

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| **2. Introduction to Enzymes**<br>**Properties of Enzymes**<br>Substrate, Optimum conditions, Co-substrate, Coenzyme,<br>Cofactors<br>**Classification and Nomenclature** ( one reaction per<br>class)Mechanism of Enzyme Action, Active Sites, Enzyme<br>Specificity,<br>**Factors affecting enzyme activity** (Effect of pH, Temperature, Substrate Concentration, Enzyme concentration)<br>**Enzyme Kinetics:**<br>Derivation of Michaelis - Menten Equation, Lineweaver - Burk plot, Concept of km<br>**Types of Enzyme Inhibitions:**<br>Irreversible & Reversible (Competitive, Uncompetitive,<br>Non-Competitive)<br>**Isoenzymes** (LDH, Alkaline Phosphatase, Creatine Phosphokinase)<br>Allosteric Modulators, Co-Factors, Zymogens, Enzymeunits<br>Enzymes as Biomarkers and diagnostic tools. (SGPT,SGOT, LDH, CPK)**Industrial Applications of Enzymes** | UO1: To learn properties, classification and nomenclature system of enzymes.<br><br>UO2: To demonstrate factors affecting enzyme activity.<br><br>UO3: To understand concepts of enzyme kinetics and enzyme inhibitors along with industrial applications of enzymes. | |
| **3.Basics of Analytical techniques**<br>**Methods of Separation:**<br>Precipitation, Filtration, Distillation and SolventExtraction<br>**Analytical Techniques**<br>**Chromatography:**Definition, Principles, Chromatographic performanceparameters, Types Paper Chromatography, Thin Layer Chromatography,Column Chromatography (Principle and Applications)**Spectroscopy - Colorimetry:**Properties of electromagnetic radiation, interaction withmatter, lasersColorimetric assays - Principle, Beer-Lambert's Law,Measurement of Extinction, Derivation of E = kcl,<br>Limitations of Beer-Lambert's Law, Filter Selection, Examples of colorimetric and UV absorption assays<br>**Electrophoresis:**<br>General principles, Factors affecting electrophoresis,Types of support media used, Types of electrophoresis<br>(Agarose gel electrophoresis, PAGE) | UO1: To elaborate principles, working and applications of various separation and purification methods.<br><br>UO2: To study principles, working of different types of chromatography.<br><br>UO3: To illustrate concepts of spectroscopy and electrophoresis. | |

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**USBT205 Core Subject Physiology and Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Plant Physiology**<br>**Photosynthesis:**<br>Hill's Reaction and its Significance, Light Reactions, Cyclic and Non-Cyclic Photoinduced Electron Flow, Energetics of Photosynthesis, Dark Phase of Photosynthesis, Calvin Cycle, C-3, C-4, CAM pathways, Rubiscooxygenase activity<br>**Plant hormones:**<br>Auxin, Gibberellins, Cytokinins, Ethylene, Abscisic acid<br>**Introduction to Secondary Metabolites** | UO1: To study mechanisms of photosynthesis along with Hill's reaction.<br>UO2: To elaborate light and dark reactions of photosynthesis along with energetics.<br>UO3: To understand the role of plant hormones, types and significance of various secondary metabolites. | Course Objective:<br>To provide an insight in to the different physiological processes of plants and animals.<br>CO1: To gain insights into the Physiological Processes of Plants and functions of plant growth regulators.<br>CO2: To develop a comprehensive and deep understanding of the vital physiological processes of animals.<br>CO3: To understand the concept of immunity and role of antigens and immunoglobulins in the immune system. |
| **2. Animal Physiology**<br>**Introduction to physiology:**<br>Concept of homeostasis.<br>**Body fluids:** Major types of Body fluid.<br>**Blood:** Functions of blood, general properties of blood, Composition of blood. Thrombocytes or Platelets. Coagulation of blood. Theories of Coagulation. Haemolysis.<br>**Respiratory system:**<br>Phases of Respiration, Principle of gases exchange, Mechanism of breathing.<br>**Digestion and absorption:**<br>Mode of nutrition, Digestion; Digestion of foodstuffs, Digestion in humans. Absorption.<br>**Excretion**: Organs of excretion. Types of excretory products. Excretion in vertebrates - Human<br>**Kidney:** Structure of kidney, Structure of nephron, Function of kidney, Urine formation, Dialysis | UO1: To explain fundamentals of homeostasis and types of body fluids.<br>UO2: To learn concepts about blood and respiratory system.<br>UO3: To elaborate physiology/mechanism of digestion, absorption and excretion. | |

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| **3.Immunology**<br>**Introduction to Immunology:** Overview of Immune Systems, Innate Immunity, Mechanisms of innate immunity, Acquired Immunity, Local and Herd Immunity, Humoral and Cellular Immunity - Factors Influencing and Mechanisms of each.<br>**Antigens:** Immunogenicity Versus Antigenicity, Factors That Influence Immunogenicity, Epitopes, Haptens, Superantigens<br>**Antibodies:** Basic Structure of Antibodies, Antibody-Mediated Effector Functions, Antibody Classes and Biological Activities, Antigenic Determinants on Immunoglobulins. | UO1 : To learn the concepts of immunology<br>UO2: To gain in depth knowledge about antigens<br>UO3: To gain insights about the knowledge of antibodies | |

**USBT206 Core Subject Basic Computers and Biostatistics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| **1.Introduction to computers**<br>Overview and functions of a computer system, Input and output devices, Storage devices.<br>Modern computers: The workstation, The Minicomputer,<br>Mainframe Computers, Parallel processing Computer &<br>The Super Computer<br>**Introduction to operating systems:**<br>Operating System concept, Windows, Unix/Linux & servers<br>**Word Processing:**<br>Basic Operations, Creating and Editing documents, Formatting documents.<br>**Spreadsheet:**<br>Creating and editing workbook, Organizing and formatting worksheets; Data analysis and management;<br>Using formulas and functions<br>**Presentation Graphics:**<br>Creating and Editing Presentations, Designing and Enhancing Presentation, Delivering Presentation, Advanced Presentation Graphics. | UO1: To get acquainted with computers<br>UO2: To gain insights into the operating systems<br>UO3: To gain in depth knowledge about word, excel and powerpoint | Course Objective:<br>To develop the students' understanding of computer and biostatistics<br>CO1: To develop an understanding of computer networking and internet<br>CO2: To develop skills to use word processing, spreadsheet, presentation software.<br>CO3: To gain insights about the use of statistics in the field of biotechnology. |

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| **2.Computer networking**<br>**Introduction to networking:**<br>Various terminologies Associated hardware devices, gadgets (Router, Switch) tools, services, and resources<br>Network Topologies and Protocols, LAN, WAN and MAN World Wide Web (WWW)<br>Network security: fire walls<br>**Computer viruses:**<br>An overview of Computer viruses; What is a virus? Virus<br>signs, how do they get transmitted? What are the dangers?<br>General Precautions<br>**The Internet and Internet Services:**<br>Introduction, History of Internet, Internetworking Protocol, The Internet Architecture, Managing the Internet, Connecting to Internet, Internet Connections: Dial-up Access, Leased Line, Integrated Services Digital Network (ISDN), Digital Subscriber Line (DSL), Cable, Modem<br>Internet Address Internet Services: World Wide Web (WWW), Web<br>Browser, Uniform Resource Locator (URL), Internet Search Engines, WWW Development Languages, Uses of Internet<br>**Electronic Mail**: E-mail Address, E-mail Message Format, E-mail Services, How E-mail Works File Transfer Protocol (FTP), How<br>FTP Works, Terminal Network (Telnet), News, Internet Relay Chat (IRC), MS Outlook. | UO1: To get acquainted with various terms used in networking.<br>UO2: To study types and significance of computer viruses.<br>UO3: To get overview about internet and internet services like email, WWW, URL,, ISDN, DSL, etc. | |

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| **3.Biostatistics**<br>**Introduction to Biostatistics:**<br>Definition & Importance of Statistics in Biology<br>Variables, Types of variables (Quantitative & Qualitative)<br>Types of Data and data visualization:<br>Concept of Data, Sources of data, **Types of data** (Quantitative & Qualitative), Representation of Data and<br>Graphs (Bar Diagrams, Pie Charts and Frequency distribution, Histogram, Polygon and Curve)<br>Sampling strategies:<br>Population and Sample, Significance of using samples,<br>Sample size, Random variation, Sampling techniques<br>(Simple random sampling, Systematic sampling, Stratified<br>sampling, Cluster sampling, Multiphase sampling) and<br>Non- probability sampling<br>**Types of Statistics:**<br>Introduction to Descriptive & Inferential statistics<br>**Descriptive statistics:**<br>**Measures of central tendency:**<br>Mean, Mode, Median (Ungrouped & Grouped data)<br>**Measures of dispersion:**<br>Range, Variance, Standard deviation (Ungrouped & Grouped data), Coefficient of variation<br>**Measures of location:**<br>Percentiles, Interquartile range (Box-Whisker plot)<br>**Normal/Gaussian distribution, Standard normal deviate, Sampling variation, Standard error of mean** | UO1: To analyse types of data and data representation.<br>UO2: To understand sampling strategies<br>UO3: To learn types of statistics and measures of central tendency and dispersion. | |

**USBT207 Ability Enhancement Course Sustainable development and Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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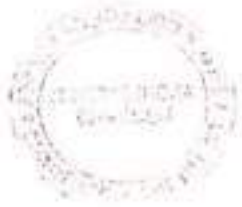
| **1. Ecological interactions and Biodiversity.**<br>**Concept of Ecosystems:**<br>Definition and Components- Structure and function of ecosystem aspects of ecosystems. Food Chain and Food Web, Ecological Pyramids (Energy, Biomass and Number)<br>Aquatic and Terrestrial Ecosystems, Different Abiotic Factors of ecosystem and adaptations to different abiotic factors<br>**Ecological Interactions:**<br>Commensalism, Mutualism, Predation and Antibiosis,<br>Parasitism, competition<br>**Biodiversity and its conservation:**<br>Introduction – definition: genetic, species, ecosystem diversity, biogeographic classification of India, value of biodiversity, biodiversity at global, national and local levels, India as a mega diversity nation, Hotspots of biodiversity, threats to biodiversity, conservation of biodiversity | UO1: To develop an understanding among the students about the concept of ecosystem.<br>UO2: To acquaint the students with the structure of the ecosystem.<br>UO3: To instill in them the values of safeguarding the ecosystem.<br>UO3: To acquaint the students about different types of factors of ecosystems such as biotic and abiotic.<br>UO4: To introduce the students about the different types of biodiversity at national and global level. | Course Objective:<br>To sensitize and create awareness about Ecology, renewable energy and different Environmental Issues.<br>CO1: To develop an understanding of the structure and functioning of the ecosystems.<br>CO2: To gain insights about the concept of pollution, climate change and sustainable development<br>CO3: To understand the relevance of renewable energy sources and conservation of biodiversity |



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| **2. Pollution and climate change**<br>**Environmental Pollution:**<br>Definition, Cause, effects and control measures of- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Role of an individual in prevention of pollution. Pollution case studies.<br>**Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Sustainable development:** Concept, basic principles of sustainable development, post - brundtland world. roots of sustainability, Indicators, paradigm towards new discipline-sustainability science. | UO1: To make the students understand the importance of safeguarding the environment from pollution.<br>UO2: To acquaint the students about types of pollution and measures to control the same.<br>UO3: To make them understand about the severity of climate change and ways to live sustainably. | |
| **3. Renewable Sources of energy**<br>**Introduction:**<br>Renewable and Non-renewable resources. The need for a sustainable lifestyle.<br>**Energy resources:** Types of energy Non renewable energy - Oil, coal and its environmental impacts.<br>**Renewable energy:** Hydroelectric power, Solar energy, Biomass energy, Biogas, Wind power and Geothermal energy.<br>**Biogas technology:** Biogas plant & types, biodigester. Biogas- composition, production and factors affecting production and uses.<br>**Biofuels:** Ethanol production, Microbial hydrogen production, Biodiesel, Petrocrops. | UO1: To make the students understand about renewable and non renewable resources.<br>UO2: To explain the importance to students about sustainable living.<br>UO3: To explain the types of renewable resources and use in daily life.<br>UO4: To teach and make them understand about the production and use of biofuels, ethanol production, microbial production, biodiesel, etc. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

S. Y. B.Sc. BIOTECHNOLOGY Semester III (A.Y. 2022-23)

**USBT301 Core Subject Biophysics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Optics and Electromagnetic Radiations | UO1: To learn about the properties of light such as reflection, refraction and their laws and applications.<br>UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum.<br>UO3: To learn about the different analytical techniques such as SEM, TEM, Immuno electron microscopy and Fluorescence microscopy and study about their importance in Biotechnology. | CO1: The objective of this course is to have a firm foundation of the fundamentals and applications of current biophysical theories.<br>CO2: By the end of the course the student will:<br>• Develop an understanding of the different aspects of classical Physics.<br>CO3: Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis. |
| 2. Heat, Sound, Magnetism and Fluid Dynamics | UO1: To understand the concept of heat and temperature and methods of transfer of heat. Also to study about the different thermometers and their applications.<br>UO2: To study about sound and their types based on their properties such as frequencies and understand the applications.<br>UO3: To study about viscosity, surface tension and other surface phenomenon with their application in Biological Sciences. | |
| 3. Electrophoretic Techniques | UO1: To get an overview about principles of electrophoresis of different types with suitable examples.<br>UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples.<br>UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis. | |

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**USBT302 Core Subject Applied Chemistry- I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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| 1. Organic Chemistry | UO1: To study about the different types of organic reactions and their applications<br>UO2: To study about the role of essential and non essential metal ions in biological systems and their significance.<br>UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes<br>UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin.<br>UO5: To study about the metal complexes used in medicines. | CO1:- The objective of this course is to have a firm foundation of the fundamentals and applications of Organic and Green Chemistry.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the different aspects of Organic and Green Chemistry.<br>CO3: Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds.<br>CO4: Discuss role of Green Chemistry and its application in Industry. |
| 2. Synthesis of Organic Compounds | UO1: To study about the different types of synthesis in organic reactions.<br>UO2: To understand the criteria for synthesis that can provide a good yield.<br>UO3: To study the green methods in organic synthesis. | |
| 3. Green Chemistry and Synthesis | UO1: To understand the need for green chemistry in today's day and age.<br>UO2: To study the principles of green chemistry.<br>UO3: To study and understand about the green materials such as reagents, solvents, catalysts. | |

**USBT303 Core Subject Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
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| 1. Effectors of Immune Response | UO1: To discuss haematopoiesis<br>UO2: To acquaint students with the cells and organs of the immune system<br>UO3: To discuss complement system - types, biological effects and deficiencies | CO1:- The objective of this course is to familiarize students with the Immune Effector Mechanisms and various Immuno-techniques.<br>CO2- By the end of the course the student will be able to:<br>• Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.<br>CO3: Understand the principles underlying various Immuno-techniques |

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| 2. Cell Receptors | UO1: To learn the mechanism of T-cell receptor's activation with its structure.<br>UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II.<br>UO3: To study the mechanism of B-cell receptor's activation with its structure and its interaction with T-cell. | |
| 3. ImmunoTechniques | UO1: To acquaint students with the precipitation reactions<br>UO2: To acquaint students with the agglutination reactions<br>UO3: To discuss alternatives to Antigen-Antibody Reactions | |

**USBT304 Core Subject Cell Biology and Cytogenetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cytoskeleton | UO1: To illustrate significance of microtubules as dynamic cytoskeleton elements with its structure and associated motor proteins.<br>UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin.<br>UO3: To demonstrate the structure, function and different types of intermediate filaments. | CO1- The objective of this course is to have a firm foundation in the fundamentals of Cell Biology and Cytogenetics.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the Cytoskeleton and Cell Membrane.<br>CO3: Discuss the structure of Chromosomes and types of Chromosomal Aberrations.<br>CO4: Discuss the principles underlying Sex Determination, Linkage and Mapping. |
| 2. Cell Membrane | UO1: To understand the principles of membrane transport with examples.<br>UO2: To study different types of cell-cell and cell extracellular matrix junctions.<br>UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition. | |

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| 3. Cytogenetics | UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number<br>UO2: To analyze the mechanism of sex determination and linkage.<br>UO3: To illustrate the fundamental concepts of linkage, crossing over and chromosomal mapping. | |

**USBT305 Core Subject Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Gene Expression-Transcription | U01: To study the intricate mechanism of Transcription in both prokaryotes and Eukaryotes<br>U02: To illustrate the details of initiation, elongation and termination of transcription<br>U03: To develop a brief understanding of the types of polymerases and promoters<br>U03: To demonstrate the mechanism of splicing and RNA editing | CO1- The objective of this course is to have an insight into the mechanism of Gene Expression and Regulation.<br>CO2: By the end of the course the student will be able to:<br>• Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.<br>CO3: Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes |
| 2. Gene Expression-Translation | U01: To discuss the genetic code, its nature and how it was deciphered<br>UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination.<br>UO3: To demonstrate the various post-translational modifications | |
| 3. Regulation of Gene Expression | UO1: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp<br>UO2: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses<br>UO3: To discuss the various operons in Eukaryotes and the methods of gene silencing | |

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**USBT306 Skill Enhancement Elective Bioprocess Technology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microorganisms in Industrial Processes | UO1: To discuss about the types of microorganisms used in industrial processes<br>UO2: To acquaint students with screening and its types<br>UO3: To impart knowledge about the preservation techniques used | CO1:- The objective of this course is to understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the various aspects of Bioprocess Technology.<br>CO3: Develop skills associated with screening of Industrially Important Strains.<br>CO4: Understand principles underlying design of Fermentor and Fermentation Process. |
| 2. Fermentor and Fermentation Processes | UO1: To impart knowledge about the design of a fermentor<br>UO2: To gain insight about the fermentation media<br>UO3: To discuss about sterilization and the process parameters<br>UO4: To acquaint students about the types of fermentation<br>UO5: To study the representative fermentation processes | |
| 3. In-vivo and In vitro Assay of Industrial Products | UO1: To discuss the assay of industrial processes<br>UO2: To acquaint the students with half-life determination of pharmaceutical products<br>UO3: To study bioavailability and bioequivalence studies | |

**USBT307 General Elective Research Methodology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Research Methodology and Research Problem | UO1: To study the meaning, criteria, and objectives of good research.<br>UO2: To learn different types of research and its significance<br>UO3: To identify good research question, methods involved to solve it and challenges faced by researchers while approaching research problem. | CO1- The objective of this course is to develop Research Aptitude, Logical Thinking and Reasoning.<br>CO2:- By the end of the course the student will be able to:<br>• Understand basic principles of Research Methodology and identify a Research Problem.<br>CO3: Understand a general definition of Research Design.<br>CO4: Identify the overall Process of Designing a Research Study from its inception to its Report. |
| 2. Research Design and Data Collection | UO1: To understand the necessity of effective research design and its principles.<br>UO2: To demonstrate mechanism of formulating a research plan.<br>UO3: To study different methods of data collection and its applications. | |
| 3. Interpretation and Report Writing | UO1: To introduce the concept of data interpretation.<br>UO2: To learn principles of report writing and its types.<br>UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report. | |

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S. Y. B.Sc. BIOTECHNOLOGY SEMESTER IV (A.Y. 2022-23)

**USBT401 Core Subject Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Carbohydrate Metabolism, ETS and Energy Rich Compounds | UO1: To study carbohydrate metabolism with different pathways such as glycolysis, Fermentation, pentose phosphate pathway, TCA and its energetics, regulation and inhibitors.<br>UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors.<br>UO3: To demonstrate the significance of ATP and other energy rich molecules. | CO1:- The objective of this course is to gain an insight into the Metabolic Processes associated with Catabolism of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO2:- By the end of the course the student will be able to<br>• Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO3: Explain the Role of Energy Rich Molecules in Metabolism. |
| 2. Amino Acid Metabolism | UO1: To highlight catabolism of amino acid pathways and its regulation.<br>UO2: To study biosynthesis of key hormones and regulators from amino acids.<br>UO3: To analyze deamination, transamination and reactions of urea cycle along with regulation and disorders. | |
| 3. Lipid and Nucleotide Metabolism | UO1: To learn mobilization and transport of fatty acids.<br>UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation.<br>UO3: To study ketone body breakdown pathway and highlight catabolism of purines and pyrimidines. | |

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**USBT402 Core Subject Applied Chemistry- II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Sampling and Separation Techniques | UO1: To study about sampling, its importance and techniques of sampling for solids, liquids and gases.<br>UO2: To study about the various types of separation techniques and their applications in biological sciences.<br>UO3: to understand about the concepts of sedimentation and centrifugation in detail. | CO1- The objective of this course is to have a firm foundation of the fundamentals and applications of current Chemical Theories for the Physical World.<br>CO2- By the end of the course the student will:<br>• Develop an understanding of the different aspects of Analytical Chemistry.<br>CO3: Gain knowledge of Natural Product Chemistry and related acquired skills.<br>CO4: Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials. |
| 2. Natural Product Chemistry | UO1: To understand and classify the natural products into primary and secondary metabolites.<br>UO2: To learn about the structure and functions of alkaloids, phenolics, sterols and essential oils. Also study about their structural elucidation.<br>UO3: To learn about the chromatographic separation techniques. | |
| 3. Polymers and Nanomaterials | UO1: To get introduced to the chemistry of polymers and learn about the different types of polymers.<br>UO2: To study about the stereochemistry of polymers and about biodegradable polymers. | |

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**USBT403 Core Subject Medical Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Infectious Diseases | UO1: To discuss the host parasite relationship<br>UO2: To gain insight about infection<br>UO3: To gain knowledge about diseases | CO1- The objective of this course is to gain insight into Disease Factors and Processes and Diseases Caused by Microorganisms.<br>CO2:- By the end of the course the student will be able to:<br>• List the factors playing a role in causing a disease.<br>CO3: Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.<br>CO4: Gain the technical capability of handling, isolating and identifying various Bacteria. |
| 2. Medical Microbiology- Causative Organisms- I | UO1: To acquaint the students with S. aureus<br>UO2: To study S. pyogenes<br>UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae<br>UO4: To gain knowledge about UTIs caused by E. coli and Proteus | |
| 3. Medical Microbiology - Causative Organisms- II | UO1: To study the GI tract infections caused by Salmonella and Shigella<br>UO2: To study the sexually transmitted diseases<br>UO3: To discuss nosocomial infections | |

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**USBT404 Core Subject Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Environmental Pollution | UO1: To analyse the types, sources, classification of air pollutants and study air pollution monitoring and prevention.<br>UO2: To study the types, sources, classification of water pollutants and study water pollution monitoring and prevention.<br>UO3: To study the types, sources, classification of soil and solid waste pollutants and study soil pollution monitoring and prevention and elaborate on the concept of soil erosion. | CO1:- The objective of this course is to gain awareness about different Types of Environmental Pollution and Related Issues.<br>CO2- By the end of the course the student will be able to:<br>• Gain an understanding of the causes, types and control methods for Environmental Pollution.<br>CO3: Application of different life forms in Environmental Remediation |
| 2. Global Environmental Problems and Issues | UO1: To get an overview about factors responsible for greenhouse effect with relevant examples.<br>UO2: To state the importance of global warming, ozone depletion and regulations of Kyoto protocol.<br>UO3: To analyse the damaging consequences of UV radiation and acid rain. | |
| 3. Bioremediation | UO1: To understand the concept of bioremediation.<br>UO2: To learn about the microorganisms in bioremediation.<br>UO3: To learn about bioaugmentation and biostimulation<br>UO4:To monitor the efficacy of bioremediation techniques. | |

**USBT405 Core Subject Biostatistics and Bioinformatics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Computers and Biological Databases | UO1: To understand the working principles of computers and the internet.<br>UO2: To state the applications biological databases and its classification.<br>UO3: To analyse the applications of genome information resources and protein structure visualization softwares. | CO1:- The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.<br>CO2:- By the end of the course the student will be able to:<br>• Gain an understanding of the basic concepts of Bioinformatics and Biostatistics.<br>CO3: Understand the tools used in Bioinformatics.<br>CO4: Apply the various Statistical Tools for Analysis of Biological Data. |

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| 2. BLAST and Sequence Alignment | UO1: To introduce the concepts of sequencing technique such as BLAST and its types<br>UO2: To study the various alignment methods, namely, global and local<br>UO3: To demonstrate the concept of multiple sequencing alignment and it's associated terminologies | |
| 3. Biostatistics | UO1: To understand the theory and solve problems based on correlation and regression analysis.<br>UO2: To study the test in studying statistical hypothesis.<br>UO3: To study and solve problems based on z-test, T-test and Chi square test | |

**USBT406 Molecular Diagnostics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Basics of Molecular Diagnostics | UO1: To develop an in-depth understanding of the brief history of the diagnosis at the molecular level<br>UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins<br>UO3: To analyze and apply the various hybridization techniques such as the blotting methods. | CO1: Objective of this course is learning and understanding Molecular Techniques and utilizing these techniques in Diagnosis.<br>CO2: By the end of the course the student will be able to:<br>• Gain an understanding of the basic Principles used in Molecular Diagnosis.<br>CO3: Gain critical thinking and analytical skills to understand new Diagnostic Methods.<br>CO4: Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits. |
| 2. Nucleic Acid Amplification Methods | UO1: To discuss amplification technique such as the working of PCR UO2: To develop a brief understanding on the various modifications of PCR<br>UO3: To understand the concept of ligase chain reaction | |

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| 3. Molecular Biology based Diagnostics | UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique<br>UO2: To briefly discuss the various methods of molecular diagnostics for infectious diseases<br>UO3: To understand the need of genetic counselling by discussing case studies and to also discuss the ethical social and legal issues associated with genetic testing. | |

**USBT407 General Elective Entrepreneurship Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Entrepreneurship Development | UO1: To introduce the concept of entrepreneurship.<br>UO2: To state qualities required to be a successful entrepreneur<br>UO3: To learn the depth of rising demand of entrepreneurship in the future. | CO1: To develop and systematically apply an Entrepreneurial way of thinking that will allow identification and creation of Business Opportunities.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the systematic process and to select and screen a Business Idea.<br>CO3: Design strategies for successful implementation of ideas.<br>CO4: Write a Business Plan |
| 2. Setting-up of an Enterprise and Planning | UO1: To learn several aspects of deciding location of a business, financial planning, effective strategies to obtain fundings and sponsors.<br>UO2: To learn methodologies involved in planning, organization and implementation of a project along with its feasibility.<br>UO3: To get an in -depth understanding of regulatory affairs, corporate laws associated with establishing an enterprise. | |
| 3. Marketing, Sales, Advertising and International Market research | UO1: To learn to design effective marketing plan.<br>UO2: To analyse different principles of advertising and sales promotion.<br>UO3: To study strategies of market assessment and different types of market research with suitable examples. | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER V (A.Y. 2022-23)

**USBT501 Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cell cycle | UO1: To distinguish between the prokaryotic and eukaryotic cell cycle highlighting the role of MPF and discuss early embryonic cell cycle.<br>UO2: To analyse the significance of yeast's genetics in regulation of cell cycle.<br>UO3: To learn different apoptosis pathways along with regulation of cell division in multicellular animals. | By the end of the course the student will be able to:<br>Gain knowledge about the cell multiplication and death at molecular level.<br>CO1. Understand the molecules involved in cell signaling.<br>CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development.<br>CO3. Gain insight into the biology of cancer cells. |
| 2. Cell Signaling | UO1: To understand the concepts of cell signaling and its types, and G-protein linked cell surface receptor signaling with suitable examples.<br>UO2: To study signaling via Enzyme linked receptors with suitable examples.<br>UO3: To learn principles of target cell adaptation and co-relating computer based signaling network with<br>biological signaling. | |
| 3. Developmental Biology | UO1: To study the importance of developmental biology as an multidisciplinary science along with<br>model organisms.<br>UO2: To elaborate different stages on development and germ layers.<br>UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern<br>formation and morphogenetic movements. | |

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| 4. Cancer Biology | UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process.<br>UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer.<br>UO3: To gain insights about latest techniques and methodology of cancer diagnosis and cancer prevention. | |

**USBT502 Medical Microbiology and Instrumentation**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Virology | UO1: To study properties of viruses along with its structure, classification and taxonomy.<br>UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.<br>UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples.<br>UO4: To study mechanisms of cellular destruction caused due to viral infections with suitable examples and highlighting the significance of novel virus-like species; viroids and prions. | By the end of the course the student will be able to:<br>CO1. Learn th, different type of virus cultivation and enumeration<br>CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.<br>CO3. Get an insight into the various spectroscopic methods used in biological studies.<br>CO4. Understand the principle and applications of chromatographic and tracer techniques. |
| 2. Chemotherapeutic drugs | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To gain insight into the mechanisms of drug resistance<br>UO4: To discuss the use and misuse of antimicrobial agents<br>UO5: To acquaint the students with antifungal and antiviral drugs | |

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| 3. Spectroscopy | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |
| 4. Bioanalytical techniques | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same | |

**USBT503 Genomics and Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetic engineering of plants | UO1: To study the methodologies of genetic engineering with Ti plasmid vectors<br>UO2: To demonstrate the various methods of artificial gene transfer<br>UO3: To learn the types of vectors and how is it used in the improvement of seed quality | By the end of the course the student will be able to:<br>CO1. Use molecular biology tools and techniques in the field of biotechnology.<br>CO2. Gain knowledge regarding recent developments in genome sequencing and editing.<br>CO3. Understand the basis of gene cloning and development of transgenic animals and plants.<br>CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms. |

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| 2. Transgenic Animals | UO1: To understand the development of transgenic mice with the aid of various techniques such as the retroviral method, DNA microinjection, ES, cre-loxp etc.<br>UO2: To gain insights about the various vectors used for animal<br>UO3: To briefly discuss the method of cloning livestock and the concept of green fluorescent fish as well as transgenic fish | |
| 3. Tools in Molecular biology | UO1: To study in-depth the various cloning vectors, its origin and the applications<br>UO2: To discuss and develop an understanding on the various isolation methods, restriction digestion, blotting techniques etc.<br>UO3: To gain knowledge about the various recombinant selection methods and hybridization techniques<br>UO4: To understand the cloning strategies and the construction of DNA libraries along with the concepts of chromosome walking and jumping<br>UO5: To combine the overall learnings and develop an aptitude for its application in various fields | |
| 4. Gene sequencing and editing | UO1: To study the various sequencing techniques<br>UO2: To focus on the human genome mapping in-depth<br>UO3: To understand the various gene editing tools such ZNF, TALENS, CRISPER/cas | |

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USBT 504 Marine Biotechnology

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Marine Biotechnology- Introduction & Bioprospecting | UO1: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats.<br>UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same.<br>UO3: To study diversity of compounds obtained from other marine organisms which are of commercial and ecological value. | By the end of the course the student will be able to:<br>1. Gain insight in the field of marine biotechnology.<br>2. Describe different marine products which can be used as pharmaceuticals.<br>3. Discuss marine functional foods and nutraceuticals and its applications.<br>4. Elaborate on marine bioresources and cosmetics and their applications. |
| 2. Marine Drugs and Enzymes | UO1: To describe different natural products from marine resources and their challenges<br>UO2: To elaborate on marine microbial enzymes.<br>UO3: To describe different pharmaceutical compounds obtained from marine organisms. | |
| 3. Marine Functional foods and Nutraceuticals | UO1: To discuss marine functional foods<br>UO2: To study marine derived ingredients with biological properties<br>UO3: To acquaint the students with marine nutraceuticals | |
| 4. Marine Bioresources and cosmetics | UO1: To gain insight into marine bioresources, marine secondary metabolites, marine proteins, marine lipids<br>UO2: To discuss cosmetics from marine sources<br>UO3: To acquaint the students with products and treatments based on marine resources | |

**Applied Component: Biosafety**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to biosafety | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | CO1: To introduce students to the concepts of biosafety.<br>CO2: To discuss the significance of good lab practices used in the biotechnology industry and research.<br>CO3: To state the possible contaminants in different samples.<br>CO4: To study the applications of rDNA technology and importance of bioethics. |
| 2. GLP | UO1: To discuss the concept of GLP<br>UO2: To acquaint the students with the guidelines of GLP<br>UO3: To gain insight into documentation of laboratory work<br>UO4: To gain knowledge about the calibration and validation methods<br>UO5: To acquaint the students with audits and audit reports | |
| 3. Detection and testing of contaminants | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |
| 4. Biosafety in Biotechnology | UO1: To study the concepts on biosafety in Biotechnology<br>UO2: To discuss rDNA technology<br>UO3: To acquaint the students with regulation of food and food ingredients<br>UO4: To learn about genetically engineered crops<br>UO5: To study about the contemporary issues in Bioethics | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER VI (A-Y. 2022-23)

**USBT601 Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Protein Biochemistry | UO1: To study protein's structure highlighting the principles of denaturation and folding.<br>UO2: To Study the protein's function with suitable examples along with protein purification methods.<br>UO3: To learn the complementary interactions between proteins and ligands with suitable examples.<br>UO4: To briefly understand the mechanism of how the protein's interaction is affected by energy with suitable examples. | CO1. To explain in detail various metabolic pathways, fate and energy production efficiency of carbohydrate and lipid metabolism.<br>CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders.<br>CO3. To study the importance of vitamins, their sources, functions, bioactivity and associated disorders. |
| 2. Metabolism | UO1: To illustrate pathway of bacterial cell wall synthesis.<br>UO2: To learn the metabolic pathways of starch and sucrose and glycogen synthesis and its regulation by various factors.<br>UO3: To demonstrate the reactions of Cholesterol synthesis pathway, its regulation and highlight the pathology of cardiovascular diseases. | |
| 3. Endocrinology | UO1: To understand the classification of hormones into group i and ii and study characteristics of hormones released by anterior and posterior pituitary glands.<br>UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex.<br>UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads. | |

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| 4. Nutrition | UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins.<br>UO2: To explain functions and mode of action of minerals in metabolism.<br>UO3: To highlight the clinical significance of Malnutrition and overnutrition with suitable examples. | |

**USBT602 Industrial Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Dairy technology | UO1: To study milk - normal flora, changes in raw milk and enumeration<br>UO2: To discuss dairy technology preservation methods<br>UO3: To gain insight into starter cultures<br>UO4: To gain knowledge about the different fermented products | CO1: To introduce to various downstream processing technologies for extraction and purification of biological products produced using Bioprocess technology.<br>CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation.<br>CO3: To gain insight in the various processes involved in production of commercially available dairy products.<br>CO4: To have an in-depth understanding of downstream processes. |
| 2. Down-stream Processing (DSP) | UO1: To study DSP<br>UO2: To discuss foam separation and types of precipitation<br>UO3: To gain insight about filtration, centrifugation and chromatography<br>UO4: To describe the cell disruption methods<br>UO5: To acquaint the students about crystallization and whole broth processing | |

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| 3. Fermentation process | UO1: To study inoculation development in bacteria and fungi<br>UO2: To discuss scale up and scale down<br>UO3: To learn fermentation processes of different fermentation products<br>UO4: To discuss biotransformation | |
| 4. QA-QC | UO1: To study the concept of GMP and requirements for GMP implementation<br>UO2: To gain insight into the documentation of GMP practices<br>UO3: To learn the concept of QC and requirements for implementing QC<br>UO4: To acquire knowledge of QA concepts and requirements for implementing the same | |

**USBT603 Basic Pharmacology and Neurochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. General principles of Pharmacology | UO1: To introduce and develop and in-depth understanding about the basics of pharmacology and the mechanism of drug action<br>UO2: To aid in the understanding of drug receptors and its respective responses<br>UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response<br>UO4: To study the concept of effective dose and lethal dose<br>UO5: To gain insights about the potency, intrinsic activity and the phenomenon of drug antagonism | CO1. To understand principles of pharmacology and its role related to biological activity of drugs in the system.<br>CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity.<br>CO3. To understand the effect of allergen, pesticide on systemic physiological functions. Also to discuss steps to be taken in case of nonmedical misuses of chemicals and bioterrorism.<br>CO4. To study in details the structure and functions of neurons and glial cells, mechanism of action potential, role of various channels , and effects of neurotransmitters and neurotoxins |

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| 2. Drug Absorption and Distribution | UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it<br>UO2: To study the absorption of through from lungs and skin<br>UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug<br>UO4: To demonstrate the binding of drugs and also the various physiological barriers. | |
| 3. Basic Toxicology and Regulatory Toxicology | UO1:To understand all the background definitions in-depth<br>UO2: To understand and distinguish between the allergic responses, side effects and adverse effects<br>UO3: To gain knowledge about poisonings and its types<br>UO4: To demonstrate about specific poisons<br>UO5: To discuss about the non-medical use of drugs and incapacitating agents | |
| 4. Neurochemistry | UO1: To understand the anatomy and functioning of the human brain<br>UO2: To demonstrate about the neuronal pathways and the working of nerve impulses<br>UO3: To understand the mechanism of neuronal excitation and inhibitions<br>UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters. | |

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**USBT604 Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Renewable sources of energy | UO1: To get an overview of different renewable sources of energy and its applications.<br>UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications.<br>UO3: To study mode of action, advantages and significance of biofuels with suitable examples. | CO1. To impart knowledge regarding management of industrial, storm and hazardous waste.<br>CO2. To study biological processes used to treat effluent from industries.<br>CO3. To study different methodologies to treat solid and liquid waste from different industries.<br>CO4. To understand the importance of biofertilizers, its types, usage and applications in sustainable agriculture. |
| 2. Industrial effluent treatment | UO1: To study various biological processes involved in treatment of industrial effluents with suitable examples.<br>UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors.<br>UO3: To understand principles of biodegradation with suitable examples.<br>UO4: To analyse the applications of enzymes and microbes used for biodegradation. | |
| 3. Wastewater treatment | UO1: To identify the pollutants causing water pollution and to study about the microorganisms used in its treatment.<br>UO2: To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.<br>UO3: To learn about the heavy metals that cause pollution in water bodies and study about the micro-organisms used for the treatment along with their mechanism | |
| 4. Hazardous waste management | UO1: To learn about water pollution wrt hazardous waste produced by petrochemicals, and manufacturing Industries,<br>UO2: To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries.<br>UO3: To highlight the importance of water treatment due to oil spillage, other green deposits | |

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**Applied Component: Agribiotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Precision Agriculture and Agriculture systems | UO1: To introduce students to different mechanisms of agriculture systems and greenhouse technology.<br>UO2: To elaborate the design, media and applications of greenhouse irrigation systems.<br>UO3: To discuss the significance of phytotrons and precision cultivation systems. | CO1: To get an overview about precision agriculture and management of agriculture systems.<br>CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress.<br>CO3: To highlight the applications of molecular markers used in plant breeding.<br>CO4: To state the eco-friendly use of biofertilizers and biopesticides. |
| 2. Plant stress biology | UO1:To study the concept of abiotic stress, its causes, sources and consequences with suitable examples.<br>UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples.<br>UO3: To understand the principles of biotic stress, its causes, sources and consequences with suitable examples. | |
| 3. Molecular Markers in Plant Breeding | UO1: To study the various genetic markers used in plant breeding technology<br>UO2: To learn the application of molecular markers<br>UO3: To discuss the techniques used in plant DNA barcoding | |
| 4. Biofertilizers and Biopesticides | UO1: To study biofertilizer<br>UO2: To discuss plant growth promotion by fungi<br>UO3: To gain insight about microbial inoculants<br>UO4: To study function of biopesticides. | |

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**USBT101- Core Subject- Basic Chemistry-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Nomenclature and Classification | UO1: To learn about the IUPAC system of nomenclature and be able to name the compounds based on the rules.<br>UO2: To classify whether the bonds in the compound are organic, inorganic or co-ordinate.<br>UO3: To analyse and solve the problems given towards the end of the topic. | CO1: To acquaint the students with basic concepts of Chemistry like Classification and Nomenclature of Chemical compounds<br><br>CO2: To impart hands-on skills in preparation of Buffers and Solutions. |
| 2. Chemical Bonds | UO1: To understand the types of bonds whether they are ionic, covalent or co-ordinate and to study the compounds forming those bonds.<br>UO2: To get an in-depth understanding of co-ordinate and non-covalent bonds and the forces associated with them.<br>UO3: To understand and study the theory of Hydrogen bonding and its application. | |
| 3. Water and Buffers | UO1: To understand the properties of water along with its structure and its usage in chemical reactions.<br>UO2: To learn to calculate and prepare solutions of different concentrations and to understand primary and secondary standards.<br>UO3: To understand the theory of acids and bases along with the concept of buffers | |

**USBT102 -Core Subject- Basic Chemistry-II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Stereochemistry | UO1: To get a thorough understanding of structure of compounds and the arrangement of atoms in space.<br>UO2: To learn about isomerism and their types and study the structures showing isomerism.<br>UO3: To understand the difference between conformations and configuration and learn the projection formulae of compounds. | CO1: To acquaint students with Concepts of Stereochemistry<br><br>CO2: To impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry. |

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| 2. Titrimetry and Gravimetry | UO1: To know and learn the basic terms associated with titration and gravimetry.<br>UO2: To further study the estimation techniques using titration.<br>UO3: To also study about gravimetry and its use in analysis with the help of suitable examples. | |
| 3. Analytical Techniques | UO1: To understand and learn about the methods of separation of organic and inorganic compounds.<br>UO2: To study about the different analytical techniques along with their applications.<br>UO3: To understand the theory behind Beer-Lambert's law and be able to solve the numerical problems based on the law. | |

**USBT103 -Core Subject- Basic Life Sciences - I : Biodiversity and Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Origin of Life and Biodiversity (Animal, Plant, Microorganisms) | UO1: To study the origin of life theories and understand the concepts of biodiversity.<br>UO2: To learn about plant diversity in detail with examples.<br>UO3: To learn about animal diversity in detail with examples.<br>UO4: To learn about microbial diversity in detail with examples. | CO1: To acquaint students with concept of Biodiversity and Cell Biology<br><br>CO2: To impart skill in handling and culture of Microorganisms. |
| 2. Ultra Structure of Prokaryotic and Eukaryotic Cell. | UO1: To get an overview about prokaryotic cellular structure<br>UO2: To get an overview about eukaryotic cellular structure<br>UO3: To study about extracellular organelles in prokaryotes and eukaryotes.<br>UO4: To distinguish between prokaryotes and eukaryotes on the basis of different biological characteristics. | |
| 3. Bacteria and Viruses | UO1: To learn about classification, types and morphology of bacteria.<br>UO2: To understand cultivation, reproduction and growth kinetics of bacteria<br>UO3: To gain knowledge about bacterial isolation and industrial applications.<br>UO4: To classify viruses based on several parameters like host infected, structural similarity, etc<br>UO5: To study properties of plant, animal and bacterial viruses with their significance. | |

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**USBT104 -Core Subject- Basic Life Sciences - II : Microbial Techniques**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microscopy and Stains | UO1: To get an overview about parts of a simple and compound microscope with its functions.<br>UO2: To study working and applications and phase contrast and dark field microscope.<br>UO3: To learn different staining techniques with its examples and applications. | CO1: To acquaint students with basic techniques in Staining and Sterilization<br><br>CO2: To impart the knowledge of growth of microorganisms. |
| 2. Sterilization Techniques | UO1: To distinguish between disinfection and sterilization<br>UO2: To study the role of physical and chemical agents used in sterilization.<br>UO3: To understand the characteristics of an ideal disinfectant with examples. | |
| 3. Nutrition, Cultivation and Enumeration of Microorganisms | UO1: To impart knowledge about nutritional requirements of bacteria.<br>UO2: To learn the concept of culture media and isolation techniques.<br>UO3: To study growth curve and enumeration of bacteria.<br>UO4: To prepare students in understanding about preservation of microbial cultures. | |

**USBT105 -Core Subject- Basic Biotechnology - I : Introduction to Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Scope and Introduction to Biotechnology | UO1: To impart knowledge about the history of Biotechnology<br>UO2: To acquaint the students with the different branches of Biotechnology and their applications<br>UO3: To differentiate between traditional and modern biotechnology | CO1: To acquaint students with various fields of Biotechnology and their applications<br>CO2: To impart the knowledge of Food Technology and Fermentation Techniques. |
| 2. Applications Biotechnology | UO1: To acquaint students with the applications of Biotechnology in Agriculture<br>UO2: To impart knowledge about the ethics in Biotechnology<br>UO3: To make the students acquainted with IPR | |

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| 3. Food and Fermentation Biotechnology | UO1: To impart knowledge about Food Biotechnology<br>UO2: To discuss the biotechnological applications in enhancement of food quality<br>UO3: To discuss about the regulatory aspects in food industries<br>UO4: To acquaint students with fermentation technology<br>UO3: | |

**USBT106- Core Subject- Basic Biotechnology - II : Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Replication | UO1: To impart knowledge about DNA replication in prokaryotes and eukaryotes.<br>UO2: To study enzymes involved in DNA replication.<br>UO3: To learn the recombination process in eukaryotes. | CO1: To acquaint students with DNA Replication, Repair and Genetic Engineering<br>CO2: Impart the knowledge of molecular Biology Techniques |
| 2. Mutation and DNA Repair | UO1: To study different types of mutations<br>UO2: To learn working applications of mutations causing agents.<br>UO2: To learn the basics of different types of repair mechanisms | |
| 3. Genetic Engineering | UO1: To distinguish between DNA and RNA as genetic material.<br>UO2: To gain understanding of Genetic Engineering techniques in various organisms.<br>UO3: To learn concepts about different types of vectors and its applications.<br>UO4: To study roles of enzymes involved in genetic engineering. | |

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**USBT107 - Ability Enhancement Course 1 (FC I) - Societal Awareness**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Overview of Indian Society | UO1: To understand the multicultural diversity of Indian society through various parameters.<br>UO2: To highlight the notion of linguistic diversity.<br>UO3: To study the concept of regional diversity with respect to various parameters. | CO1: To acquaint the students with concepts of Societal Awareness<br>CO2: To impart knowledge of Society and make students aware about the Problems in Society |
| 2. Concept of Disparity | UO1: To study the causes and effects of disparity arising due to various social, economical factors.<br>UO2: To highlight the inequalities faced by people with different types of disabilities.<br>UO3: To develop brief understanding about inequalities arising out of caste system, regionalism and linguistic diversity. | |
| 3. The Indian Constitution and Significant Aspects of Political Processes | UO1: To learn the basic features of constitution as given in the preamble<br>UO2: To study fundamental duties of a Indian citizen and values required to build effective society.<br>UO3: To understand features of Indian politics with highlight<br>on party system, special amendments and contribution of women in politics. | |

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F. Y. B.Sc. BIOTECHNOLOGY - Semester – II (A.Y. 2021 -22)

**USBT201 Core Subject Chemistry – I : Bioorganic Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Biomolecules: Carbohydrates and Lipids | UO1: To classify biomolecules such as carbohydrates, lipids and steroids based on their structure and properties.<br>UO2: To distinguish between simple and complex carbohydrates and study their properties.<br>UO3: To study the types of lipids and the reactions they participate in. | CO1: To aquint students with Bioorganic Molecules<br>CO2: To impart the knowledge of Classification, Strucure and Characterization of Biomolecules |
| 2. Biomolecules: Proteins and Amino Acids | UO1: To classify proteins and amino acids based on their structures and functions.<br>UO2: To understand the concept of isoelectric point and study the synthesis of peptides=es.<br>UO3: To learn and understand the reactions carried out by protein and amino acids. | |
| 3. Biomolecules: Nucleic Acids | UO1: To study the structure and composition of DNA and RNA.<br>UO2: To understand the difference between purine and pyridine bases.<br>UO3: Differentiate between DNA and RNA based on their compositions. | |

**USBT202 Core Subject Chemistry - II : Physical Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Thermodynamics | UO1: To clear the basic terms related to thermodynamics.<br>UO2: To study the laws of thermodynamics; their laws and limitations.<br>UO3: To solve numericals based on internal energy, work, enthalpy, entropy. | CO1: To aquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions<br>CO2: To impart skills in Kinetics and Chemical Reactions |

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| 2. Chemical Kinetics | UO1: To understand the progress of a reaction based on their rate.<br>UO2: To learn about the order of reaction<br>UO3: To solve numericals based on the above given concepts. | |
| 3. Oxidation Reduction reactions | UO1: To understand the basic concepts of oxidation and reduction reactions.<br>UO2: To understand the role of oxidizing and reducing agents.<br>UO3: To solve the conceptual numericals towards the end of the unit. | |

**USBT203 Core Subject Life Sciences - I : Physiology and Ecology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Physiology | UO1: To study photosynthesis and its systems with reactions.<br>UO2: To distinguish between dark phase, C3, C4 cycles and photorespiration.<br>UO3: To learn the action of several plant hormones and secondary metabolites. | CO1: To acquaint students with Physiological Processes in Plants and Animals<br>CO1: To impart the knowledge of Physiology and Ecology |
| 2. Animal Physiology | UO1: To study mechanisms of digestion, absorption and assimilation in humans.<br>UO2: To learn anatomy, physiology of the human kidney.<br>UO3: To learn anatomy, physiology of respiration.<br>UO4: To learn anatomy, physiology of the human heart, blood circulation and coagulation. | |
| 3. Ecosystem and Interactions | UO1: To gain insight of different types of ecosystems, its structures and functions.<br>UO2: To learn concepts of food chain, food web and food pyramids.<br>UO3: To get detailed understanding about biogeochemical cycles and interactions between organisms. | |

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**USBT204 Core Subject Life Sciences - II : Genetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetics Fundamentals | UO1: To understand the basics of genetics and Mendel's laws.<br>UO2: To distinguish between genotype and phenotype.<br>UO3: To understand the principles of non-Mendelian genetics.<br>UO3: To highlight environmental effects on genes and gene interactions. | CO1: To acquaint students with concepts in Genetics<br>CO2: To impart skills in Techniques in Genetic Analysis and Population Genetics |
| 2. Microbial Genetics | UO1: To learn to classify bacteria as prototrophs and auxotrophs.<br>UO2: To study mechanism and pathway of genetic material exchange in bacteria.<br>UO3: To learn transduction and bacterial virus life cycles and transposable elements. | |
| 3. Population Genetics | UO1: To study Hardy-Weinberg law and its applications.<br>UO2: To understand genetic variations in populations at DNA level.<br>UO3: To learn the significance of population genetics in conservation biology. | |

**USBT205 Core Subject Biotechnology - I : Tissue Culture & Scientific Writing and Communication Skills**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Tissue Culture | UO1: To understand the concepts of plant tissue culture and cell theory.<br>UO2: To develop insight about basic framework of plant tissue culture laboratory.<br>UO3: To illustrate the culture medium required for plant tissue culture and throw light on callus culture technique. | CO1: To acquaint students with Techniques of Plant and Animal Tissue Culture<br>CO2:To impart the skills of PTC, ATC and Science Communication |

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| 2. Animal Tissue Culture | UO1: To introduce cell culture techniques and its applications.<br>UO2: To learn significance of growth factors, cell metabolism and growth kinetics.<br>UO3: To study development and maintenance of primary cell culture and its types. | |
| 3. Scientific Writing and Communication Skills | UO1: To understand communication, its types and key principles.<br>UO2: To learn the principles and applications of scientific writing with examples.<br>UO3: To introduce concept of plagerism. | |

**USBT206 Core Subject Biotechnology - II : Enzymology, Immunology and Biostatistics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Enzymes | UO1: To understand the detailed classification , nature and properties of enzymes in detail.<br>UO2: To study the mechanism, enzyme kinetics and effects of various parameters of enzyme activity.<br>UO3: To analyse mechanisms of different modes of enzyme inhibitions and allosteric modulators. | CO1: To acquaint students with concepts in Enzymology, Immunology and Biostatistics<br>CO2: To impart the skills in Enzyme Kinetics, Immunological Techniques and Biostatistics. |
| 2. Immunology | UO1: To acquaint the students with the cells and organs of the immune system<br>UO2: To discuss about the different types of immunity<br>UO3: To impart knowledge about the antigens and different classes of antibodies<br>UO4: To gain insight about the antigen-antibody interactions<br>UO5: To discuss about different types of vaccines | |

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| 3. Biostatistics | UO1: To study the importance of Statistics in Biology.<br>UO2: To learn the terms associated with Statistics and understand the representation of different forms of charts.<br>UO3: To solve numericals based on mean, median and mode and also solve questions on dispersion, variation, standard deviation and standard error. | |

**USBT207 Ability Enhancement Course 2 (FC II) - Globalization, Ecology and Sustainable Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Globalisation and Indian Society and Human Rights | UO1: To understand the basic concept of globalisation and its associated terms<br>UO2: To discuss about the concept of Human rights in-depth and develop and understanding for the same<br>UO3: To apply the learnings and develop an aptitude in one's life | CO1: To acquaint the students with concepts of Globalization, Ecology and Environment<br>CO2: To impart knowledge of Globalization make students aware about the problems in Society |
| 2. Ecology and Sustainable Development | UO1: To discuss the importance of environment protection and the concept of sustainability<br>UO2: To understand the environmental threats and how one can protect it | |
| 3. Understanding and Managing Stress and Conflict in Contemporary Society | UO1: To discuss the types and causes of stress and how one can overcome it<br>UO2: To understand the significance of social values and ethics<br>UO3: To discuss and analyze the various methods of stress management | |

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S. Y. B.Sc. BIOTECHNOLOGY Semester III (A.Y. 2021 - 22)

USBT301 Core Subject Biophysics

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Optics and Electromagnetic Radiations | UO1: To learn about the properties of light such as reflection, refraction and their laws and applications.<br>UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum.<br>UO3: To learn about the different analytical techniques such as SEM, TEM, Immuno electron microscopy and Fluorescence microscopy and study about their importance in Biotechnology. | CO1: The objective of this course is to have a firm foundation of the fundamentals and applications of current biophysical theories.<br>CO2: By the end of the course the student will:<br>• Develop an understanding of the different aspects of classical Physics.<br>CO3: Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis. |
| 2. Heat, Sound, Magnetism and Fluid Dynamics | UO1: To understand the concept of heat and temperature and methods of transfer of heat. Also to study about the different thermometers and their applications.<br>UO2: To study about sound and their types based on their properties such as frequencies and understand the applications.<br>UO3: To study about viscosity, surface tension and other surface phenomenon with their application in Biological Sciences. | |
| 3. Electrophoretic Techniques | UO1: To get an overview about principles of electrophoresis of different types with suitable examples.<br>UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples.<br>UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis. | |

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**USBT302 Core Subject Applied Chemistry- I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Organic Chemistry | UO1: To study about the different types of organic reactions and their applications<br>UO2: To study about the role of essential and non essential metal ions in biological systems and their significance.<br>UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes<br>UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin.<br>UO5: To study about the metal complexes used in medicines. | CO1:- The objective of this course is to have a firm foundation of the fundamentals and applications of Organic and Green Chemistry.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the different aspects of Organic and Green Chemistry.<br>CO3: Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds.<br>CO4: Discuss role of Green Chemistry and its application in Industry. |
| 2. Synthesis of Organic Compounds | UO1: To study about the different types of synthesis in organic reactions.<br>UO2: To understand the criteria for synthesis that can provide a good yield.<br>UO3: To study the green methods in organic synthesis. | |
| 3. Green Chemistry and Synthesis | UO1: To understand the need for green chemistry in today's day and age.<br>UO2: To study the principles of green chemistry.<br>UO3: To study and understand about the green materials such as reagents, solvents, catalysts. | |

**USBT303 Core Subject Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Effectors of Immune Response | UO1: To discuss haematopoiesis<br>UO2: To acquaint students with the cells and organs of the immune system<br>UO3: To discuss complement system - types, biological effects and deficiencies | CO1:- The objective of this course is to familiarize students with the Immune Effector Mechanisms and various Immuno-techniques.<br>CO2- By the end of the course the student will be able to:<br>• Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.<br>CO3: Understand the principles underlying various Immuno-techniques |

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| 2. Cell Receptors | UO1: To learn the mechanism of T-cell receptor's activation with its structure.<br>UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II.<br>UO3: To study the mechanism of B-cell receptor's activation with its structure and its interaction with T-cell. | |
| 3. ImmunoTechniques | UO1: To acquaint students with the precipitation reactions<br>UO2: To acquaint students with the agglutination reactions<br>UO3: To discuss alternatives to Antigen-Antibody Reactions | |

**USBT304 Core Subject Cell Biology and Cytogenetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cytoskeleton | UO1: To illustrate significance of microtubules as dynamic cytoskeleton elements with its structure and associated motor proteins.<br>UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin.<br>UO3: To demonstrate the structure, function and different types of intermediate filaments. | CO1- The objective of this course is to have a firm foundation in the fundamentals of Cell Biology and Cytogenetics.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the Cytoskeleton and Cell Membrane.<br>CO3: Discuss the structure of Chromosomes and types of Chromosomal Aberrations.<br>CO4: Discuss the principles underlying Sex Determination, Linkage and Mapping. |
| 2. Cell Membrane | UO1: To understand the principles of membrane transport with examples.<br>UO2: To study different types of cell-cell and cell extracellular matrix junctions.<br>UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition. | |

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| 3. Cytogenetics | UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number.<br>UO2: To analyze the mechanism of sex determination and linkage.<br>UO3: To illustrate the fundamental concepts of linkage, crossing over and chromosomal mapping. | |

**USBT305 Core Subject Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Gene Expression-Transcription | U01: To study the intricate mechanism of Transcription in both prokaryotes and Eukaryotes<br>U02: To illustrate the details of initiation, elongation and termination of transcription<br>U03: To develop a brief understanding of the types of polymerases and promoters<br>U03: To demonstrate the mechanism of splicing and RNA editing | CO1 - The objective of this course is to have an insight into the mechanism of Gene Expression and Regulation.<br>CO2: By the end of the course the student will be able to:<br>• Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.<br>CO3: Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes |
| 2. Gene Expression-Translation | U01: To discuss the genetic code, its nature and how it was deciphered<br>UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination.<br>UO3: To demonstrate the various post-translational modifications | |
| 3. Regulation of Gene Expression | UO1: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp<br>UO2: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses<br>UO3: To discuss the various operons in Eukaryotes and the methods of gene silencing | |

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**USBT306 Skill Enhancement Elective Bioprocess Technology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microorganisms in Industrial Processes | UO1: To discuss about the types of microorganisms used in industrial processes<br>UO2: To acquaint students with screening and its types<br>UO3: To impart knowledge about the preservation techniques used | CO1:- The objective of this course is to understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the various aspects of Bioprocess Technology.<br>CO3: Develop skills associated with screening of Industrially Important Strains.<br>CO4: Understand principles underlying design of Fermentor and Fermentation Process. |
| 2. Fermentor and Fermentation Processes | UO1: To impart knowledge about the design of a fermentor<br>UO2: To gain insight about the fermentation media<br>UO3: To discuss about sterilization and the process parameters<br>UO4: To acquaint students about the types of fermentation<br>UO5: To study the representative fermentation processes | |
| 3. In-vivo and In vitro Assay of Industrial Products | UO1: To discuss the assay of industrial processes<br>UO2: To acquaint the students with half-life determination of pharmaceutical products<br>UO3: To study bioavailability and bioequivalence studies | |

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**USBT307 General Elective Research Methodology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Research Methodology and Research Problem | UO1: To study the meaning, criteria, and objectives of good research.<br>UO2: To learn different types of research and its significance<br>UO3: To identify good research question, methods involved to solve it and challenges faced by researchers while approaching research problem. | CO1- The objective of this course is to develop Research Aptitude, Logical Thinking and Reasoning.<br>CO2:- By the end of the course the student will be able to:<br>• Understand basic principles of Research Methodology and identify a Research Problem.<br>CO3: Understand a general definition of Research Design.<br>CO4: Identify the overall Process of Designing a Research Study from its inception to its Report. |
| 2. Research Design and Data Collection | UO1: To understand the necessity of effective research design and its principles.<br>UO2: To demonstrate mechanism of formulating a research plan.<br>UO3: To study different methods of data collection and its applications. | |
| 3. Interpretation and Report Writing | UO1: To introduce the concept of data interpretation.<br>UO2: To learn principles of report writing and its types.<br>UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report. | |

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S. Y. B.Sc. BIOTECHNOLOGY SEMESTER IV (A.Y. 2021-22)

**USBT401 Core Subject Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Carbohydrate Metabolism, ETS and Energy Rich Compounds | UO1: To study carbohydrate metabolism with different pathways such as glycolysis, Fermentation, pentose phosphate pathway, TCA and its energetics, regulation and inhibitors.<br>UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors.<br>UO3: To demonstrate the significance of ATP and other energy rich molecules. | CO1:- The objective of this course is to gain an insight into the Metabolic Processes associated with Catabolism of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO2:- By the end of the course the student will be able to<br>• Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO3: Explain the Role of Energy Rich Molecules in Metabolism. |
| 2. Amino Acid Metabolism | UO1: To highlight catabolism of amino acid pathways and its regulation.<br>UO2: To study biosynthesis of key hormones and regulators from amino acids.<br>UO3: To analyze deamination, transamination and reactions of urea cycle along with regulation and disorders. | |
| 3. Lipid and Nucleotide Metabolism | UO1: To learn mobilization and transport of fatty acids.<br>UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation.<br>UO3: To study ketone body breakdown pathway and highlight catabolism of purines and pyrimidines. | |

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**USBT402 Core Subject Applied Chemistry- II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Sampling and Separation Techniques | UO1: To study about sampling, its importance and techniques of sampling for solids, liquids and gases.<br>UO2: To study about the various types of separation techniques and their applications in biological sciences.<br>UO3: to understand about the concepts of sedimentation and centrifugation in detail. | CO1- The objective of this course is to have a firm foundation of the fundamentals and applications of current Chemical Theories for the Physical World.<br>CO2- By the end of the course the student will:<br>• Develop an understanding of the different aspects of Analytical Chemistry.<br>CO3: Gain knowledge of Natural Product Chemistry and related acquired skills.<br>CO4: Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials. |
| 2. Natural Product Chemistry | UO1: To understand and classify the natural products into primary and secondary metabolites.<br>UO2: To learn about the structure and functions of alkaloids, phenolics, sterols and essential oils. Also study about their structural elucidation.<br>UO3: To learn about the chromatographic separation techniques. | |
| 3. Polymers and Nanomaterials | UO1: To get introduced to the chemistry of polymers and learn about the different types of polymers.<br>UO2: To study about the stereochemistry of polymers and about biodegradable polymers. | |

**USBT403 Core Subject Medical Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Infectious Diseases | UO1: To discuss the host parasite relationship<br>UO2: To gain insight about infection<br>UO3: To gain knowledge about diseases | CO1- The objective of this course is to gain insight into Disease Factors and Processes and Diseases Caused by Microorganisms.<br>CO2:- By the end of the course the student will be able to:<br>• List the factors playing a role in causing a disease.<br>CO3: Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.<br>CO4: Gain the technical capability of handling, isolating and identifying various Bacteria. |
| 2. Medical Microbiology- Causative Organisms- I | UO1: To acquaint the students with S. aureus<br>UO2: To study S. pyogenes<br>UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae<br>UO4: To gain knowledge about UTIs caused by E. coli and Proteus | |
| 3. Medical Microbiology - Causative Organisms- II | UO1: To study the GI tract infections caused by Salmonella and Shigella<br>UO2: To study the sexually transmitted diseases<br>UO3: To discuss nosocomial infections | |

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**USBT404 Core Subject Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Environmental Pollution | UO1: To analyse the types, sources, classification of air pollutants and study air pollution monitoring and prevention.<br>UO2: To study the types, sources, classification of water pollutants and study water pollution monitoring and prevention.<br>UO3: To study the types, sources, classification of soil and solid waste pollutants and study soil pollution monitoring and prevention and elaborate on the concept of soil erosion. | CO1:- The objective of this course is to gain awareness about different Types of Environmental Pollution and Related Issues.<br>CO2- By the end of the course the student will be able to:<br>• Gain an understanding of the causes, types and control methods for Environmental Pollution.<br>CO3: Application of different life forms in Environmental Remediation |
| 2. Global Environmental Problems and Issues | UO1: To get an overview about factors responsible for greenhouse effect with relevant examples.<br>UO2: To state the importance of global warming, ozone depletion and regulations of Kyoto protocol.<br>UO3: To analyse the damaging consequences of UV radiation and acid rain. | |
| 3. Bioremediation | UO1: To understand the concept of bioremediation.<br>UO2: To learn about the microorganisms in bioremediation.<br>UO3: To learn about bioaugmentation and biostimulation<br>UO4:To monitor the efficacy of bioremediation techniques. | |

**USBT405 Core Subject Biostatistics and Bioinformatics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Computers and Biological Databases | UO1: To understand the working principles of computers and the internet.<br>UO2: To state the applications biological databases and its classification.<br>UO3: To analyse the applications of genome information resources and protein structure visualization softwares. | CO1:- The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.<br>CO2:- By the end of the course the student will be able to:<br>• Gain an understanding of the basic concepts of Bioinformatics and Biostatistics.<br>CO3: Understand the tools used in Bioinformatics.<br>CO4: Apply the various Statistical Tools for Analysis of Biological Data. |

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| 2. BLAST and Sequence Alignment | UO1: To introduce the concepts of sequencing technique such as BLAST and its types<br>UO2: To study the various alignment methods, namely, global and local<br>UO3: To demonstrate the concept of multiple sequencing alignment and it's associated terminologies | |
| 3. Biostatistics | UO1: To understand the theory and solve problems based on correlation and regression analysis.<br>UO2: To study the test in studying statistical hypothesis.<br>UO3: To study and solve problems based on z-test, T-test and Chi square test | |

**USBT406 Molecular Diagnostics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Basics of Molecular Diagnostics | UO1: To develop an in-depth understanding of the brief history of the diagnosis at the molecular level<br>UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins<br>UO3: To analyze and apply the various hybridization techniques such as the blotting methods. | CO1: Objective of this course is learning and understanding Molecular Techniques and utilizing these techniques in Diagnosis.<br>CO2: By the end of the course the student will be able to:<br>• Gain an understanding of the basic Principles used in Molecular Diagnosis.<br>CO3: Gain critical thinking and analytical skills to understand new Diagnostic Methods.<br>CO4: Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits. |
| 2. Nucleic Acid Amplification Methods | UO1: To discuss amplification technique such as the working of PCR UO2: To develop a brief understanding on the various modifications of PCR<br>UO3: To understand the concept of ligase chain reaction | |

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| 3. Molecular Biology based Diagnostics | UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique<br>UO2: To briefly discuss the various methods of molecular diagnostics for infectious diseases<br>UO3: To understand the need of genetic counselling by discussing case studies and to also discuss the ethical social and legal issues associated with genetic testing. | |

**USBT407 General Elective Entrepreneurship Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Entrepreneurship Development | UO1: To introduce the concept of entrepreneurship.<br>UO2: To state qualities required to be a successful entrepreneur<br>UO3: To learn the depth of rising demand of entrepreneurship in the future. | CO1: To develop and systematically apply an Entrepreneurial way of thinking that will allow identification and creation of Business Opportunities.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the systematic process and to select and screen a Business Idea.<br>CO3: Design strategies for successful implementation of ideas.<br>CO4: Write a Business Plan |
| 2. Setting-up of an Enterprise and Planning | UO1: To learn several aspects of deciding location of a business, financial planning, effective strategies to obtain fundings and sponsors.<br>UO2: To learn methodologies involved in planning, organization and implementation of a project along with its feasibility.<br>UO3: To get an in -depth understanding of regulatory affairs, corporate laws associated with establishing an enterprise. | |
| 3. Marketing, Sales, Advertising and International Market research | UO1: To learn to design effective marketing plan.<br>UO2: To analyse different principles of advertising and sales promotion.<br>UO3: To study strategies of market assessment and different types of market research with suitable examples. | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER V (A.Y. 2021–22)

**USBT501 Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cell cycle | UO1: To distinguish between the prokaryotic and eukaryotic cell cycle highlighting the role of MPF and discuss early embryonic cell cycle.<br>UO2: To analyse the significance of yeast's genetics in regulation of cell cycle.<br>UO3: To learn different apoptosis pathways along with regulation of cell division in multicellular animals. | By the end of the course the student will be able to:<br>Gain knowledge about the cell multiplication and death at molecular level.<br>CO1. Understand the molecules involved in cell signaling.<br>CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development.<br>CO3. Gain insight into the biology of cancer cells. |
| 2. Cell Signaling | UO1: To understand the concepts of cell signaling and its types, and G-protein linked cell surface receptor signaling with suitable examples.<br>UO2: To study signaling via Enzyme linked receptors with suitable examples.<br>UO3: To learn principles of target cell adaptation and co-relating computer based signaling network with<br>biological signaling. | |
| 3. Developmental Biology | UO1: To study the importance of developmental biology as an multidisciplinary science along with<br>model organisms.<br>UO2: To elaborate different stages on development and germ layers.<br>UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern<br>formation and morphogenetic movements. | |

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| 4. Cancer Biology | UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process.<br>UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer.<br>UO3: To gain insights about latest techniques and methodology of cancer diagnosis and cancer prevention. | |

**USBT502 Medical Microbiology and Instrumentation**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Virology | UO1: To study properties of viruses along with its structure, classification and taxonomy.<br>UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.<br>UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples.<br>UO4: To study mechanisms of cellular destruction caused due to viral infections with suitable examples and highlighting the significance of novel virus-like species; viroids and prions. | By the end of the course the student will be able to:<br>CO1. Learn the different type of virus cultivation and enumeration<br>CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.<br>CO3. Get an insight into the various spectroscopic methods used in biological studies.<br>CO4. Understand the principle and applications of chromatographic and tracer techniques. |
| 2. Chemotherapeutic drugs | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To gain insight into the mechanisms of drug resistance<br>UO4: To discuss the use and misuse of antimicrobial agents<br>UO5: To acquaint the students with antifungal and antiviral drugs | |

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| 3. Spectroscopy | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |
| 4. Bioanalytical techniques | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same | |

**USBT503 Genomics and Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetic engineering of plants | UO1: To study the methodologies of genetic engineering with Ti plasmid vectors<br>UO2: To demonstrate the various methods of artificial gene transfer<br>UO3: To learn the types of vectors and how is it used in the improvement of seed quality | By the end of the course the student will be able to:<br>CO1. Use molecular biology tools and techniques in the field of biotechnology.<br>CO2. Gain knowledge regarding recent developments in genome sequencing and editing.<br>CO3. Understand the basis of gene cloning and development of transgenic animals and plants.<br>CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms. |

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**USBT 504 Marine Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Marine Biotechnology- Introduction & Bioprospecting | UO1: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats.<br>UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same.<br>UO3: To study diversity of compounds obtained from other marine organisms which are of commercial and ecological value. | By the end of the course the student will be able to:<br>1. Gain insight in the field of marine biotechnology.<br>2. Describe different marine products which can be used as pharmaceuticals.<br>3. Discuss marine functional foods and nutraceuticals and its applications.<br>4. Elaborate on marine bioresources and cosmetics and their applications. |
| 2. Marine Drugs and Enzymes | UO1: To describe different natural products from marine resources and their challenges<br>UO2: To elaborate on marine microbial enzymes.<br>UO3: To describe different pharmaceutical compounds obtained from marine organisms. | |
| 3. Marine Functional foods and Nutraceuticals | UO1: To discuss marine functional foods<br>UO2: To study marine derived ingredients with biological properties<br>UO3: To acquaint the students with marine nutraceuticals | |
| 4. Marine Bioresources and cosmetics | UO1: To gain insight into marine bioresources, marine secondary metabolites, marine proteins, marine lipids<br>UO2: To discuss cosmetics from marine sources<br>UO3: To acquaint the students with products and treatments based on marine resources | |

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**Applied Component: Biosafety**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to biosafety | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | CO1: To introduce students to the concepts of biosafety.<br>CO2: To discuss the significance of good lab practices used in the biotechnology industry and research.<br>CO3: To state the possible contaminants in different samples.<br>CO4: To study the applications of rDNA technology and importance of bioethics. |
| 2. GLP | UO1: To discuss the concept of GLP<br>UO2: To acquaint the students with the guidelines of GLP<br>UO3: To gain insight into documentation of laboratory work<br>UO4: To gain knowledge about the calibration and validation methods<br>UO5: To acquaint the students with audits and audit reports | |
| 3. Detection and testing of contaminants | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |
| 4. Biosafety in Biotechnology | UO1: To study the concepts on biosafety in Biotechnology<br>UO2: To discuss rDNA technology<br>UO3: To acquaint the students with regulation of food and food ingredients<br>UO4: To learn about genetically engineered crops<br>UO5: To study about the contemporary issues in Bioethics | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER VI (A.Y. 2021-22)

**USBT601 Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Protein Biochemistry | UO1: To study protein's structure highlighting the principles of denaturation and folding.<br>UO2: To Study the protein's function with suitable examples along with protein purification methods.<br>UO3: To learn the complementary interactions between proteins and ligands with suitable examples.<br>UO4: To briefly understand the mechanism of how the protein's interaction is affected by energy with suitable examples. | CO1. To explain in detail various metabolic pathways, fate and energy production efficiency of carbohydrate and lipid metabolism.<br>CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders.<br>CO3. To study the importance of vitamins, their sources, functions, bioactivity and associated disorders. |
| 2. Metabolism | UO1: To illustrate pathway of bacterial cell wall synthesis.<br>UO2: To learn the metabolic pathways of starch and sucrose and glycogen synthesis and its regulation by various factors.<br>UO3: To demonstrate the reactions of Cholesterol synthesis pathway, its regulation and highlight the pathology of cardiovascular diseases. | |
| 3. Endocrinology | UO1: To understand the classification of hormones into group i and ii and study characteristics of hormones released by anterior and posterior pituitary glands.<br>UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex.<br>UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads. | |

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| 4. Nutrition | UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins.<br>UO2: To explain functions and mode of action of minerals in metabolism.<br>UO3: To highlight the clinical significance of Malnutrition and overnutrition with suitable examples. | |

**USBT602 Industrial Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Dairy technology | UO1: To study milk - normal flora, changes in raw milk and enumeration<br>UO2: To discuss dairy technology preservation methods<br>UO3: To gain insight into starter cultures<br>UO4: To gain knowledge about the different fermented products | CO1: To introduce to various downstream processing technologies for extraction and purification of biological products produced using Bioprocess technology.<br>CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation.<br>CO3: To gain insight in the various processes involved in production of commercially available dairy products.<br>CO4: To have an in-depth understanding of downstream processes. |
| 2. Down-stream Processing (DSP) | UO1: To study DSP<br>UO2: To discuss foam separation and types of precipitation<br>UO3: To gain insight about filtration, centrifugation and chromatography<br>UO4: To describe the cell disruption methods<br>UO5: To acquaint the students about crystallization and whole broth processing | |

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| 3. Fermentation process | UO1: To study inoculation development in bacteria and fungi<br>UO2: To discuss scale up and scale down<br>UO3: To learn fermentation processes of different fermentation products<br>UO4: To discuss biotransformation | |
| 4. QA-QC | UO1: To study the concept of GMP and requirements for GMP implementation<br>UO2: To gain insight into the documentation of GMP practices<br>UO3: To learn the concept of QC and requirements for implementing QC<br>UO4: To acquire knowledge of QA concepts and requirements for implementing the same | |

**USBT603 Basic Pharmacology and Neurochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. General principles of Pharmacology | UO1: To introduce and develop and in-depth understanding about the basics of pharmacology and the mechanism of drug action<br>UO2: To aid in the understanding of drug receptors and its respective responses<br>UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response<br>UO4: To study the concept of effective dose and lethal dose<br>UO5: To gain insights about the potency, intrinsic activity and the phenomenon of drug antagonism | CO1. To understand principles of pharmacology and its role related to biological activity of drugs in the system.<br>CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity.<br>CO3. To understand the effect of allergen, pesticide on systemic physiological functions. Also to discuss steps to be taken in case of nonmedical misuses of chemicals and bioterrorism.<br>CO4. To study in details the structure and functions of neurons and glial cells, mechanism of action potential, role of various channels , and effects of neurotransmitters and neurotoxins |

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| 2. Drug Absorption and Distribution | UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it<br>UO2: To study the absorption of through from lungs and skin<br>UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug<br>UO4: To demonstrate the binding of drugs and also the various physiological barriers. | |
| 3. Basic Toxicology and Regulatory Toxicology | UO1:To understand all the background definitions in-depth<br>UO2: To understand and distinguish between the allergic responses, side effects and adverse effects<br>UO3: To gain knowledge about poisonings and its types<br>UO4: To demonstrate about specific poisons<br>UO5: To discuss about the non-medical use of drugs and incapacitating agents | |
| 4. Neurochemistry | UO1: To understand the anatomy and functioning of the human brain<br>UO2: To demonstrate about the neuronal pathways and the working of nerve impulses<br>UO3: To understand the mechanism of neuronal excitation and inhibitions<br>UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters. | |

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**USBT604 Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Renewable sources of energy | UO1: To get an overview of different renewable sources of energy and its applications.<br>UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications.<br>UO3: To study mode of action, advantages and significance of biofuels with suitable examples. | CO1. To impart knowledge regarding management of industrial, storm and hazardous waste.<br>CO2. To study biological processes used to treat effluent from industries.<br>CO3. To study different methodologies to treat solid and liquid waste from different industries.<br>CO4. To understand the importance of biofertilizers, its types, usage and applications in sustainable agriculture. |
| 2. Industrial effluent treatment | UO1: To study various biological processes involved in treatment of industrial effluents with suitable examples.<br>UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors.<br>UO3: To understand principles of biodegradation with suitable examples.<br>UO4: To analyse the applications of enzymes and microbes used for biodegradation. | |
| 3. Wastewater treatment | UO1: To identify the pollutants causing water pollution and to study about the microorganisms used in its treatment.<br>UO2: To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.<br>UO3: To learn about the heavy metals that cause pollution in water bodies and study about the micro-organisms used for the treatment along with their mechanism | |
| 4. Hazardous waste management | UO1: To learn about water pollution wrt hazardous waste produced by petrochemicals, and manufacturing Industries.<br>UO2: To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries.<br>UO3: To highlight the importance of water treatment due to oil spillage, other green deposits | |

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**Applied Component: AgriBiotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Precision Agriculture and Agriculture systems | UO1: To introduce students to different mechanisms of agriculture systems and greenhouse technology.<br>UO2: To elaborate the design, media and applications of greenhouse irrigation systems.<br>UO3: To discuss the significance of phytotrons and precision cultivation systems. | CO1: To get an overview about precision agriculture and management of agriculture systems.<br>CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress.<br>CO3: To highlight the applications of molecular markers used in plant breeding.<br>CO4: To state the eco-friendly use of biofertilizers and biopesticides. |
| 2. Plant stress biology | UO1:To study the concept of abiotic stress, its causes, sources and consequences with suitable examples.<br>UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples.<br>UO3: To understand the principles of biotic stress, its causes, sources and consequences with suitable examples. | |
| 3. Molecular Markers in Plant Breeding | UO1: To study the various genetic markers used in plant breeding technology<br>UO2: To learn the application of molecular markers<br>UO3: To discuss the techniques used in plant DNA barcoding | |
| 4. Biofertilizers and Biopesticides | UO1: To study biofertilizer<br>UO2: To discuss plant growth promotion by fungi<br>UO3: To gain insight about microbial inoculants<br>UO4: To study function of biopesticides. | |

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DR. S. RADHAKRISHNAN MARG, ANDHERI (E), MUMBAI – 400 069

F. Y. B.Sc. BIOTECHNOLOGY Semester - I (A.Y. 2020-21)

**USBT101- Core Subject- Basic Chemistry-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Nomenclature and Classification | UO1: To learn about the IUPAC system of nomenclature and be able to name the compounds based on the rules.<br>UO2: To classify whether the bonds in the compound are organic, inorganic or co-ordinate.<br>UO3: To analyse and solve the problems given towards the end of the topic. | CO1: To acquaint the students with basic concepts of Chemistry like Classification and Nomenclature of Chemical compounds<br><br>CO2: To impart hands-on skills in preparation of Buffers and Solutions. |
| 2. Chemical Bonds | UO1: To understand the types of bonds whether they are ionic, covalent or co-ordinate and to study the compounds forming those bonds.<br>UO2: To get an in-depth understanding of co-ordinate and non-covalent bonds and the forces associated with them.<br>UO3: To understand and study the theory of Hydrogen bonding and its application. | |
| 3. Water and Buffers | UO1: To understand the properties of water along with its structure and its usage in chemical reactions.<br>UO2: To learn to calculate and prepare solutions of different concentrations and to understand primary and secondary standards.<br>UO3: To understand the theory of acids and bases along with the concept of buffers | |

**USBT102 -Core Subject- Basic Chemistry-II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Stereochemistry | UO1: To get a thorough understanding of structure of compounds and the arrangement of atoms in space.<br>UO2: To learn about isomerism and their types and study the structures showing isomerism.<br>UO3: To understand the difference between conformations and configuration and learn the projection formulae of compounds. | CO1: To acquaint students with Concepts of Stereochemistry<br><br>CO2: To impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry. |

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| 2. Titrimetry and Gravimetry | UO1: To know and learn the basic terms associated with titration and gravimetry.<br>UO2: To further study the estimation techniques using titration.<br>UO3: To also study about gravimetry and its use in analysis with the help of suitable examples. | |
| 3. Analytical Techniques | UO1: To understand and learn about the methods of separation of organic and inorganic compounds.<br>UO2: To study about the different analytical techniques along with their applications.<br>UO3: To understand the theory behind Beer-Lambert's law and be able to solve the numerical problems based on the law. | |

**USBT103 -Core Subject- Basic Life Sciences - 1 : Biodiversity and Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Origin of Life and Biodiversity (Animal, Plant, Microorganisms) | UO1: To study the origin of life theories and understand the concepts of biodiversity.<br>UO2: To learn about plant diversity in detail with examples.<br>UO3: To learn about animal diversity in detail with examples.<br>UO4: To learn about microbial diversity in detail with examples. | CO1: To acquaint students with concept of Biodiversity and Cell Biology<br><br>CO2: To impart skill in handling and culture of Microorganisms. |
| 2. Ultra Structure of Prokaryotic and Eukaryotic Cell. | UO1: To get an overview about prokaryotic cellular structure<br>UO2: To get an overview about eukaryotic cellular structure<br>UO3: To study about extracellular organelles in prokaryotes and eukaryotes.<br>UO4: To distinguish between prokaryotes and eukaryotes on the basis of different biological characteristics. | |
| 3. Bacteria and Viruses | UO1: To learn about classification, types and morphology of bacteria.<br>UO2: To understand cultivation, reproduction and growth kinetics of bacteria<br>UO3: To gain knowledge about bacterial isolation and industrial applications.<br>UO4: To classify viruses based on several parameters like host infected, structural similarity, etc<br>UO5: To study properties of plant, animal and bacterial viruses with their significance. | |

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**USBT104 -Core Subject- Basic Life Sciences - II : Microbial Techniques**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microscopy and Stains | UO1: To get an overview about parts of a simple and compound microscope with its functions.<br>UO2: To study working and applications and phase contrast and dark field microscope.<br>UO3: To learn different staining techniques with its examples and applications. | CO1: To acquaint students with basic techniques in Staining and Sterilization<br><br>CO2: To impart the knowledge of growth of microorganisms. |
| 2. Sterilization Techniques | UO1: To distinguish between disinfection and sterilization<br>UO2: To study the role of physical and chemical agents used in sterilization.<br>UO3: To understand the characteristics of an ideal disinfectant with examples. | |
| 3. Nutrition, Cultivation and Enumeration of Microorganisms | UO1: To impart knowledge about nutritional requirements of bacteria.<br>UO2: To learn the concept of culture media and isolation techniques.<br>UO3: To study growth curve and enumeration of bacteria.<br>UO4: To prepare students in understanding about preservation of microbial cultures. | |

**USBT105 -Core Subject- Basic Biotechnology - I : Introduction to Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Scope and Introduction to Biotechnology | UO1: To impart knowledge about the history of Biotechnology<br>UO2: To acquaint the students with the different branches of Biotechnology and their applications<br>UO3: To differentiate between traditional and modern biotechnology | CO1: To acquaint students with various fields of Biotechnology and their applications<br>CO2: To impart the knowledge of Food Technology and Fermentation Techniques. |
| 2. Applications Biotechnology | UO1: To acquaint students with the applications of Biotechnology in Agriculture<br>UO2: To impart knowledge about the ethics in Biotechnology<br>UO3: To make the students acquainted with IPR | |

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| 3. Food and Fermentation Biotechnology | UO1: To impart knowledge about Food Biotechnology<br>UO2: To discuss the biotechnological applications in enhancement of food quality<br>UO3: To discuss about the regulatory aspects in food industries<br>UO4: To acquaint students with fermentation technology<br>UO3: | |

**USBT106- Core Subject- Basic Biotechnology - II : Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Replication | UO1: To impart knowledge about DNA replication in prokaryotes and eukaryotes.<br>UO2: To study enzymes involved in DNA replication.<br>UO3: To learn the recombination process in eukaryotes. | CO1: To acquaint students with DNA Replication, Repair and Genetic Engineering<br>CO2: Impart the knowledge of molecular Biology Techniques |
| 2. Mutation and DNA Repair | UO1: To study different types of mutations<br>UO2: To learn working applications of mutations causing agents.<br>UO2: To learn the basics of different types of repair mechanisms | |
| 3. Genetic Engineering | UO1: To distinguish between DNA and RNA as genetic material.<br>UO2: To gain understanding of Genetic Engineering techniques in various organisms.<br>UO3: To learn concepts about different types of vectors and its applications.<br>UO4: To study roles of enzymes involved in genetic engineering. | |

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**USBT107 - Ability Enhancement Course 1 (FC 1) - Societal Awareness**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Overview of Indian Society | UO1: To understand the multicultural diversity of Indian society through various parameters.<br>UO2: To highlight the notion of linguistic diversity.<br>UO3: To study the concept of regional diversity with respect to various parameters. | CO1: To acquaint the students with concepts of Societal Awareness<br>CO2: To impart knowledge of Society and make students aware about the Problems in Society |
| 2. Concept of Disparity | UO1: To study the causes and effects of disparity arising due to various social, economical factors.<br>UO2: To highlight the inequalities faced by people with different types of disabilities.<br>UO3: To develop brief understanding about inequalities arising out of caste system, regionalism and linguistic diversity. | |
| 3. The Indian Constitution and Significant Aspects of Political Processes | UO1: To learn the basic features of constitution as given in the preamble<br>UO2: To study fundamental duties of a Indian citizen and values required to build effective society.<br>UO3: To understand features of Indian politics with highlight<br>on party system, special amendments and contribution of women in politics. | |

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F. Y. B.Sc. BIOTECHNOLOGY - Semester – II (A.Y. 2020 - 21)

**USBT201 Core Subject Chemistry – I : Bioorganic Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Biomolecules: Carbohydrates and Lipids | UO1: To classify biomolecules such as carbohydrates, lipids and steroids based on their structure and properties.<br>UO2: To distinguish between simple and complex carbohydrates and study their properties.<br>UO3: To study the types of lipids and the reactions they participate in. | CO1: To aquint students with Bioorganic Molecules<br>CO2: To impart the knowledge of Classification, Strucure and Characterization of Biomolecules |
| 2. Biomolecules: Proteins and Amino Acids | UO1: To classify proteins and amino acids based on their structures and functions.<br>UO2: To understand the concept of isoelectric point and study the synthesis of peptides=es.<br>UO3: To learn and understand the reactions carried out by protein and amino acids. | |
| 3. Biomolecules: Nucleic Acids | UO1: To study the structure and composition of DNA and RNA.<br>UO2: To understand the difference between purine and pyridine bases.<br>UO3: Differentiate between DNA and RNA based on their compositions. | |

**USBT202 Core Subject Chemistry - II : Physical Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Thermodynamics | UO1: To clear the basic terms related to thermodynamics.<br>UO2: To study the laws of thermodynamics; their laws and limitations.<br>UO3: To solve numericals based on internal energy, work, enthalpy, entropy. | CO1: To aquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions<br>CO2: To impart skills in Kinetics and Chemical Reactions |

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| 2. Chemical Kinetics | UO1: To understand the progress of a reaction based on their rate.<br>UO2: To learn about the order of reaction<br>UO3: To solve numericals based on the above given concepts. | |
| 3. Oxidation Reduction reactions | UO1: To understand the basic concepts of oxidation and reduction reactions.<br>UO2: To understand the role of oxidizing and reducing agents.<br>UO3: To solve the conceptual numericals towards the end of the unit. | |

**USBT203 Core Subject Life Sciences - I : Physiology and Ecology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Physiology | UO1: To study photosynthesis and its systems with reactions.<br>UO2: To distinguish between dark phase, C3, C4 cycles and photorespiration.<br>UO3: To learn the action of several plant hormones and secondary metabolites. | CO1: To acquaint students with Physiological Processes in Plants and Animals<br>CO1: To impart the knowledge of Physiology and Ecology |
| 2. Animal Physiology | UO1: To study mechanisms of digestion, absorption and assimilation in humans.<br>UO2: To learn anatomy, physiology of the human kidney.<br>UO3: To learn anatomy, physiology of respiration.<br>UO4: To learn anatomy, physiology of the human heart, blood circulation and coagulation. | |
| 3. Ecosystem and Interactions | UO1: To gain insight of different types of ecosystems, its structures and functions.<br>UO2: To learn concepts of food chain, food web and food pyramids.<br>UO3: To get detailed understanding about biogeochemical cycles and interactions between organisms. | |

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**USBT204 Core Subject Life Sciences - II : Genetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetics Fundamentals | UO1: To understand the basics of genetics and Mendel's laws.<br>UO2: To distinguish between genotype and phenotype.<br>UO3: To understand the principles of non-Mendelian genetics.<br>UO3: To highlight environmental effects on genes and gene interactions. | CO1: To acquaint students with concepts in Genetics<br>CO2: To impart skills in Techniques in Genetic Analysis and Population Genetics |
| 2. Microbial Genetics | UO1: To learn to classify bacteria as prototrophs and auxotrophs.<br>UO2: To study mechanism and pathway of genetic material exchange in bacteria.<br>UO3: To learn transduction and bacterial virus life cycles and transposable elements. | |
| 3. Population Genetics | UO1: To study Hardy-Weinberg law and its applications.<br>UO2: To understand genetic variations in populations at DNA level.<br>UO3: To learn the significance of population genetics in conservation biology. | |

**USBT205 Core Subject Biotechnology - I : Tissue Culture & Scientific Writing and Communication Skills**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Tissue Culture | UO1: To understand the concepts of plant tissue culture and cell theory.<br>UO2: To develop insight about basic framework of plant tissue culture laboratory.<br>UO3: To illustrate the culture medium required for plant tissue culture and throw light on callus culture technique. | CO1: To acquaint students with Techniques of Plant and Animal Tissue Culture<br>CO2:To impart the skills of PTC, ATC and Science Communication |

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| 2. Animal Tissue Culture | UO1: To introduce cell culture techniques and its applications.<br>UO2: To learn significance of growth factors, cell metabolism and growth kinetics.<br>UO3: To study development and maintenance of primary cell culture and its types. | |
| 3. Scientific Writing and Communication Skills | UO1: To understand communication, its types and key principles.<br>UO2: To learn the principles and applications of scientific writing with examples.<br>UO3: To introduce concept of plagerism. | |

**USBT206 Core Subject Biotechnology - II : Enzymology, Immunology and Biostatistics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Enzymes | UO1: To understand the detailed classification , nature and properties of enzymes in detail.<br>UO2: To study the mechanism, enzyme kinetics and effects of various parameters of enzyme activity.<br>UO3: To analyse mechanisms of different modes of enzyme inhibitions and allosteric modulators. | CO1: To acquaint students with concepts in Enzymology, Immunology and Biostatistics<br>CO2: To impart the skills in Enzyme Kinetics, Immunological Techniques and Biostatistics. |
| 2. Immunology | UO1: To acquaint the students with the cells and organs of the immune system<br>UO2: To discuss about the different types of immunity<br>UO3: To impart knowledge about the antigens and different classes of antibodies<br>UO4: To gain insight about the antigen-antibody interactions<br>UO5: To discuss about different types of vaccines | |

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| 3. Biostatistics | UO1: To study the importance of Statistics in Biology.<br>UO2: To learn the terms associated with Statistics and understand the representation of different forms of charts.<br>UO3: To solve numericals based on mean, median and mode and also solve questions on dispersion, variation, standard deviation and standard error. | |

**USBT207 Ability Enhancement Course 2 (FC II) - Globalization, Ecology and Sustainable Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Globalisation and Indian Society and Human Rights | UO1: To understand the basic concept of globalisation and its associated terms<br>UO2: To discuss about the concept of Human rights in-depth and develop and understanding for the same<br>UO3: To apply the learnings and develop an aptitude in one's life | CO1: To acquaint the students with concepts of Globalization, Ecology and Environment<br>CO2: To impart knowledge of Globalization make students aware about the problems in Society |
| 2. Ecology and Sustainable Development | UO1: To discuss the importance of environment protection and the concept of sustainability<br>UO2: To understand the environmental threats and how one can protect it | |
| 3. Understanding and Managing Stress and Conflict in Contemporary Society | UO1: To discuss the types and causes of stress and how one can overcome it<br>UO2: To understand the significance of social values and ethics<br>UO3: To discuss and analyze the various methods of stress management | |

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S. Y. B.Sc. BIOTECHNOLOGY *Semester III* (A.Y. 2020-21)

**USBT301 Core Subject Biophysics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Optics and Electromagnetic Radiations | UO1: To learn about the properties of light such as reflection, refraction and their laws and applications.<br>UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum.<br>UO3: To learn about the different analytical techniques such as SEM, TEM, Immuno electron microscopy and Fluorescence microscopy and study about their importance in Biotechnology. | CO1: The objective of this course is to have a firm foundation of the fundamentals and applications of current biophysical theories.<br>CO2: By the end of the course the student will:<br>• Develop an understanding of the different aspects of classical Physics.<br>CO3: Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis. |
| 2. Heat, Sound, Magnetism and Fluid Dynamics | UO1: To understand the concept of heat and temperature and methods of transfer of heat. Also to study about the different thermometers and their applications.<br>UO2: To study about sound and their types based on their properties such as frequencies and understand the applications.<br>UO3: To study about viscosity, surface tension and other surface phenomenon with their application in Biological Sciences. | |
| 3. Electrophoretic Techniques | UO1: To get an overview about principles of electrophoresis of different types with suitable examples.<br>UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples.<br>UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis. | |

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**USBT302 Core Subject Applied Chemistry- I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Organic Chemistry | UO1: To study about the different types of organic reactions and their applications<br>UO2: To study about the role of essential and non essential metal ions in biological systems and their significance.<br>UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes<br>UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin.<br>UO5: To study about the metal complexes used in medicines. | CO1:- The objective of this course is to have a firm foundation of the fundamentals and applications of Organic and Green Chemistry.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the different aspects of Organic and Green Chemistry.<br>CO3: Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds.<br>CO4: Discuss role of Green Chemistry and its application in Industry. |
| 2. Synthesis of Organic Compounds | UO1: To study about the different types of synthesis in organic reactions.<br>UO2: To understand the criteria for synthesis that can provide a good yield.<br>UO3: To study the green methods in organic synthesis. | |
| 3. Green Chemistry and Synthesis | UO1: To understand the need for green chemistry in today's day and age.<br>UO2: To study the principles of green chemistry.<br>UO3: To study and understand about the green materials such as reagents, solvents, catalysts. | |

**USBT303 Core Subject Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Effectors of Immune Response | UO1: To discuss haematopoiesis<br>UO2: To acquaint students with the cells and organs of the immune system<br>UO3: To discuss complement system - types, biological effects and deficiencies | CO1:- The objective of this course is to familiarize students with the Immune Effector Mechanisms and various Immuno-techniques.<br>CO2- By the end of the course the student will be able to:<br>• Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.<br>CO3: Understand the principles underlying various Immuno-techniques |

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| 2. Cell Receptors | UO1: To learn the mechanism of T-cell receptor's activation with its structure<br>UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II.<br>UO3: To study the mechanism of B-cell receptor's activation with its structure and its interaction with T-cell. | |
| 3. ImmunoTechniques | UO1: To acquaint students with the precipitation reactions<br>UO2: To acquaint students with the agglutination reactions<br>UO3: To discuss alternatives to Antigen-Antibody Reactions | |

**USBT304 Core Subject Cell Biology and Cytogenetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cytoskeleton | UO1: To illustrate significance of microtubules as dynamic cytoskeleton elements with its structure and associated motor proteins.<br>UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin.<br>UO3: To demonstrate the structure, function and different types of intermediate filaments. | CO1- The objective of this course is to have a firm foundation in the fundamentals of Cell Biology and Cytogenetics.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the Cytoskeleton and Cell Membrane.<br>CO3: Discuss the structure of Chromosomes and types of Chromosomal Aberrations.<br>CO4: Discuss the principles underlying Sex Determination, Linkage and Mapping. |
| 2. Cell Membrane | UO1: To understand the principles of membrane transport with examples.<br>UO2: To study different types of cell-cell and cell extracellular matrix junctions.<br>UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition. | |

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| 3. Cytogenetics | UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number.<br>UO2: To analyze the mechanism of sex determination and linkage.<br>UO3: To illustrate the fundamental concepts of linkage, crossing over and chromosomal mapping. | |

**USBT305 Core Subject Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Gene Expression-Transcription | U01: To study the intricate mechanism of Transcription in both prokaryotes and Eukaryotes<br>U02: To illustrate the details of initiation, elongation and termination of transcription<br>U03: To develop a brief understanding of the types of polymerases and promoters<br>U03: To demonstrate the mechanism of splicing and RNA editing | CO1- The objective of this course is to have an insight into the mechanism of Gene Expression and Regulation.<br>CO2: By the end of the course the student will be able to:<br>• Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.<br>CO3: Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes |
| 2. Gene Expression-Translation | U01: To discuss the genetic code, its nature and how it was deciphered<br>UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination.<br>UO3: To demonstrate the various post-translational modifications | |
| 3. Regulation of Gene Expression | UO1: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp<br>UO2: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses<br>UO3: To discuss the various operons in Eukaryotes and the methods of gene silencing | |

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**USBT306 Skill Enhancement Elective Bioprocess Technology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microorganisms in Industrial Processes | UO1: To discuss about the types of microorganisms used in industrial processes<br>UO2: To acquaint students with screening and its types<br>UO3: To impart knowledge about the preservation techniques used | CO1:- The objective of this course is to understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the various aspects of Bioprocess Technology.<br>CO3: Develop skills associated with screening of Industrially Important Strains.<br>CO4: Understand principles underlying design of Fermentor and Fermentation Process. |
| 2. Fermentor and Fermentation Processes | UO1: To impart knowledge about the design of a fermentor<br>UO2: To gain insight about the fermentation media<br>UO3: To discuss about sterilization and the process parameters<br>UO4: To acquaint students about the types of fermentation<br>UO5: To study the representative fermentation processes | |
| 3. In-vivo and In vitro Assay of Industrial Products | UO1: To discuss the assay of industrial processes<br>UO2: To acquaint the students with half-life determination of pharmaceutical products<br>UO3: To study bioavailability and bioequivalence studies | |

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**USBT307 General Elective Research Methodology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Research Methodology and Research Problem | UO1: To study the meaning, criteria, and objectives of good research.<br>UO2: To learn different types of research and its significance<br>UO3: To identify good research question, methods involved to solve it and challenges faced by researchers while approaching research problem. | *CO1- The objective of this course is to develop Research Aptitude, Logical Thinking and Reasoning.*<br>*CO2:- By the end of the course the student will be able to*<br>*• Understand basic principles of Research Methodology and identify a Research Problem.*<br>*CO3: Understand a general definition of Research Design.*<br>*CO4: Identify the overall Process of Designing a Research Study from its inception to its Report.* |
| 2. Research Design and Data Collection | UO1: To understand the necessity of effective research design and its principles.<br>UO2: To demonstrate mechanism of formulating a research plan.<br>UO3: To study different methods of data collection and its applications. | |
| 3. Interpretation and Report Writing | UO1: To introduce the concept of data interpretation.<br>UO2: To learn principles of report writing and its types.<br>UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report. | |

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S. Y. B.Sc. BIOTECHNOLOGY SEMESTER IV (A.Y. 2020-21)

**USBT401 Core Subject Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Carbohydrate Metabolism, ETS and Energy Rich Compounds | UO1: To study carbohydrate metabolism with different pathways such as glycolysis, Fermentation, pentose phosphate pathway, TCA and its energetics, regulation and inhibitors.<br>UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors.<br>UO3: To demonstrate the significance of ATP and other energy rich molecules. | CO1:- The objective of this course is to gain an insight into the Metabolic Processes associated with Catabolism of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO2:- By the end of the course the student will be able to<br>• Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO3: Explain the Role of Energy Rich Molecules in Metabolism. |
| 2. Amino Acid Metabolism | UO1: To highlight catabolism of amino acid pathways and its regulation.<br>UO2: To study biosynthesis of key hormones and regulators from amino acids.<br>UO3: To analyze deamination, transamination and reactions of urea cycle along with regulation and disorders. | |
| 3. Lipid and Nucleotide Metabolism | UO1: To learn mobilization and transport of fatty acids.<br>UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation.<br>UO3: To study ketone body breakdown pathway and highlight catabolism of purines and pyrimidines. | |

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**USBT402 Core Subject Applied Chemistry- II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Sampling and Separation Techniques | UO1: To study about sampling, its importance and techniques of sampling for solids, liquids and gases.<br>UO2: To study about the various types of separation techniques and their applications in biological sciences.<br>UO3: to understand about the concepts of sedimentation and centrifugation in detail. | CO1- The objective of this course is to have a firm foundation of the fundamentals and applications of current Chemical Theories for the Physical World.<br>CO2- By the end of the course the student will:<br>• Develop an understanding of the different aspects of Analytical Chemistry.<br>CO3: Gain knowledge of Natural Product Chemistry and related acquired skills.<br>CO4: Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials. |
| 2. Natural Product Chemistry | UO1: To understand and classify the natural products into primary and secondary metabolites.<br>UO2: To learn about the structure and functions of alkaloids, phenolics, sterols and essential oils. Also study about their structural elucidation.<br>UO3. To learn about the chromatographic separation techniques. | |
| 3. Polymers and Nanomaterials | UO1: To get introduced to the chemistry of polymers and learn about the different types of polymers.<br>UO2: To study about the stereochemistry of polymers and about biodegradable polymers. | |

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**USBT403 Core Subject Medical Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Infectious Diseases | UO1: To discuss the host parasite relationship<br>UO2: To gain insight about infection<br>UO3: To gain knowledge about diseases | CO1 - The objective of this course is to gain insight into Disease Factors and Processes and Diseases Caused by Microorganisms.<br>CO2:- By the end of the course the student will be able to:<br>• List the factors playing a role in causing a disease.<br>CO3: Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.<br>CO4: Gain the technical capability of handling, isolating and identifying various Bacteria. |
| 2. Medical Microbiology- Causative Organisms- I | UO1: To acquaint the students with S. aureus<br>UO2: To study S. pyogenes<br>UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae<br>UO4: To gain knowledge about UTIs caused by E. coli and Proteus | |
| 3. Medical Microbiology - Causative Organisms- II | UO1: To study the GI tract infections caused by Salmonella and Shigella<br>UO2: To study the sexually transmitted diseases<br>UO3: To discuss nosocomial infections | |

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**USBT404 Core Subject Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Environmental Pollution | UO1: To analyse the types, sources, classification of air pollutants and study air pollution monitoring and prevention.<br>UO2: To study the types, sources, classification of water pollutants and study water pollution monitoring and prevention.<br>UO3: To study the types, sources, classification of soil and solid waste pollutants and study soil pollution monitoring and prevention and elaborate on the concept of soil erosion. | CO1:- The objective of this course is to gain awareness about different Types of Environmental Pollution and Related Issues.<br>CO2- By the end of the course the student will be able to<br>• Gain an understanding of the causes, types and control methods for Environmental Pollution.<br>CO3: Application of different life forms in Environmental Remediation |
| 2. Global Environmental Problems and Issues | UO1: To get an overview about factors responsible for greenhouse effect with relevant examples.<br>UO2: To state the importance of global warming, ozone depletion and regulations of Kyoto protocol.<br>UO3: To analyse the damaging consequences of UV radiation and acid rain. | |
| 3. Bioremediation | UO1: To understand the concept of bioremediation.<br>UO2: To learn about the microorganisms in bioremediation.<br>UO3: To learn about bioaugmentation and biostimulation<br>UO4:To monitor the efficacy of bioremediation techniques. | |

**USBT405 Core Subject Biostatistics and Bioinformatics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Computers and Biological Databases | UO1: To understand the working principles of computers and the internet.<br>UO2: To state the applications biological databases and its classification.<br>UO3: To analyse the applications of genome information resources and protein structure visualization softwares. | CO1:- The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.<br>CO2:- By the end of the course the student will be able to:<br>• Gain an understanding of the basic concepts of Bioinformatics and Biostatistics.<br>CO3: Understand the tools used in Bioinformatics.<br>CO4: Apply the various Statistical Tools for Analysis of Biological Data. |

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| 2. BLAST and Sequence Alignment | UO1: To introduce the concepts of sequencing technique such as BLAST and its types<br>UO2: To study the various alignment methods, namely, global and local<br>UO3: To demonstrate the concept of multiple sequencing alignment and it's associated terminologies | |
| 3. Biostatistics | UO1: To understand the theory and solve problems based on correlation and regression analysis.<br>UO2: To study the test in studying statistical hypothesis.<br>UO3: To study and solve problems based on z-test, T-test and Chi square test | |

**USBT406 Molecular Diagnostics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Basics of Molecular Diagnostics | UO1: To develop an in-depth understanding of the brief history of the diagnosis at the molecular level<br>UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins<br>UO3: To analyze and apply the various hybridization techniques such as the blotting methods. | CO1: Objective of this course is learning and understanding Molecular Techniques and utilizing these techniques in Diagnosis.<br>CO2: By the end of the course the student will be able to:<br>• Gain an understanding of the basic Principles used in Molecular Diagnosis.<br>CO3: Gain critical thinking and analytical skills to understand new Diagnostic Methods.<br>CO4: Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits. |
| 2. Nucleic Acid Amplification Methods | UO1: To discuss amplification technique such as the working of PCR UO2: To develop a brief understanding on the various modifications of PCR<br>UO3: To understand the concept of ligase chain reaction | |

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| 3. Molecular Biology based Diagnostics | UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique<br>UO2: To briefly discuss the various methods of molecular diagnostics for infectious diseases<br>UO3: To understand the need of genetic counselling by discussing case studies and to also discuss the ethical social and legal issues associated with genetic testing. | |

**USBT407 General Elective Entrepreneurship Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Entrepreneurship Development | UO1: To introduce the concept of entrepreneurship.<br>UO2: To state qualities required to be a successful entrepreneur<br>UO3: To learn the depth of rising demand of entrepreneurship in the future. | CO1: To develop and systematically apply an Entrepreneurial way of thinking that will allow identification and creation of Business Opportunities.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the systematic process and to select and screen a Business Idea.<br>CO3: Design strategies for successful implementation of ideas.<br>CO4: Write a Business Plan |
| 2. Setting-up of an Enterprise and Planning | UO1: To learn several aspects of deciding location of a business, financial planning, effective strategies to obtain fundings and sponsors.<br>UO2: To learn methodologies involved in planning, organization and implementation of a project along with its feasibility.<br>UO3: To get an in -depth understanding of regulatory affairs, corporate laws associated with establishing an enterprise. | |
| 3. Marketing, Sales, Advertising and International Market research | UO1: To learn to design effective marketing plan.<br>UO2: To analyse different principles of advertising and sales promotion.<br>UO3: To study strategies of market assessment and different types of market research with suitable examples. | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER V (A.Y. 2020-21)

**USBT501 Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cell cycle | UO1: To distinguish between the prokaryotic and eukaryotic cell cycle highlighting the role of MPF and discuss early embryonic cell cycle.<br>UO2: To analyse the significance of yeast's genetics in regulation of cell cycle.<br>UO3: To learn different apoptosis pathways along with regulation of cell division in multicellular animals. | By the end of the course the student will be able to:<br>Gain knowledge about the cell multiplication and death at molecular level.<br>CO1. Understand the molecules involved in cell signaling.<br>CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development.<br>CO3. Gain insight into the biology of cancer cells. |
| 2. Cell Signaling | UO1: To understand the concepts of cell signaling and its types, and G-protein linked cell surface receptor signaling with suitable examples.<br>UO2: To study signaling via Enzyme linked receptors with suitable examples.<br>UO3: To learn principles of target cell adaptation and co-relating computer based signaling network with biological signaling. | |
| 3. Developmental Biology | UO1: To study the importance of developmental biology as an multidisciplinary science along with model organisms.<br>UO2: To elaborate different stages on development and germ layers.<br>UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern formation and morphogenetic movements. | |

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| 4. Cancer Biology | UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process.<br>UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer.<br>UO3: To gain insights about latest techniques and methodology of cancer diagnosis and cancer prevention. | |

**USBT502 Medical Microbiology and Instrumentation**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Virology | UO1: To study properties of viruses along with its structure, classification and taxonomy.<br>UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.<br><br>UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples.<br>UO4: To study mechanisms of cellular destruction caused due to viral infections with suitable examples and highlighting the significance of novel virus-like species; viroids and prions. | By the end of the course the student will be able to:<br>CO1. Learn the different type of virus cultivation and enumeration<br>CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.<br>CO3. Get an insight into the various spectroscopic methods used in biological studies.<br>CO4. Understand the principle and applications of chromatographic and tracer techniques. |
| 2. Chemotherapeutic drugs | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To gain insight into the mechanisms of drug resistance<br>UO4: To discuss the use and misuse of antimicrobial agents<br>UO5: To acquaint the students with antifungal and antiviral drugs | |

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| 3. Spectroscopy | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |
| 4. Bioanalytical techniques | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same | |

**USBT503 Genomics and Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetic engineering of plants | UO1: To study the methodologies of genetic engineering with Ti plasmid vectors<br>UO2: To demonstrate the various methods of artificial gene transfer<br>UO3: To learn the types of vectors and how is it used in the improvement of seed quality | By the end of the course the student will be able to:<br>CO1. Use molecular biology tools and techniques in the field of biotechnology.<br>CO2. Gain knowledge regarding recent developments in genome sequencing and editing.<br>CO3. Understand the basis of gene cloning and development of transgenic animals and plants.<br>CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms. |

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| 2. Transgenic Animals | UO1: To understand the development of transgenic mice with the aid of various techniques such as the retroviral method, DNA microinjection, ES, cre-loxp etc.<br>UO2: To gain insights about the various vectors used for animal<br>UO3: To briefly discuss the method of cloning livestock and the concept of green fluorescent fish as well as transgenic fish | |
| 3. Tools in Molecular biology | UO1: To study in-depth the various cloning vectors, its origin and the applications<br>UO2: To discuss and develop an understanding on the various isolation methods, restriction digestion, blotting techniques etc.<br>UO3: To gain knowledge about the various recombinant selection methods and hybridization techniques<br>UO4: To understand the cloning strategies and the construction of DNA libraries along with the concepts of chromosome walking and jumping<br>UO5: To combine the overall learnings and develop an aptitude for its application in various fields | |
| 4. Gene sequencing and editing | UO1: To study the various sequencing techniques<br>UO2: To focus on the human genome mapping in-depth<br>UO3: To understand the various gene editing tools such ZNF, TALENS, CRISPER/cas | |

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**USBT 504 Marine Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Marine Biotechnology- Introduction & Bioprospecting | UO1: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats.<br>UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same.<br>UO3: To study diversity of compounds obtained from other marine organisms which are of commercial and ecological value. | By the end of the course the student will be able to:<br>1. Gain insight in the field of marine biotechnology.<br>2. Describe different marine products which can be used as pharmaceuticals.<br>3. Discuss marine functional foods and nutraceuticals and its applications.<br>4. Elaborate on marine bioresources and cosmetics and their applications. |
| 2. Marine Drugs and Enzymes | UO1: To describe different natural products from marine resources and their challenges<br>UO2: To elaborate on marine microbial enzymes.<br>UO3: To describe different pharmaceutical compounds obtained from marine organisms. | |
| 3. Marine Functional foods and Nutraceuticals | UO1: To discuss marine functional foods<br>UO2: To study marine derived ingredients with biological properties<br>UO3: To acquaint the students with marine nutraceuticals | |
| 4. Marine Bioresources and cosmetics | UO1: To gain insight into marine bioresources, marine secondary metabolites, marine proteins, marine lipids<br>UO2: To discuss cosmetics from marine sources<br>UO3: To acquaint the students with products and treatments based on marine resources | |

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**Applied Component: Biosafety**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to biosafety | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | CO1: To introduce students to the concepts of biosafety.<br>CO2: To discuss the significance of good lab practices used in the biotechnology industry and research.<br>CO3: To state the possible contaminants in different samples.<br>CO4: To study the applications of rDNA technology and importance of bioethics. |
| 2. GLP | UO1: To discuss the concept of GLP<br>UO2: To acquaint the students with the guidelines of GLP<br>UO3: To gain insight into documentation of laboratory work<br>UO4: To gain knowledge about the calibration and validation methods<br>UO5: To acquaint the students with audits and audit reports | |
| 3. Detection and testing of contaminants | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |
| 4. Biosafety in Biotechnology | UO1: To study the concepts on biosafety in Biotechnology<br>UO2: To discuss rDNA technology<br>UO3: To acquaint the students with regulation of food and food ingredients<br>UO4: To learn about genetically engineered crops<br>UO5: To study about the contemporary issues in Bioethics | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER VI (A.Y. 2020-21)

**USBT601 Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Protein Biochemistry | UO1: To study protein's structure highlighting the principles of denaturation and folding.<br>UO2: To Study the protein's function with suitable examples along with protein purification methods.<br>UO3: To learn the complementary interactions between proteins and ligands with suitable examples.<br>UO4: To briefly understand the mechanism of how the protein's interaction is affected by energy with suitable examples. | CO1. To explain in detail various metabolic pathways, fate and energy production efficiency of carbohydrate and lipid metabolism.<br>CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders.<br>CO3. To study the importance of vitamins, their sources, functions, bioactivity and associated disorders. |
| 2. Metabolism | UO1: To illustrate pathway of bacterial cell wall synthesis.<br>UO2: To learn the metabolic pathways of starch and sucrose and glycogen synthesis and its regulation by various factors.<br>UO3: To demonstrate the reactions of Cholesterol synthesis pathway, its regulation and highlight the pathology of cardiovascular diseases. | |
| 3. Endocrinology | UO1: To understand the classification of hormones into group i and ii and study characteristics of hormones released by anterior and posterior pituitary glands.<br>UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex.<br>UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads. | |

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| 4. Nutrition | UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins.<br>UO2: To explain functions and mode of action of minerals in metabolism.<br>UO3: To highlight the clinical significance of Malnutrition and overnutrition with suitable examples. | |

**USBT602 Industrial Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Dairy technology | UO1: To study milk - normal flora, changes in raw milk and enumeration<br>UO2: To discuss dairy technology preservation methods<br>UO3: To gain insight into starter cultures<br>UO4: To gain knowledge about the different fermented products | CO1: To introduce to various downstream processing technologies for extraction and purification of biological products produced using Bioprocess technology.<br>CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation.<br>CO3: To gain insight in the various processes involved in production of commercially available dairy products.<br>CO4: To have an in-depth understanding of downstream processes. |
| 2. Down-stream Processing (DSP) | UO1: To study DSP<br>UO2: To discuss foam separation and types of precipitation<br>UO3: To gain insight about filtration, centrifugation and chromatography<br>UO4: To describe the cell disruption methods<br>UO5: To acquaint the students about crystallization and whole broth processing | |

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| 3. Fermentation process | UO1: To study inoculation development in bacteria and fungi<br>UO2: To discuss scale up and scale down<br>UO3: To learn fermentation processes of different fermentation products<br>UO4: To discuss biotransformation | |
| 4. QA-QC | UO1: To study the concept of GMP and requirements for GMP implementation<br>UO2: To gain insight into the documentation of GMP practices<br>UO3: To learn the concept of QC and requirements for implementing QC<br>UO4: To acquire knowledge of QA concepts and requirements for implementing the same | |

**USBT603 Basic Pharmacology and Neurochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. General principles of Pharmacology | UO1: To introduce and develop and in-depth understanding about the basics of pharmacology and the mechanism of drug action<br>UO2: To aid in the understanding of drug receptors and its respective responses<br>UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response<br>UO4: To study the concept of effective dose and lethal dose<br>UO5: To gain insights about the potency, intrinsic activity and the phenomenon of drug antagonism | CO1. To understand principles of pharmacology and its role related to biological activity of drugs in the system.<br>CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity.<br>CO3. To understand the effect of allergen, pesticide on systemic physiological functions. Also to discuss steps to be taken in case of nonmedical misuses of chemicals and bioterrorism.<br>CO4. To study in details the structure and functions of neurons and glial cells, mechanism of action potential, role of various channels , and effects of neurotransmitters and neurotoxins |

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| 2. Drug Absorption and Distribution | UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it<br>UO2: To study the absorption of through from lungs and skin<br>UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug<br>UO4: To demonstrate the binding of drugs and also the various physiological barriers. | |
| 3. Basic Toxicology and Regulatory Toxicology | UO1:To understand all the background definitions in-depth<br>UO2: To understand and distinguish between the allergic responses, side effects and adverse effects<br>UO3: To gain knowledge about poisonings and its types<br>UO4: To demonstrate about specific poisons<br>UO5: To discuss about the non-medical use of drugs and incapacitating agents | |
| 4. Neurochemistry | UO1: To understand the anatomy and functioning of the human brain<br>UO2: To demonstrate about the neuronal pathways and the working of nerve impulses<br>UO3: To understand the mechanism of neuronal excitation and inhibitions<br>UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters. | |

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**USBT604 Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Renewable sources of energy | UO1: To get an overview of different renewable sources of energy and its applications.<br>UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications.<br>UO3: To study mode of action, advantages and significance of biofuels with suitable examples. | CO1. To impart knowledge regarding management of industrial, storm and hazardous waste.<br>CO2. To study biological processes used to treat effluent from industries.<br>CO3. To study different methodologies to treat solid and liquid waste from different industries.<br>CO4. To understand the importance of biofertilizers, its types, usage and applications in sustainable agriculture. |
| 2. Industrial effluent treatment | UO1: To study various biological processes involved in treatment of industrial effluents with suitable examples.<br>UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors.<br>UO3: To understand principles of biodegradation with suitable examples.<br>UO4: To analyse the applications of enzymes and microbes used for biodegradation. | |
| 3. Wastewater treatment | UO1: To identify the pollutants causing water pollution and to study about the microorganisms used in its treatment.<br>UO2: To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.<br>UO3: To learn about the heavy metals that cause pollution in water bodies and study about the micro-organisms used for the treatment along with their mechanism | |
| 4. Hazardous waste management | UO1: To learn about water pollution wrt hazardous waste produced by petrochemicals, and manufacturing Industries,<br>UO2: To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries.<br>UO3: To highlight the importance of water treatment due to oil spillage, other green deposits | |

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**Applied Component: AgriBiotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Precision Agriculture and Agriculture systems | UO1: To introduce students to different mechanisms of agriculture systems and greenhouse technology.<br>UO2: To elaborate the design, media and applications of greenhouse irrigation systems.<br>UO3: To discuss the significance of phytotrons and precision cultivation systems. | CO1: To get an overview about precision agriculture and management of agriculture systems.<br>CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress.<br>CO3: To highlight the applications of molecular markers used in plant breeding.<br>CO4: To state the eco-friendly use of biofertilizers and biopesticides. |
| 2. Plant stress biology | UO1:To study the concept of abiotic stress, its causes, sources and consequences with suitable examples.<br>UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples.<br>UO3: To understand the principles of biotic stress, its causes, sources and consequences with suitable examples. | |
| 3. Molecular Markers in Plant Breeding | UO1: To study the various genetic markers used in plant breeding technology<br>UO2: To learn the application of molecular markers<br>UO3: To discuss the techniques used in plant DNA barcoding | |
| 4. Biofertilizers and Biopesticides | UO1: To study biofertilizer<br>UO2: To discuss plant growth promotion by fungi<br>UO3: To gain insight about microbial inoculants<br>UO4: To study function of biopesticides. | |

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F. Y. B.Sc. BIOTECHNOLOGY Semester – I (A·Y 2019–20)

**USBT101- Core Subject- Basic Chemistry-I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Nomenclature and Classification | UO1: To learn about the IUPAC system of nomenclature and be able to name the compounds based on the rules.<br>UO2: To classify whether the bonds in the compound are organic, inorganic or co-ordinate.<br>UO3: To analyse and solve the problems given towards the end of the topic. | CO1: To acquaint the students with basic concepts of Chemistry like Classification and Nomenclature of Chemical compounds<br><br>CO2: To impart hands-on skills in preparation of Buffers and Solutions. |
| 2. Chemical Bonds | UO1: To understand the types of bonds whether they are ionic, covalent or co-ordinate and to study the compounds forming those bonds.<br>UO2: To get an in-depth understanding of co-ordinate and non-covalent bonds and the forces associated with them.<br>UO3: To understand and study the theory of Hydrogen bonding and its application. | |
| 3. Water and Buffers | UO1: To understand the properties of water along with its structure and its usage in chemical reactions.<br>UO2: To learn to calculate and prepare solutions of different concentrations and to understand primary and secondary standards.<br>UO3: To understand the theory of acids and bases along with the concept of buffers | |

**USBT102 -Core Subject- Basic Chemistry-II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Stereochemistry | UO1: To get a thorough understanding of structure of compounds and the arrangement of atoms in space.<br>UO2: To learn about isomerism and their types and study the structures showing isomerism.<br>UO3: To understand the difference between conformations and configuration and learn the projection formulae of compounds. | CO1: To acquaint students with Concepts of Stereochemistry<br><br>CO2: To impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry. |

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| 2. Titrimetry and Gravimetry | UO1: To know and learn the basic terms associated with titration and gravimetry.<br>UO2: To further study the estimation techniques using titration.<br>UO3: To also study about gravimetry and its use in analysis with the help of suitable examples. | |
| 3. Analytical Techniques | UO1: To understand and learn about the methods of separation of organic and inorganic compounds.<br>UO2: To study about the different analytical techniques along with their applications.<br>UO3: To understand the theory behind Beer-Lambert's law and be able to solve the numerical problems based on the law. | |

**USBT103 -Core Subject- Basic Life Sciences - I : Biodiversity and Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Origin of Life and Biodiversity (Animal, Plant, Microorganisms) | UO1: To study the origin of life theories and understand the concepts of biodiversity.<br>UO2: To learn about plant diversity in detail with examples.<br>UO3: To learn about animal diversity in detail with examples.<br>UO4: To learn about microbial diversity in detail with examples. | CO1: To acquaint students with concept of Biodiversity and Cell Biology<br><br>CO2: To impart skill in handling and culture of Microorganisms. |
| 2. Ultra Structure of Prokaryotic and Eukaryotic Cell | UO1: To get an overview about prokaryotic cellular structure<br>UO2: To get an overview about eukaryotic cellular structure<br>UO3: To study about extracellular organelles in prokaryotes and eukaryotes.<br>UO4: To distinguish between prokaryotes and eukaryotes on the basis of different biological characteristics. | |
| 3. Bacteria and Viruses | UO1: To learn about classification, types and morphology of bacteria.<br>UO2: To understand cultivation, reproduction and growth kinetics of bacteria<br>UO3: To gain knowledge about bacterial isolation and industrial applications.<br>UO4: To classify viruses based on several parameters like host infected, structural similarity, etc<br>UO5: To study properties of plant, animal and bacterial viruses with their significance. | |

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**USBT104 -Core Subject- Basic Life Sciences - II : Microbial Techniques**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microscopy and Stains | UO1: To get an overview about parts of a simple and compound microscope with its functions.<br>UO2: To study working and applications and phase contrast and dark field microscope.<br>UO3: To learn different staining techniques with its examples and applications. | CO1: To acquaint students with basic techniques in Staining and Sterilization<br><br>CO2: To impart the knowledge of growth of microorganisms. |
| 2. Sterilization Techniques | UO1: To distinguish between disinfection and sterilization<br>UO2: To study the role of physical and chemical agents used in sterilization.<br>UO3: To understand the characteristics of an ideal disinfectant with examples. | |
| 3. Nutrition, Cultivation and Enumeration of Microorganisms | UO1: To impart knowledge about nutritional requirements of bacteria.<br>UO2: To learn the concept of culture media and isolation techniques.<br>UO3: To study growth curve and enumeration of bacteria.<br>UO4: To prepare students in understanding about preservation of microbial cultures. | |

**USBT105 -Core Subject- Basic Biotechnology - I : Introduction to Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Scope and Introduction to Biotechnology | UO1: To impart knowledge about the history of Biotechnology<br>UO2: To acquaint the students with the different branches of Biotechnology and their applications<br>UO3: To differentiate between traditional and modern biotechnology | CO1: To acquaint students with various fields of Biotechnology and their applications<br>CO2: To impart the knowledge of Food Technology and Fermentation Techniques. |
| 2. Applications Biotechnology | UO1: To acquaint students with the applications of Biotechnology in Agriculture<br>UO2: To impart knowledge about the ethics in Biotechnology<br>UO3: To make the students acquainted with IPR | |

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| 3. Food and Fermentation Biotechnology | UO1: To impart knowledge about Food Biotechnology<br>UO2: To discuss the biotechnological applications in enhancement of food quality<br>UO3: To discuss about the regulatory aspects in food industries<br>UO4: To acquaint students with fermentation technology<br>UO3: | |

**USBT106- Core Subject- Basic Biotechnology - II : Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Replication | UO1: To impart knowledge about DNA replication in prokaryotes and eukaryotes.<br>UO2: To study enzymes involved in DNA replication.<br>UO3: To learn the recombination process in eukaryotes. | CO1: To acquaint students with DNA Replication, Repair and Genetic Engineering<br>CO2: Impart the knowledge of molecular Biology Techniques |
| 2. Mutation and DNA Repair | UO1: To study different types of mutations<br>UO2: To learn working applications of mutations causing agents.<br>UO2: To learn the basics of different types of repair mechanisms | |
| 3. Genetic Engineering | UO1: To distinguish between DNA and RNA as genetic material.<br>UO2: To gain understanding of Genetic Engineering techniques in various organisms.<br>UO3: To learn concepts about different types of vectors and its applications.<br>UO4: To study roles of enzymes involved in genetic engineering. | |

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**USBT107 - Ability Enhancement Course 1 (FC 1) - Societal Awareness**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Overview of Indian Society | UO1: To understand the multicultural diversity of Indian society through various parameters.<br>UO2: To highlight the notion of linguistic diversity.<br>UO3: To study the concept of regional diversity with respect to various parameters. | CO1: To acquaint the students with concepts of Societal Awareness<br>CO2: To impart knowledge of Society and make students aware about the Problems in Society |
| 2. Concept of Disparity | UO1: To study the causes and effects of disparity arising due to various social, economical factors.<br>UO2: To highlight the inequalities faced by people with different types of disabilities.<br>UO3: To develop brief understanding about inequalities arising out of caste system, regionalism and linguistic diversity. | |
| 3. The Indian Constitution and Significant Aspects of Political Processes | UO1: To learn the basic features of constitution as given in the preamble<br>UO2: To study fundamental duties of a Indian citizen and values required to build effective society.<br>UO3: To understand features of Indian politics with highlight on party system, special amendments and contribution of women in politics. | |

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F. Y. B.Sc. BIOTECHINOLOGY - Semester – II (A.Y. 2019 – 20)

**USBT201 Core Subject Chemistry – I : Bioorganic Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Biomolecules: Carbohydrates and Lipids | UO1: To classify biomolecules such as carbohydrates, lipids and steroids based on their structure and properties.<br>UO2: To distinguish between simple and complex carbohydrates and study their properties.<br>UO3: To study the types of lipids and the reactions they participate in. | CO1: To aquint students with Bioorganic Molecules<br>CO2: To impart the knowledge of Classification, Strucure and Characterization of Biomolecules |
| 2. Biomolecules: Proteins and Amino Acids | UO1: To classify proteins and amino acids based on their structures and functions.<br>UO2: To understand the concept of isoelectric point and study the synthesis of peptides=es.<br>UO3: To learn and understand the reactions carried out by protein and amino acids. | |
| 3. Biomolecules: Nucleic Acids | UO1: To study the structure and composition of DNA and RNA.<br>UO2: To understand the difference between purine and pyridine bases.<br>UO3: Differentiate between DNA and RNA based on their compositions. | |

**USBT202 Core Subject Chemistry - II : Physical Chemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Thermodynamics | UO1: To clear the basic terms related to thermodynamics.<br>UO2: To study the laws of thermodynamics; their laws and limitations.<br>UO3: To solve numericals based on internal energy, work, enthalpy, entropy. | CO1: To aquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions<br>CO2: To impart skills in Kinetics and Chemical Reactions |

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| 2. Chemical Kinetics | UO1: To understand the progress of a reaction based on their rate.<br>UO2: To learn about the order of reaction<br>UO3: To solve numericals based on the above given concepts. | |
| 3. Oxidation Reduction reactions | UO1: To understand the basic concepts of oxidation and reduction reactions.<br>UO2: To understand the role of oxidizing and reducing agents.<br>UO3: To solve the conceptual numericals towards the end of the unit. | |

**USBT203 Core Subject Life Sciences - I : Physiology and Ecology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Physiology | UO1: To study photosynthesis and its systems with reactions.<br>UO2: To distinguish between dark phase, C3, C4 cycles and photorespiration.<br>UO3: To learn the action of several plant hormones and secondary metabolites. | CO1: To acquaint students with Physiological Processes in Plants and Animals<br>CO1: To impart the knowledge of Physiology and Ecology |
| 2. Animal Physiology | UO1: To study mechanisms of digestion, absorption and assimilation in humans.<br>UO2: To learn anatomy, physiology of the human kidney.<br>UO3: To learn anatomy, physiology of respiration.<br>UO4: To learn anatomy, physiology of the human heart, blood circulation and coagulation. | |
| 3. Ecosystem and Interactions | UO1: To gain insight of different types of ecosystems, its structures and functions.<br>UO2: To learn concepts of food chain, food web and food pyramids.<br>UO3: To get detailed understanding about biogeochemical cycles and interactions between organisms. | |

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**USBT204 Core Subject Life Sciences - II : Genetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetics Fundamentals | UO1: To understand the basics of genetics and Mendel's laws.<br>UO2: To distinguish between genotype and phenotype.<br>UO3: To understand the principles of non-Mendelian genetics.<br>UO3: To highlight environmental effects on genes and gene interactions. | CO1: To acquaint students with concepts in Genetics<br>CO2: To impart skills in Techniques in Genetic Analysis and Population Genetics |
| 2. Microbial Genetics | UO1: To learn to classify bacteria as prototrophs and auxotrophs.<br>UO2: To study mechanism and pathway of genetic material exchange in bacteria.<br>UO3: To learn transduction and bacterial virus life cycles and transposable elements. | |
| 3. Population Genetics | UO1: To study Hardy-Weinberg law and its applications.<br>UO2: To understand genetic variations in populations at DNA level.<br>UO3: To learn the significance of population genetics in conservation biology. | |

**USBT205 Core Subject Biotechnology - I : Tissue Culture & Scientific Writing and Communication Skills**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Plant Tissue Culture | UO1: To understand the concepts of plant tissue culture and cell theory.<br>UO2: To develop insight about basic framework of plant tissue culture laboratory.<br>UO3: To illustrate the culture medium required for plant tissue culture and throw light on callus culture technique. | CO1: To acquaint students with Techniques of Plant and Animal Tissue Culture<br>CO2:To impart the skills of PTC, ATC and Science Communication |

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| 2. Animal Tissue Culture | UO1: To introduce cell culture techniques and its applications.<br>UO2: To learn significance of growth factors, cell metabolism and growth kinetics.<br>UO3: To study development and maintenance of primary cell culture and its types. | |
| 3. Scientific Writing and Communication Skills | UO1: To understand communication, its types and key principles.<br>UO2: To learn the principles and applications of scientific writing with examples.<br>UO3: To introduce concept of plagerism. | |

**USBT206 Core Subject Biotechnology - II : Enzymology, Immunology and Biostatistics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Enzymes | UO1: To understand the detailed classification , nature and properties of enzymes in detail.<br>UO2: To study the mechanism, enzyme kinetics and effects of various parameters of enzyme activity.<br>UO3: To analyse mechanisms of different modes of enzyme inhibitions and allosteric modulators. | CO1: To acquaint students with concepts in Enzymology, Immunology and Biostatistics<br>CO2: To impart the skills in Enzyme Kinetics, Immunological Techniques and Biostatistics. |
| 2. Immunology | UO1: To acquaint the students with the cells and organs of the immune system<br>UO2: To discuss about the different types of immunity.<br>UO3: To impart knowledge about the antigen and different classes of antibodies.<br>UO4: To gain insight about the antigen-antibody interactions.<br>UO5: To discuss about different types of vaccines. | |

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| 3. Biostatistics | UO1: To study the importance of Statistics in Biology.<br>UO2: To learn the terms associated with Statistics and understand the representation of different forms of charts.<br>UO3: To solve numericals based on mean, median and mode and also solve questions on dispersion, variation, standard deviation and standard error. | |

**USBT207 Ability Enhancement Course 2 (FC II) - Globalization, Ecology and Sustainable Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Globalisation and Indian Society and Human Rights | UO1: To understand the basic concept of globalisation and its associated terms<br>UO2: To discuss about the concept of Human rights in-depth and develop and understanding for the same<br>UO3: To apply the learnings and develop an aptitude in one's life | CO1: To acquaint the students with concepts of Globalization, Ecology and Environment<br>CO2: To impart knowledge of Globalization make students aware about the problems in Society |
| 2. Ecology and Sustainable Development | UO1: To discuss the importance of environment protection and the concept of sustainability<br>UO2: To understand the environmental threats and how one can protect it | |
| 3. Understanding and Managing Stress and Conflict in Contemporary Society | UO1: To discuss the types and causes of stress and how one can overcome it<br>UO2: To understand the significance of social values and ethics<br>UO3: To discuss and analyze the various methods of stress management | |

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S. Y. B.Sc. BIOTECHNOLOGY Semester III (A.Y. 2019-20)

**USBT301 Core Subject Biophysics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Optics and Electromagnetic Radiations | UO1: To learn about the properties of light such as reflection, refraction and their laws and applications.<br>UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum.<br>UO3: To learn about the different analytical techniques such as SEM, TEM, Immuno electron microscopy and Fluorescence microscopy and study about their importance in Biotechnology. | CO1: The objective of this course is to have a firm foundation of the fundamentals and applications of current biophysical theories.<br>CO2: By the end of the course the student will:<br>• Develop an understanding of the different aspects of classical Physics.<br>CO3: Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis. |
| 2. Heat, Sound, Magnetism and Fluid Dynamics | UO1: To understand the concept of heat and temperature and methods of transfer of heat. Also to study about the different thermometers and their applications.<br>UO2: To study about sound and their types based on their properties such as frequencies and understand the applications.<br>UO3: To study about viscosity, surface tension and other surface phenomenon with their application in Biological Sciences. | |
| 3. Electrophoretic Techniques | UO1: To get an overview about principles of electrophoresis of different types with suitable examples.<br>UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples.<br>UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis. | |

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**USBT302 Core Subject Applied Chemistry- I**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Organic Chemistry | UO1: To study about the different types of organic reactions and their applications<br>UO2: To study about the role of essential and non essential metal ions in biological systems and their significance.<br>UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes<br>UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin.<br>UO5: To study about the metal complexes used in medicines. | CO1:- The objective of this course is to have a firm foundation of the fundamentals and applications of Organic and Green Chemistry.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the different aspects of Organic and Green Chemistry.<br>CO3: Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds.<br>CO4: Discuss role of Green Chemistry and its application in Industry. |
| 2. Synthesis of Organic Compounds | UO1: To study about the different types of synthesis in organic reactions.<br>UO2: To understand the criteria for synthesis that can provide a good yield.<br>UO3: To study the green methods in organic synthesis. | |
| 3. Green Chemistry and Synthesis | UO1: To understand the need for green chemistry in today's day and age<br>UO2: To study the principles of green chemistry.<br>UO3: To study and understand about the green materials such as reagents, solvents, catalysts | |

**USBT303 Core Subject Immunology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Effectors of Immune Response | UO1: To discuss haematopoiesis<br>UO2: To acquaint students with the cells and organs of the immune system<br>UO3: To discuss complement system - types, biological effects and deficiencies | CO1 - The objective of this course is to familiarize students with the Immune Effector Mechanisms and various Immuno-techniques.<br>CO2- By the end of the course the student will be able to:<br>• Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.<br>CO3: Understand the principles underlying various Immuno-techniques |

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| 2. Cell Receptors | UO1: To learn the mechanism of T-cell receptor's activation with its structure.<br>UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II.<br>UO3: To study the mechanism of B-cell receptor's activation with its structure and its interaction with T-cell. | |
| 3. ImmunoTechniques | UO1: To acquaint students with the precipitation reactions<br>UO2: To acquaint students with the agglutination reactions<br>UO3: To discuss alternatives to Antigen-Antibody Reactions | |

**USBT304 Core Subject Cell Biology and Cytogenetics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cytoskeleton | UO1: To illustrate significance of microtubules as dynamic cytoskeleton elements with its structure and associated motor proteins.<br>UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin.<br>UO3: To demonstrate the structure, function and different types of intermediate filaments. | CO1- The objective of this course is to have a firm foundation in the fundamentals of Cell Biology and Cytogenetics.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the Cytoskeleton and Cell Membrane.<br>CO3: Discuss the structure of Chromosomes and types of Chromosomal Aberrations.<br>CO4: Discuss the principles underlying Sex Determination, Linkage and Mapping. |
| 2. Cell Membrane | UO1: To understand the principles of membrane transport with examples.<br>UO2: To study different types of cell-cell and cell extracellular matrix junctions.<br>UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition. | |

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| 3. Cytogenetics | UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number.<br>UO2: To analyze the mechanism of sex determination and linkage<br>UO3: To illustrate the fundamental concepts of linkage, crossing over and chromosomal mapping. | |

**USBT305 Core Subject Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Gene Expression-Transcription | U01: To study the intricate mechanism of Transcription in both prokaryotes and Eukaryotes<br>U02: To illustrate the details of initiation, elongation and termination of transcription<br>U03: To develop a brief understanding of the types of polymerases and promoters<br>U03: To demonstrate the mechanism of splicing and RNA editing | CO1- The objective of this course is to have an insight into the mechanism of Gene Expression and Regulation.<br>CO2: By the end of the course the student will be able to:<br>• Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.<br>CO3: Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes |
| 2. Gene Expression-Translation | U01: To discuss the genetic code, its nature and how it was deciphered<br>UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination.<br>UO3: To demonstrate the various post-translational modifications | |
| 3. Regulation of Gene Expression | UO1: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp<br>UO2: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses<br>UO3: To discuss the various operons in Eukaryotes and the methods of gene silencing | |

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**USBT306 Skill Enhancement Elective Bioprocess Technology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Microorganisms in Industrial Processes | UO1: To discuss about the types of microorganisms used in industrial processes<br>UO2: To acquaint students with screening and its types<br>UO3: To impart knowledge about the preservation techniques used | CO1:- The objective of this course is to understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology.<br>CO2- By the end of the course the student will be able to:<br>• Develop an understanding of the various aspects of Bioprocess Technology.<br>CO3: Develop skills associated with screening of Industrially Important Strains.<br>CO4: Understand principles underlying design of Fermentor and Fermentation Process. |
| 2. Fermentor and Fermentation Processes | UO1: To impart knowledge about the design of a fermentor<br>UO2: To gain insight about the fermentation media<br>UO3: To discuss about sterilization and the process parameters<br>UO4: To acquaint students about the types of fermentation<br>UO5: To study the representative fermentation processes | |
| 3. In-vivo and In vitro Assay of Industrial Products | UO1: To discuss the assay of industrial processes<br>UO2: To acquaint the students with half-life determination of pharmaceutical products<br>UO3: To study bioavailability and bioequivalence studies | |

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**USBT307 General Elective Research Methodology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Research Methodology and Research Problem | UO1: To study the meaning, criteria, and objectives of good research.<br>UO2: To learn different types of research and its significance<br>UO3: To identify good research question, methods involved to solve it and challenges faced by researchers while approaching research problem. | CO1- The objective of this course is to develop Research Aptitude, Logical Thinking and Reasoning.<br>CO2:- By the end of the course the student will be able to:<br>• Understand basic principles of Research Methodology and identify a Research Problem.<br>CO3: Understand a general definition of Research Design.<br>CO4: Identify the overall Process of Designing a Research Study from its inception to its Report. |
| 2. Research Design and Data Collection | UO1: To understand the necessity of effective research design and its principles.<br>UO2: To demonstrate mechanism of formulating a research plan.<br>UO3: To study different methods of data collection and its applications. | |
| 3. Interpretation and Report Writing | UO1: To introduce the concept of data interpretation.<br>UO2: To learn principles of report writing and its types.<br>UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report. | |

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S. Y. B.Sc. BIOTECHNOLOGY SEMESTER IV (A. Y. 2019-20)

**USBT401 Core Subject Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Carbohydrate Metabolism, ETS and Energy Rich Compounds | UO1: To study carbohydrate metabolism with different pathways such as glycolysis, Fermentation, pentose phosphate pathway, TCA and its energetics, regulation and inhibitors.<br>UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors.<br>UO3: To demonstrate the significance of ATP and other energy rich molecules. | CO1:- The objective of this course is to gain an insight into the Metabolic Processes associated with Catabolism of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO2:- By the end of the course the student will be able to<br>- Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides.<br>CO3: Explain the Role of Energy Rich Molecules in Metabolism. |
| 2. Amino Acid Metabolism | UO1: To highlight catabolism of amino acid pathways and its regulation.<br>UO2: To study biosynthesis of key hormones and regulators from amino acids.<br>UO3: To analyze deamination, transamination and reactions of urea cycle along with regulation and disorders. | |
| 3. Lipid and Nucleotide Metabolism | UO1: To learn mobilization and transport of fatty acids.<br>UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation.<br>UO3: To study ketone body breakdown pathway and highlight catabolism of purines and pyrimidines. | |

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**USBT402 Core Subject Applied Chemistry- II**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Sampling and Separation Techniques | UO1: To study about sampling, its importance and techniques of sampling for solids, liquids and gases.<br>UO2: To study about the various types of separation techniques and their applications in biological sciences.<br>UO3: to understand about the concepts of sedimentation and centrifugation in detail. | CO1- The objective of this course is to have a firm foundation of the fundamentals and applications of current Chemical Theories for the Physical World.<br>CO2- By the end of the course the student will:<br>• Develop an understanding of the different aspects of Analytical Chemistry.<br>CO3: Gain knowledge of Natural Product Chemistry and related acquired skills.<br>CO4: Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials. |
| 2. Natural Product Chemistry | UO1: To understand and classify the natural products into primary and secondary metabolites.<br>UO2: To learn about the structure and functions of alkaloids, phenolics, sterols and essential oils. Also study about their structural elucidation.<br>UO3: To learn about the chromatographic separation techniques. | |
| 3. Polymers and Nanomaterials | UO1: To get introduced to the chemistry of polymers and learn about the different types of polymers.<br>UO2: To study about the stereochemistry of polymers and about biodegradable polymers. | |

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**USBT403 Core Subject Medical Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Infectious Diseases | UO1: To discuss the host parasite relationship<br>UO2: To gain insight about infection<br>UO3: To gain knowledge about diseases | CO1 - The objective of this course is to gain insight into Disease Factors and Processes and Diseases Caused by Microorganisms.<br>CO2:- By the end of the course the student will be able to:<br>• List the factors playing a role in causing a disease.<br>CO3: Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.<br>CO4: Gain the technical capability of handling, isolating and identifying various Bacteria. |
| 2. Medical Microbiology- Causative Organisms- I | UO1: To acquaint the students with S. aureus<br>UO2: To study S. pyogenes<br>UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae<br>UO4: To gain knowledge about UTIs caused by E. coli and Proteus | |
| 3. Medical Microbiology - Causative Organisms- II | UO1: To study the GI tract infections caused by Salmonella and Shigella<br>UO2: To study the sexually transmitted diseases<br>UO3: To discuss nosocomial infections | |

**USBT404 Core Subject Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Environmental Pollution | UO1: To analyse the types, sources, classification of air pollutants and study air pollution monitoring and prevention.<br>UO2: To study the types, sources, classification of water pollutants and study water pollution monitoring and prevention.<br>UO3: To study the types, sources, classification of soil and solid waste pollutants and study soil pollution monitoring and prevention and elaborate on the concept of soil erosion. | CO1:- The objective of this course is to gain awareness about different Types of Environmental Pollution and Related Issues.<br>CO2- By the end of the course the student will be able to:<br>• Gain an understanding of the causes, types and control methods for Environmental Pollution.<br>CO3: Application of different life forms in Environmental Remediation |
| 2. Global Environmental Problems and Issues | UO1: To get an overview about factors responsible for greenhouse effect with relevant examples.<br>UO2: To state the importance of global warming, ozone depletion and regulations of Kyoto protocol.<br>UO3: To analyse the damaging consequences of UV radiation and acid rain. | |
| 3. Bioremediation | UO1: To understand the concept of bioremediation.<br>UO2: To learn about the microorganisms in bioremediation.<br>UO3: To learn about bioaugmentation and biostimulation<br>UO4:To monitor the efficacy of bioremediation techniques. | |

**USBT405 Core Subject Biostatistics and Bioinformatics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Computers and Biological Databases | UO1: To understand the working principles of computers and the internet.<br>UO2: To state the applications biological databases and its classification.<br>UO3: To analyse the applications of genome information resources and protein structure visualization softwares. | CO1 :- The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.<br>CO2:- By the end of the course the student will be able to:<br>• Gain an understanding of the basic concepts of Bioinformatics and Biostatistics.<br>CO3: Understand the tools used in Bioinformatics.<br>CO4: Apply the various Statistical Tools for Analysis of Biological Data. |

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| 2. BLAST and Sequence Alignment | UO1: To introduce the concepts of sequencing technique such as BLAST and its types<br>UO2: To study the various alignment methods, namely, global and local<br>UO3: To demonstrate the concept of multiple sequencing alignment and it's associated terminologies | |
| 3. Biostatistics | UO1: To understand the theory and solve problems based on correlation and regression analysis.<br>UO2: To study the test in studying statistical hypothesis.<br>UO3: To study and solve problems based on z-test, T-test and Chi square test | |

**USBT406 Molecular Diagnostics**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Basics of Molecular Diagnostics | UO1: To develop an in-depth understanding of the brief history of the diagnosis at the molecular level<br>UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins<br>UO3: To analyze and apply the various hybridization techniques such as the blotting methods. | CO1: Objective of this course is learning and understanding Molecular Techniques and utilizing these techniques in Diagnosis.<br>CO2: By the end of the course the student will be able to:<br>• Gain an understanding of the basic Principles used in Molecular Diagnosis.<br>CO3: Gain critical thinking and analytical skills to understand new Diagnostic Methods.<br>CO4: Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits. |
| 2. Nucleic Acid Amplification Methods | UO1: To discuss amplification technique such as the working of PCR UO2: To develop a brief understanding on the various modifications of PCR<br>UO3: To understand the concept of ligase chain reaction | |

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| 3. Molecular Biology based Diagnostics | UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique<br>UO2: To briefly discuss the various methods of molecular diagnostics for infectious diseases<br>UO3: To understand the need of genetic counselling by discussing case studies and to also discuss the ethical social and legal issues associated with genetic testing. | |

**USBT407 General Elective Entrepreneurship Development**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to Entrepreneurship Development | UO1: To introduce the concept of entrepreneurship.<br>UO2: To state qualities required to be a successful entrepreneur<br>UO3: To learn the depth of rising demand of entrepreneurship in the future. | CO1: To develop and systematically apply an Entrepreneurial way of thinking that will allow identification and creation of Business Opportunities.<br>CO2: By the end of the course the student will be able to:<br>• Develop an understanding of the systematic process and to select and screen a Business Idea.<br>CO3: Design strategies for successful implementation of ideas.<br>CO4: Write a Business Plan |
| 2. Setting-up of an Enterprise and Planning | UO1: To learn several aspects of deciding location of a business, financial planning, effective strategies to obtain fundings and sponsors.<br>UO2: To learn methodologies involved in planning, organization and implementation of a project along with its feasibility.<br>UO3: To get an in -depth understanding of regulatory affairs, corporate laws associated with establishing an enterprise. | |
| 3. Marketing, Sales, Advertising and International Market research | UO1: To learn to design effective marketing plan<br>UO2: To analyse different principles of advertising and sales promotion.<br>UO3: To study strategies of market assessment and different types of market research with suitable examples. | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER V (A.Y. 2019-20)

**USBT501 Cell Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Cell cycle | UO1: To distinguish between the prokaryotic and eukaryotic cell cycle highlighting the role of MPF and discuss early embryonic cell cycle.<br>UO2: To analyse the significance of yeast's genetics in regulation of cell cycle.<br>UO3: To learn different apoptosis pathways along with regulation of cell division in multicellular animals. | By the end of the course the student will be able to:<br>Gain knowledge about the cell multiplication and death at molecular level.<br>CO1. Understand the molecules involved in cell signaling.<br>CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development.<br>CO3. Gain insight into the biology of cancer cells. |
| 2. Cell Signaling | UO1: To understand the concepts of cell signaling and its types, and G-protein linked cell surface receptor signaling with suitable examples.<br>UO2: To study signaling via Enzyme linked receptors with suitable examples.<br>UO3: To learn principles of target cell adaptation and co-relating computer based signaling network with biological signaling. | |
| 3. Developmental Biology | UO1: To study the importance of developmental biology as an multidisciplinary science along with model organisms.<br>UO2: To elaborate different stages on development and germ layers.<br>UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern formation and morphogenetic movements. | |

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| 4. Cancer Biology | UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process.<br>UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer.<br>UO3: To gain insights about latest techniques and methodology of cancer diagnosis and cancer prevention. | |

**USBT502 Medical Microbiology and Instrumentation**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Virology | UO1: To study properties of viruses along with its structure, classification and taxonomy.<br>UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.<br>UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples.<br>UO4: To study mechanisms of cellular destruction caused due to viral infections with suitable examples and highlighting the significance of novel virus-like species, viroids and prions. | By the end of the course the student will be able to:<br>CO1. Learn the different type of virus cultivation and enumeration<br>CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.<br>CO3. Get an insight into the various spectroscopic methods used in biological studies.<br>CO4. Understand the principle and applications of chromatographic and tracer techniques. |
| 2. Chemotherapeutic drugs | UO1: To study the discovery and design of antimicrobial agents<br>UO2: To study the mode of action of antimicrobial agents<br>UO3: To gain insight into the mechanisms of drug resistance.<br>UO4: To discuss the use and misuse of antimicrobial agents<br>UO5: To acquaint the students with antifungal and antiviral drugs | |

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| 3. Spectroscopy | UO1: To study about the principle and instrumentation techniques related to Spectroscopy.<br>UO2: To understand their importance and application in Biology.<br>UO3: To get acquainted with the techniques and understand the future scope of the techniques discussed. | |
| 4. Bioanalytical techniques | UO1: To study about the method of separation of Biological compounds and the application of the techniques.<br>UO2: To learn about each of the separation technique based on the principle of chromatography.<br>UO3: To learn about the applications of separation technique for a thorough understanding of the same | |

**USBT503 Genomics and Molecular Biology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Genetic engineering of plants | UO1: To study the methodologies of genetic engineering with Ti plasmid vectors<br>UO2: To demonstrate the various methods of artificial gene transfer<br>UO3: To learn the types of vectors and how is it used in the improvement of seed quality | By the end of the course the student will be able to:<br>CO1. Use molecular biology tools and techniques in the field of biotechnology.<br>CO2. Gain knowledge regarding recent developments in genome sequencing and editing.<br>CO3. Understand the basis of gene cloning and development of transgenic animals and plants.<br>CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms. |

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| 2. Transgenic Animals | UO1: To understand the development of transgenic mice with the aid of various techniques such as the retroviral method, DNA microinjection, ES, cre-loxp etc.<br>UO2. To gain insights about the various vectors used for animal<br>UO3: To briefly discuss the method of cloning livestock and the concept of green fluorescent fish as well as transgenic fish | |
| 3. Tools in Molecular biology | UO1: To study in-depth the various cloning vectors, its origin and the applications<br>UO2: To discuss and develop an understanding on the various isolation methods, restriction digestion, blotting techniques etc.<br>UO3: To gain knowledge about the various recombinant selection methods and hybridization techniques<br>UO4: To understand the cloning strategies and the construction of DNA libraries along with the concepts of chromosome walking and jumping<br>UO5: To combine the overall learnings and develop an aptitude for its application in various fields | |
| 4. Gene sequencing and editing | UO1: To study the various sequencing techniques<br>UO2: To focus on the human genome mapping in-depth<br>UO3: To understand the various gene editing tools such ZNF, TALENS, CRISPER/cas | |

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**USBT 504 Marine Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Marine Biotechnology- Introduction & Bioprospecting | UO1: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats.<br>UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same.<br>UO3: To study diversity of compounds obtained from other marine organisms which are of commercial and ecological value. | By the end of the course the student will be able to:<br>1. Gain insight in the field of marine biotechnology.<br>2. Describe different marine products which can be used as pharmaceuticals.<br>3. Discuss marine functional foods and nutraceuticals and its applications.<br>4. Elaborate on marine bioresources and cosmetics and their applications. |
| 2. Marine Drugs and Enzymes | UO1: To describe different natural products from marine resources and their challenges<br>UO2: To elaborate on marine microbial enzymes.<br>UO3: To describe different pharmaceutical compounds obtained from marine organisms. | |
| 3. Marine Functional foods and Nutraceuticals | UO1: To discuss marine functional foods<br>UO2: To study marine derived ingredients with biological properties<br>UO3: To acquaint the students with marine nutraceuticals | |
| 4. Marine Bioresources and cosmetics | UO1: To gain insight into marine bioresources, marine secondary metabolites, marine proteins, marine lipids<br>UO2: To discuss cosmetics from marine sources<br>UO3: To acquaint the students with products and treatments based on marine resources | |

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**Applied Component: Biosafety**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Introduction to biosafety | UO1: To study the biological risk assessment and hazardous characteristics of an agent<br>UO2: To acquaint the students with genetically modified agent hazards<br>UO3: To discuss the potential hazards associated with work practices<br>UO4: To gain insight into safety equipment and facility safeguards | CO1: To introduce students to the concepts of biosafety.<br>CO2: To discuss the significance of good lab practices used in the biotechnology industry and research.<br>CO3: To state the possible contaminants in different samples.<br>CO4: To study the applications of rDNA technology and importance of bioethics. |
| 2. GLP | UO1: To discuss the concept of GLP<br>UO2: To acquaint the students with the guidelines of GLP<br>UO3: To gain insight into documentation of laboratory work<br>UO4: To gain knowledge about the calibration and validation methods<br>UO5: To acquaint the students with audits and audit reports | |
| 3. Detection and testing of contaminants | UO1: To describe microbial contamination in food products<br>UO2: To study microbial contamination in pharma products<br>UO3: To acquaint the students with microbial assays | |
| 4. Biosafety in Biotechnology | UO1: To study the concepts on biosafety in Biotechnology<br>UO2: To discuss rDNA technology<br>UO3: To acquaint the students with regulation of food and food ingredients<br>UO4: To learn about genetically engineered crops<br>UO5: To study about the contemporary issues in Bioethics | |

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T. Y. B.Sc. BIOTECHNOLOGY SEMESTER VI (A.Y. 2019-20)

**USBT601 Biochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Protein Biochemistry | UO1: To study protein's structure highlighting the principles of denaturation and folding.<br>UO2: To Study the protein's function with suitable examples along with protein purification methods.<br>UO3: To learn the complementary interactions between proteins and ligands with suitable examples.<br>UO4: To briefly understand the mechanism of how the protein's interaction is affected by energy with suitable examples. | CO1. To explain in detail various metabolic pathways, fate and energy production efficiency of carbohydrate and lipid metabolism.<br>CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders.<br>CO3. To study the importance of vitamins, their sources, functions, bioactivity and associated disorders. |
| 2. Metabolism | UO1: To illustrate pathway of bacterial cell wall synthesis.<br>UO2: To learn the metabolic pathways of starch and sucrose and glycogen synthesis and its regulation by various factors.<br>UO3: To demonstrate the reactions of Cholesterol synthesis pathway, its regulation and highlight the pathology of cardiovascular diseases. | |
| 3. Endocrinology | UO1: To understand the classification of hormones into group i and ii and study characteristics of hormones released by anterior and posterior pituitary glands.<br>UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex.<br>UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads. | |

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| 4. Nutrition | UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins.<br>UO2: To explain functions and mode of action of minerals in metabolism.<br>UO3: To highlight the clinical significance of Malnutrition and overnutrition with suitable examples. | |

**USBT602 Industrial Microbiology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Dairy technology | UO1: To study milk - normal flora, changes in raw milk and enumeration<br>UO2: To discuss dairy technology preservation methods<br>UO3: To gain insight into starter cultures<br>UO4: To gain knowledge about the different fermented products | CO1: To introduce to various downstream processing technologies for extraction and purification of biological products produced using Bioprocess technology.<br>CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation.<br>CO3: To gain insight in the various processes involved in production of commercially available dairy products.<br>CO4: To have an in-depth understanding of downstream processes. |
| 2. Down-stream Processing (DSP) | UO1: To study DSP<br>UO2: To discuss foam separation and types of precipitation<br>UO3: To gain insight about filtration, centrifugation and chromatography<br>UO4: To describe the cell disruption methods<br>UO5: To acquaint the students about crystallization and whole broth processing | |

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| 3. Fermentation process | UO1: To study inoculation development in bacteria and fungi<br>UO2: To discuss scale up and scale down<br>UO3: To learn fermentation processes of different fermentation products<br>UO4: To discuss biotransformation | |
| 4. QA-QC | UO1: To study the concept of GMP and requirements for GMP implementation<br>UO2: To gain insight into the documentation of GMP practices<br>UO3: To learn the concept of QC and requirements for implementing QC<br>UO4: To acquire knowledge of QA concepts and requirements for implementing the same | |

**USBT603 Basic Pharmacology and Neurochemistry**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. General principles of Pharmacology | UO1: To introduce and develop and in-depth understanding about the basics of pharmacology and the mechanism of drug action<br>UO2: To aid in the understanding of drug receptors and its respective responses<br>UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response<br>UO4: To study the concept of effective dose and lethal dose<br>UO5: To gain insights about the potency, intrinsic activity and the phenomenon of drug antagonism | CO1. To understand principles of pharmacology and its role related to biological activity of drugs in the system.<br>CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity.<br>CO3. To understand the effect of allergen, pesticide on systemic physiological functions. Also to discuss steps to be taken in case of nonmedical misuses of chemicals and bioterrorism.<br>CO4. To study in details the structure and functions of neurons and glial cells, mechanism of action potential, role of various channels , and effects of neurotransmitters and neurotoxins |

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| 2. Drug Absorption and Distribution | UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it<br>UO2: To study the absorption of through from lungs and skin<br>UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug<br>UO4: To demonstrate the binding of drugs and also the various physiological barriers. | |
| 3. Basic Toxicology and Regulatory Toxicology | UO1:To understand all the background definitions in-depth<br>UO2; To understand and distinguish between the allergic responses, side effects and adverse effects<br>UO3: To gain knowledge about poisonings and its types<br>UO4: To demonstrate about specific poisons<br>UO5: To discuss about the non-medical use of drugs and incapacitating agents | |
| 4. Neurochemistry | UO1: To understand the anatomy and functioning of the human brain<br>UO2: To demonstrate about the neuronal pathways and the working of nerve impulses<br>UO3: To understand the mechanism of neuronal excitation and inhibitions<br>UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters. | |

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**USBT604 Environmental Biotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Renewable sources of energy | UO1: To get an overview of different renewable sources of energy and its applications.<br>UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications.<br>UO3: To study mode of action, advantages and significance of biofuels with suitable examples. | CO1. To impart knowledge regarding management of industrial, storm and hazardous waste.<br>CO2. To study biological processes used to treat effluent from industries.<br>CO3. To study different methodologies to treat solid and liquid waste from different industries.<br>CO4. To understand the importance of biofertilizers, its types, usage and applications in sustainable agriculture. |
| 2. Industrial effluent treatment | UO1: To study various biological processes involved in treatment of industrial effluents with suitable examples.<br>UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors.<br>UO3: To understand principles of biodegradation with suitable examples.<br>UO4: To analyse the applications of enzymes and microbes used for biodegradation. | |
| 3. Wastewater treatment | UO1 To identify the pollutants causing water pollution and to study about the microorganisms used in its treatment.<br>UO2 To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.<br>UO3 To learn about the heavy metals that cause pollution in water bodies and study about the micro-organisms used for the treatment along with their mechanism. | |
| 4. Hazardous waste management | UO1 To learn about water pollution wrt hazardous waste produced by petrochemicals and manufacturing industries.<br>UO2 To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries.<br>UO3 To highlight the importance of water treatment due to oil spillage, other green deposits. | |

**Applied Component: AgriBiotechnology**

| UNIT NO. AND NAME | UNIT OUTCOME | COURSE OUTCOME |
|---|---|---|
| 1. Precision Agriculture and Agriculture systems | UO1: To introduce students to different mechanisms of agriculture systems and greenhouse technology.<br>UO2: To elaborate the design, media and applications of greenhouse irrigation systems.<br>UO3: To discuss the significance of phytotrons and precision cultivation systems. | CO1: To get an overview about precision agriculture and management of agriculture systems.<br>CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress.<br>CO3: To highlight the applications of molecular markers used in plant breeding.<br>CO4: To state the eco-friendly use of biofertilizers and biopesticides. |
| 2. Plant stress biology | UO1:To study the concept of abiotic stress, its causes, sources and consequences with suitable examples.<br>UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples.<br>UO3: To understand the principles of biotic stress, its causes, sources and consequences with suitable examples. | |
| 3. Molecular Markers in Plant Breeding | UO1: To study the various genetic markers used in plant breeding technology<br>UO2: To learn the application of molecular markers.<br>UO3: To discuss the techniques used in plant DNA barcoding | |
| 4. Biofertilizers and Biopesticides | UO1: To study biofertilizer<br>UO2: To discuss plant growth promotion by fungi<br>UO3: To gain insight about microbial inoculants<br>UO4: To study function of biopesticides. | |

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## COURSE OUTCOME
## F.Y.B.Sc. COMPUTER SCIENCE SEM I
## 2023-2024 Syllabus

**Paper 1: Digital Systems & Architecture**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Students are able to understand basic functions of computers.<br>2) To learn about how computer systems work and underlying principles<br>3) To understand the basics of digital electronics needed for computers | 1) To learn about how computer systems work and underlying principles<br>2) To understand the basics of digital electronics needed for computers<br>3) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>4) To understand the basics of processor structure and operation<br>5) To understand how data is transferred between the processor and I/O devices |
| UNIT 2 | 1) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>2) Understand types of machine instructions<br>3) Understand difference between RISC and CISC<br>4) Understand different types of memory | |
| UNIT 3 | 1) To understand the basics of processor structure and operation<br>2) To learn advanced computer architecture | |

**Paper 2: Introduction to Programming with Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand structure and model of the Python programming language | 1) Ability to store, manipulate and access data in Python<br>2) Ability to implement basic Input / Output operations in Python<br>3) Ability to define the structure and components of a Python program.<br>4) Ability to learn how to write loops and decision statements in Python.<br>5) Ability to learn how to write functions and pass arguments in Python.<br>6) Ability to create and use Compound data types in Python |
| UNIT 2: | 1. Understand structure and model of the Python programming language | |
| UNIT 3 | 1. Create, run and evaluate Python Programs using core data structures like Lists, Dictionaries and tuples.<br>2. Interpret the concepts of Object-Oriented Programming as used in Python. | |

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**Paper 3: LINUX Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1. Gives a basic introduction to Linux.<br>2. To understand importance of Linux in the real world.<br>3. Demonstrated various methods to install Linux.<br>4. Difference between CLI vs GUI.<br>5. To learn general purpose commands to start with Linux. | 1. Work with Linux file system structure, Linux Environment<br>2. Handle shell commands for scripting, with features of regular expressions, redirections<br>3. Implement file security permissions<br>4. Work with vi, sed and awk editors for shell scripting using various control structures<br>5. Install softwares like compilers and develop programs in C and Python programming languages on Linux Platform |
| UNIT 2 | 1. Discussed various text editors in Linux.<br>2. File system used in Linux.<br>3. Students have been explained about security in Linux.<br>4. Discussed networking commands to check network-related tasks in Linux. | |
| UNIT 3 | 1. Basic commands to work with file manipulation and shell scripting commands. | |

**Paper 4: Open Source Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the concept and principles of Open Source Software (OSS).<br>2. Recognize the need for OSS and its role in software development.<br>3. Differentiate between Free Software and Open-Source Software.<br>4. Understand the philosophy of software freedom and the development process of Open- Source Software.<br>5. Identify and understand various OSS licenses, including Apache, BSD, PL, LGPL.<br>6. Grasp the concepts of copyrights, copyleft, and patents in relation to OSS. | 1. Differentiate between Open Source and Proprietary software and Licensing.<br>2. Recognize the applications, benefits and features of Open-Source Technologies<br>3. Gain knowledge to start, manage open-source projects. |
| UNIT 2 | 1. Understand the concepts of Open-Source Hardware, Open-Source Design, Open-Source Teaching, and Open-Source Media.<br>2. Explore collaboration in Open- Source projects, including community building and effective communication.<br>3. Learn how to contribute to existing Open-Source projects, including utilizing platforms like GitHub, following community etiquette, and engaging in testing and issue reporting.<br>4. Understand the concepts of shared software and shared source.<br>5. Recognize the use of Open- Source as a business strategy. | |
| UNIT 3 | 1. Understand the Open-Source operating systems and their significance, including GNU/Linux, Android, Free BSD, and Open Solaris.<br>2. Gain knowledge of Open- Source hardware and its applications.<br>3. Familiarize themselves with various development tools, IDEs, debuggers, and programming languages used in the Open-Source ecosystem.<br>4. Understand the LAMP stack (Linux, Apache, MySQL, PHP) and other Open-Source database technologies.<br>5. Study the developmental models, licensing, and modes of funding for Open-Source projects, including their commercial and non- commercial use. | |

**Paper 5: Discrete Mathematics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Students are able to understand the concept of functions.<br>2) Understand types of relation<br>3) Acquire concept of partially ordered set<br>4) Implement recurrence relation concepts | 1) Define mathematical structures (relations, functions, graphs) and use them to model real life situations.<br>2) Understand, construct and solve simple mathematical problems.<br>3) Solve puzzles based on counting principles.<br>4) Provide basic knowledge about models of automata theory and the corresponding formal languages.<br>5) Develop an attitude to solve problems based on graphs and trees, which are widely used in software. |
| UNIT 2 | 1) Understand concept of counting principle<br>2) Problem solving based on Permutation and combination<br>3) Acquire basic knowledge about models of automata theory and the corresponding formal languages. | |
| UNIT 3 | 1) Understand the concept of graphs and trees, which are widely used in software.<br>2) Learn algorithms of operation on Graph<br>3) Implement Graph traversal techniques<br>4) Implement tree traversal techniques | |

**Paper 6: Descriptive Statistics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Provide basic learning about different types of data and presenting tools.<br>2. Introduction to R Software and basic uses.<br>3. To understand different centered values like mean, median and mode percentile and decile<br>4. Learn to represent the data using graphs | 1. To provide complete learning about statistical data like attribute, variable and its representation methods using graphs like Frequency distribution, Histogram.<br>2. Complete understanding of R Software and its uses in Statistical Analysis.<br>3. To make students familiar with Central tendency like Mean and Median for grouped and ungrouped data.<br>4. To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance.<br>5. Concept of Moments<br>6. To make learner enable to find the correlation between different variables and further apply the regression analysis to find the exact relation between them. |
| UNIT 2 | 1. Provide learning of Raw and Central Moments.<br>2. Students should understand the symmetry in data using skewness value and kurtosis graph. | |
| UNIT 3 | 1. Provide learning and understanding of Correlation between 2 variables and its application in analysis<br>2. Concept of Regression analysis and its use in predicting the future values Concept of Multiple regression and linear regression. | |

**Paper 7: Soft Skills**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Students should understand about knowing self and Johari's Window.<br>2. Difference between Emotional and Intelligence Quotient.<br>3. To provide learning about Professional and Personal etiquette.<br>4. Learn about the 3M Model of communication, Verbal and Nonverbal Communication. | 1) To know about various aspects of soft skills and learn ways to develop personality<br>2) Understand the importance and type of communication in a personal and professional environment.<br>3) To provide insight into much needed technical and non-technical qualities in career planning.<br>4) Learn about Leadership, team building, decision making and stress management |
| UNIT 2 | 1. Introduction to JOb Interview, Resume and CV.<br>2. To make the cover letter and Job Application.<br>3. Learn to Present in professional life.<br>4. Understand the steps of Interview and FAQ. Group discussion process and arrangement , topics<br>5. involved in group discussions | |
| UNIT 3 | 1. To understand the workplace creativity and get the work completed in innovative ways<br>2. Develop ethical values.<br>3. Build the capacity of learning right point and unlearn not required or wrong points.<br>4. Increase the decision making capabilities.<br>5. Learn to understand stress and method to overcome by proper time management. | |

(B.Sc. CS Co-ordinator)

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## COURSE OUTCOME
## F.Y.B.Sc. COMPUTER SCIENCE SEM 2
## 2023-2024 Syllabus

**Paper 1: Design & Analysis of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. To Define the basic concepts of algorithms and analyze the performance of algorithms.<br>2. Students are able to understand the use of different types of data structure. | 1) Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used.<br>2) Students should be able to appreciate the use of various data structures as per need.<br>3) To select, decide and apply appropriate design principle by understanding the requirements of any real life problems |
| UNIT 2 | 1. Students able to understand concept of recursion<br>2. To Discuss various searching and sorting algorithms. | |
| UNIT 3 | 1. Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming.<br>2. Apply dynamic programming approach to solve suitable problems<br>3. Describe the divide and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide - and-conquer algorithms. | |

**Paper 2: Advanced Python Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand how to read/write to files using python.<br>2. Identify to catch their own errors that happen during execution of programs<br>3. Remember the concept of pattern matching. | 1) Ability to implement OOP concepts in Python including Inheritance and Polymorphism<br>2) Ability to work with files and perform operations on it using Python.<br>3) Ability to implement regular expression and concept of threads for developing efficient program<br>4) Ability to implement exception handling in Python applications for error handling.<br>5) Knowledge of working with databases,<br>6) designing GUI in Python and implement networking in Python |
| UNIT 2 | 1. Understand how to read/write to files using python.<br>2. Identify to catch their own errors that happen during execution of programs<br>3. Remember the concept of pattern matching. | |
| UNIT 3 | 1. Apply knowledge to connect to the database to move the data to/from the application.<br>2. Evaluate and create programs to connect to computers, read from URL and send email. | |

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**Paper 3: Introduction to OOPs using C++**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the Object-Oriented Programming (OOP) paradigm and its basic concepts.<br>2. Gain knowledge of programming tokens, keywords, identifiers, and constants in C++. | 1. Work with numeric, character and textual data and arrays.<br>2. Understand the importance of OOP approach over procedural language.<br>3. Understand how to model classes and relationships using UML.<br>4. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism.<br>5. Handle basic file operations. |
| UNIT 2 | 1. Understand the concept of constructors and destructors in object- oriented programming.<br>2. Gain proficiency in working with objects, including implementing accessor and mutator methods.<br>Explore the concept of arrays of objects in | |
| UNIT 3 | 1. Understand the concept of inheritance in object-oriented programming.<br>2. Learn about runtime polymorphism, dynamic binding, function overriding, and the use of virtual functions. | |

Paper 4: Database Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. To understand the basic use of database.<br>2. Various models like RDBMS, Network model, etc.<br>3. To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc.<br>4. Constraints used in database management system.<br>5. To understand how to convert ER to table so that we can implement these tables in database application.<br>6. Describe fundamental elements of RDBMS.<br>7. Design E-R diagram to represent simple database applications scenarios. | 1. To appreciate the importance of database design.<br>2. Analyze database requirements and determine the entities involved in the system and their relationship to one another.<br>3. Write simple queries to MySQL related to String, Maths and Date Functions.<br>4. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands.<br>5. Understand the normalization and its role in the database design process.<br>6. Handle data permissions.<br>7. Create indexes and understands the role of Indexes in optimization search. |
| UNIT 2 | 1. To understand Functional dependencies, schema so that the table relationship is<br>1. can be understood which will further help to create tables in database.<br>2. To illustrate DDL statements, DML statements, Joins to update, alter or delete any record from the database without changing other records of tables.<br>3. Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL. | |
| UNIT 3 | 1. To understand types of in built functions so that they can manipulate database records easily.<br>2. String functions, math functions, date function,<br>3. To understand about the DBA, permissions and security<br>Basic of Database protection & Distributed databases | |

**Paper 5: Calculus**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1) Understand the concept of limit, continuity, derivatives.<br>2) Problem solving on derivative in graphing and applications | 1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions.<br>2) Ability to appreciate real world applications which use these concepts.<br>3) Skill to formulate a problem through Mathematical modeling and simulation. |
| UNIT 2 | 1) Understand the concept of integration<br>2) Problem solving with different types of integration methods.<br>3) Problem solving on modeling with differential equation | |
| UNIT 3 | 1) Understand the concept partial derivatives<br>2) Implement partial derivatives on different applications | |

**Paper 6: Statistical Methods**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1. To learn the concept of Probability and Bayes theorem and its definition<br>2. To learn about discrete and Continuous data with its related functions like pdf and pmf. | 1. Calculate probability, conditional probability and independence.<br>2. Students should be able to learn about distribution and its application on the basis of example.<br>3. To Analyze and proof the hypothetical statements using test statistics.<br>4. Learn to read tabulated values of different functions.<br>5. Analysis or compare 2 and more samples together and conclude the outcome.<br>6. Learn to calculate and analyze the Non parametric distribution and CHi square association. |
| UNIT 2 | 1. Learn about the Expectation and Variance of Random Variable<br>2. To understand and use the distribution like BInomial for discrete data, Normal for continuous, F for comparison of variance. | |
| UNIT 3 | 1. Definition of Hypothesis and steps to conclude the hypothesis<br>2. Learn Methods of ANOVA and analyze more than 2 data simultaneously.<br>3. Learn method of Non parametric tests like sign test, wilcoxon test, kruskal wallis test and Post hoc analysis | |

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**Paper 7: E-Commerce & Digital Marketing**

| UNIT NO. & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: | 1. Understand the concepts of E-commerce and E-business and their impact on business models.<br>2. Understand the different types of electronic payment systems, such as credit cards, debit cards, smart cards, and internet banking.<br>3. Analyze the digital advertising market in India.<br>4. Develop a digital marketing plan. | 1. Understand the core concepts of E-Commerce.<br>2. Understand the various online payment techniques<br>3. Understand the core concepts of digital marketing and the role of digital marketing in business.<br>4. Apply digital marketing strategies to increase sales and growth of business<br>5. Apply digital marketing through different channels and platforms<br>6. Understand the significance of Web Analytics and Google Analytics and apply the same. |
| UNIT 2 | 1. Understand the meaning, purpose, and types of social media websites.<br>2. Use email marketing tools and automation to improve email deliverability and engagement.<br>3. Understand the concept of content marketing and its importance in digital marketing. | |
| UNIT 3 | 1. Understand the meaning and common techniques of search engine optimization (SEO).<br>2. Understand the concept of search engine marketing (SEM) and its importance in digital marketing.<br>3. Understand the basics of Google Analytics, including how to install it on a website and analyze its parameters. | |

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ANDHERI (EAST) MUMBAI

(B.Sc. CS Co-ordinator)

**COURSE OUTCOME**
**S.Y.B.Sc. COMPUTER SCIENCE SEM 3**
**2023-2024 Syllabus**

**Paper 1: Principles of Operating Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. To understand the services provided by and the design of an operating system.<br>2. To make aware of different types of Operating System and their services. | 1. Work with any type of operating system<br>2. Handle threads, processes, process synchronization<br>3. Implement CPU scheduling algorithms<br>4. Understand the background role of memory management<br>5. Design file system. |
| UNIT 2 | 1. Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.<br>2. Analyze important algorithms eg. Process scheduling and memory management algorithms<br>3. Students should understand the data structures and algorithms used to implement an OS.<br>4. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.<br>5. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems | |
| UNIT 3 | 1. To understand the structure and organization of the file system.<br>2. To understand different approaches to memory management.<br>3. Describe the role of paging, segmentation and virtual memory in operating systems.<br>4. Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms. | |

**Paper 2: Linear Algebra**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. To understand the fundamental concepts of complex numbers.<br>2. Introduction to the principles and mechanisms of Support Vector Machines (SVMs)<br>3. To recognize vectors as functions mapping to mathematical sets.<br>4. Understanding the concepts of linear combinations and spans. | 1. Appreciate the relevance and applications of Linear Algebra in the field of Computer Science.<br>2. Understand the concepts through program implementation.<br>3. Instill a computational thinking while learning linear algebra.<br>4. Express clear understanding of the concept of a solution to a system of equations.<br>5. Find eigenvalues and corresponding eigenvectors for a square matrix. |
| UNIT 2 | 1. To understand matrices as vectors and their properties.<br>2. Perform matrix-vector and vector-matrix multiplications using linear combinations and dot products.<br>3. To study linear functions involving matrices.<br>4. Explore coordinate systems and their significance.<br>5. Define and calculate the dimension and rank of vector spaces.<br>Perform Gaussian elimination to transform matrices into echelon form. | |
| UNIT 3 | 1. To understand the inner product for vectors over the real numbers.<br>2. Explore the concept of orthogonality and its significance.<br>3. Perform projection orthogonal to multiple vectors.<br>4. Analyze the properties and applications of eigenvalues and eigenvectors.<br>Represent vectors in coordinate form using eigenvectors. | |

**Paper 3: Data Structures**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1. Gain an understanding of various data types and data structures, including their classifications, and learn the concept of Abstract Data Types (ADT) and how to create user-specific ADTs for specific applications.<br>2. Master and Apply the concept of linked data structures, specifically the ADT for linked lists, and comprehend the advantages and disadvantages of linked lists.<br>3. Develop the ability to perform operations like traversing, searching, prepending, and removing nodes in singly linked lists, and understand the practical applications of linked lists, such as polynomial equations.<br>4. Explore the Stack ADT, understand its advantages and disadvantages, and become proficient in applying stack data structures.<br>5. To solve problems like balanced delimiter checking and conversion from prefix to postfix notation.<br>6. Familiarize learning with the Queue ADT, its advantages and disadvantages, and learn about linked representations of queues.<br>Develop the skills to perform operations on circular queues and dequeues, and understand the practical applications of queues, including job scheduling queues | 1. Create different types of data structures.<br>2. Understand which data structure to be used based on the type of the problem.<br>3. Apply combined knowledge of algorithms and data structures to write highly effective programs in various domains. |
| UNIT 2 | 1. Develop a comprehensive understanding of doubly linked lists, including their advantages and disadvantages.<br>2. Gain proficiency in performing insertion and deletion operations at various positions within a doubly linked list.<br>3. Master the ADT for tree structures and traversal methods.<br>4. Practical applications of trees, such as Huffman coding.<br>5. Gain expertise in the Priority Queue ADT.<br>1. Learn about heaps, including different types of heaps, and develop the ability to heapify elements effectively, facilitating efficient priority queue operations. | |
| UNIT 3 | 1. Understanding of graphs and its applications.<br>2. Gain proficiency in representing graphs using both adjacency matrices and adjacency lists.<br>3. Learn to perform graph operations.<br>4. Explore and Implement graph traversal techniques using Breadth-First Search (BFS) and Depth-First Search (DFS)<br>5. Practical applications of graphs in algorithms like shortest path algorithms.<br>6. Explore the concept of hashing, hash tables, hash functions, and collision handling techniques. Develop the ability to apply hashing in various practical scenarios, understanding its applications in data storage and retrieval. | |

**Paper 4: Advanced Database Concepts**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1. Understand the advantages, features and architecture of PL/SQL, .<br>2. Familiarize with character sets used in PL/SQL.<br>3. Implement conditional selection statements in PL/SQL.<br>4. Reference, alter, and drop sequences as needed.<br>5. Create, execute, alter, and view stored procedures and understand the concept of functions in PL/SQL. | 1. Master concepts of stored procedure, functions, cursors and triggers and its use.<br>2. Learn about using PL/SQL for data management.<br>3. Use efficiently Collections and records.<br>4. Understand concepts and implementations of transaction management and crash recovery. |
| UNIT 2 | 1. Understand the concepts of associative arrays, Varrays (Variable- Size Arrays), and nested tables in PL/SQL.<br>2. Explore various collection types defined in package specifications.<br>3. Identify compile-time warnings and handle them appropriately.<br>4. Understand the concept of cursors in PL/SQL and their types.<br>Describe static and dynamic SQL and its use in PL/SQL. | |
| UNIT 3 | 1. Implement triggers by creating them for various events (e.g., insert, delete, update).<br>2. Explore the use of triggers for enforcing data integrity in a database.<br>Understanding the need for packages and their benefits.<br>4. Explore the ACID properties of transactions.<br>5. Understand the concept of serializability and its importance.<br>6. Gain knowledge of the ARIES algorithm for crash recovery.<br>Learn how to recover a database system from a system crash, including the Redo and Undo phases. | |

**Paper 5: Java based Application Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I | 1. Understand the JDK, JRE,JVM architecture<br>2. In depth knowledge of OOPs concept<br>3. Implement Exception Handling and Multithreading in dynamic programming<br>4. Usage of Packages in Monolithic and Microservice Architecture | 1. Design basic application in java using Graphical User Interface.<br>2. The learner will be able to develop applications using swings<br>3. The learner will be able to develop web based applications using servlet and jsp<br>4. The learner will be able to connect databases with java through<br>5. The learner will be able to perform programs using JSON objects |
| UNIT 2 | 1. Understand the Collection framework.<br>2. Implement the features of JFC and Swing framework.<br>3. Solving the connectivity of JDBC using Connectors and API<br>Working of Event Handling in Code | |
| UNIT 3 | 1. In depth knowledge of Servlets, JSP frameworks on browser.<br>2. Passing Data from Front end to backend using HTTP Methods<br>Understand the concept of JSON for API and forms. | |

**Paper 6: Web Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Understand basic concept of HTML<br>2) Understand types of CSS how to apply on website | 1. Design valid, well-formed, scalable, and meaningful pages using emerging technologies.<br>Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites<br>3. Develop and implement client-side and server-side scripting language programs.<br>4. Develop and implement Database Driven Websites.<br>2. Design and apply XML to create a markup language for data and document centric applications. |
| UNIT 2 | 1) Student learn popup boxes used in JavaScript<br>2) Understand JavaScript objects<br>3) Learn Form validation using JavaScript<br>4) Understand comparison XML and HTML<br>Student learn about XSLT | |
| UNIT 3: | 1) Understand concept AJAX, PHP and jQuery<br>2) Develop website using database concept with PHP | |

Paper 7: Creative Content Writing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Gain a foundational understanding of content writing, including the principles of effective communication and its role in various contexts.<br>2. Identify different tones and styles in writing and their applications, and recognize and correct common grammatical errors to enhance the quality of written content.<br>3. Learn best practices for creating web content that is elegant, professional, and engaging, focusing on the importance of tone, attitude, and active verbs. Acquire the skills to structure web content effectively, including the use of lists, chunking information, and creating titles and subtitles tailored to the intended online audience.<br>5. Understand the significance of content length in various marketing channels, such as blog posts, podcasts, Facebook posts, and tweets, and learn to adapt writing style accordingly.<br>4. Develop the ability to tailor marketing content to meet specific platform requirements and audience preferences, optimizing the impact of marketing messages in different online spaces. | 1. Understand the fundamentals of content creation for Blog, Website etc.<br>2. Acquire the ability to write and edit in a variety of styles and procedures<br>3. To develop the creative abilities.<br>4. To acquire essential language skills for editors. |
| UNIT 2 | 1. Develop the skills to write concise and engaging content tailored to specific social media platforms, including Twitter, Facebook, and LinkedIn, while utilizing appropriate hashtags and humor where applicable.<br>2. Learn effective email writing techniques, create compelling landing pages, craft attention-grabbing headlines, and construct engaging website content, including home pages, About Us pages, and blog posts, to effectively communicate messages in the digital landscape.<br>3. Gain an understanding of the principles of visual communication and the role of infographics in conveying complex information in a visually appealing manner.<br>Explore the science behind effective data visualization and develop the ability to create purpose-driven infographics by observing, processing ideas, and designing visually compelling graphics for various purposes, including reports and presentations. | |
| UNIT 3 | 1. Acquire proficiency in using a variety of research and knowledge management tools to gather and organize information effectively for content creation.<br>2. Using writing, productivity, and editing tools to enhance the quality and efficiency of content creation, while also becoming familiar with style guides and non-text writing tools for diverse content needs.<br>3. Develop a comprehensive understanding of legal English and vocabulary as it relates to legal writing, equipping you with the necessary language skills to navigate legal content.<br>4. Explore intellectual property rights (IPR) laws and copyright regulations relevant to content writing, and understand the legal and ethical implications of plagiarism in content creation and publishing. | |

(B.Sc. CS Co-ordinator)

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COURSE OUTCOME
S.Y.B.Sc. COMPUTER SCIENCE SEM 4
2023-2024 Syllabus

**Paper 1: Theory of Computation**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) To understand Automata Theory<br>2) Identifying DFA and NDFA.<br>3) Defining Grammer and Languages<br>4) Distinguish different computing languages and classify their respective types | 1. Understand Grammar and Languages<br>2. Learn about Automata theory and its application in Language Design<br>3. Learn about Turing Machines and Pushdown Automata<br>4. Understand Linear Bound Automata and its applications |
| UNIT 2 | 1) Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.<br>2) To Apply transformation between multiple representations of finite automata.<br>3) Problem solving based on Regular Sets and Regular Grammar | |
| UNIT 3 | 1) To state and explain the Church-Turing thesis and its significance.<br>2) Problem solving based on Linear Bound Automata | |

**Paper 2: Computer Networks**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understanding networking standards and administrations and their roles in modern communication systems.<br>2. To Explain networking models, particularly the OSI model and the TCP/IP protocol suite.<br>3. Master the fundamentals of the physical layer in networking.<br>4. Implement digital-to- digital and analog-to- digital conversion processes.<br>5. Develop an understanding of bandwidth utilization techniques, including multiplexing and spread spectrum methods.<br>Apply the concept of switching in networking. | 1. Learn basic networking concepts and layered architecture.<br>2. 2. Understand the concepts of networking, which are important for them to be known as a 'networking professionals'. |
| UNIT 2 | 1. Understanding of the Data Link Layer, addressing and design issues.<br>2. Explain and Implement concepts of error detection and correction techniques.<br>3. Gain proficiency in Data Link Control (DLC) services, data link layer protocols, and explore specific protocols such as HDLC and Point-to- Point Protocol (PPP) used for reliable data transfer over network links.<br>4. Understand the principles of media access control. | |
| UNIT 3 | 1. Simulate routing protocols<br>2. Identify Transport layers protocols and its applications.<br>3. To implement client server protocol and explore its use.<br>4. Understand various QoS requirements and standards.<br>5. Gain insight into wireless local area networks (LANs).<br>To apply knowledge of network layer protocol. | |

**Paper 3: Software Engineering**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Understand the fundamental concepts of Software Engineering Lifecycle models.<br>2) Summarize the software requirement specifications and the SRS documents.<br>3) Understanding of different software architectural styles. | 1. Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements<br>2. Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.<br>3. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice<br>4. Able to use modern engineering tools necessary for software project management, time management and software reuse. |
| UNIT 2 | 1) Describe software engineering layered technology and Process frame work.<br>2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the Requirements.<br>3) Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance | |
| UNIT 3 | 1) Demonstrate the software project management skills through case studies.<br>2) Understanding of software testing approaches.<br>3) Describe software measurement and software risks<br>4) Understanding on quality control and how to ensure good quality software. | |

**Paper 4: IoT Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the concept of IoT (Internet of Things) and its significance.<br>2. Gain insights into the historical development and evolution of IoT.<br>3. Analyze the structure and components of a typical SoC.<br>4. Introduce and understand popular IoT platforms such as Raspberry Pi, Arduino, and NodeMCU. | 1. understand SoC and IoT<br>2. use different types of IoT Platforms and interfaces<br>3. understand and implement an idea of various types of applications built using IoT |
| UNIT 2 | 1. Understand basic hardware components like LEDs, buttons, cameras, 8x8 LED grids, motors, etc.<br>2. Explore communication protocols such as PWM, UART, GPIO, I2C, and SPI for IoT device interaction.<br>3. Learn to interface various sensors including temperature, humidity, motion, light, and gas sensors.<br>4. Understand the role of protocols in IoT communication.<br>5. Explore the importance of security in IoT ecosystems. | |
| UNIT 3 | 1. Establish a web server for IoT applications.<br>2. Learn how to use Node-RED for IoT application development.<br>3. Explore WSN architectures and the different types of WSNs.<br>4. Study modern IoT case studies and applications in various sectors, including transportation, agriculture, healthcare, and more.<br>5. Define the purpose and concept of edge computing in IoT. Evaluate the advantages and disadvantages of each communication model in various IoT scenarios. | |

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**Paper 5: Android Application Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Students will understand the basics of Kotlin data type, control structure, concept of OOPS, companion, extension, etc.<br>2) After Basics of Kotlin students will learn advanced concepts of Kotlin, Like, Writing/ Calling of function, lambda expression, Collections and its types, null safety, exception handling.<br>3) Once Students learn the basic and advanced concept of Kotlin. After that they learn Android Architecture like. (MVC,MVVM).<br>4) Creating the first Virtual Machine. Setting Android Studio.<br>5) Students will understand the basic concept of Android different components like. Activity, Fragment, Content Provider, Service, Notification, Etc. | 1. Build useful mobile applications using Kotlin language on Android<br>2. Install and configure Android Studio for application development<br>3. Master basic to intermediate concepts of Kotlin required for mobile application development<br>4. Use built-in widgets and components, work with the database to store data<br>5. Master key Android programming concepts and deploy the application on Google Play |
| UNIT 2 | 1) In this unit students will learn the designing of Android UI. Adding different types of Layout, Component, Style<br>2) Understand the advanced concept of IMageView, ListView, RecyclerView, Writing different types of Adapter, Understanding the use of Activity and Fragment Navigation.<br>3) Students will learn data binding techniques to avoid binding errors in runtime. Data binding also work with AdapterView Binding | |
| UNIT 3 | 1) Create and manipulate graphics using the Drawable class in Android.<br>2) Understand and apply Android Camera functionalities for capturing photos and videos.<br>3) Implement Broadcaset Receivers to respond to system events and external triggers. | |

**Paper 6: Advanced Application Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Working with the latest framework on Node JS for backend<br>2. Understand the unstructured database for MongoDB<br>3. Solving the complex data handling on MongoDB | 1. Store the data in NoSQL, document-oriented MongoDB database that brings performance and scalability.<br>2. Use Node.js and Express Framework for building fast, scalable network applications<br>3. Use AngularJS framework that offers declarative, two- way data binding for web applications.<br>4. Integrate the front-end and back-end components of the MEAN stack.<br>Develop robust mobile applications using Flutter. |
| UNIT 2 | 1. Working on Front end with Express framework<br>2. Connecting bridge from front end to back end using API<br>Multiple template handling functions on Node JS | |
| UNIT 3 | 1. Understanding the Mobile technology<br>2. Working on Flutter and Data Programming<br>3. Implementing business logic in Dart<br>Solving problems on Dart Function | |

**Paper 7: Research Methodology**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the concept of research and its significance in various fields.<br>2. Identify the objectives and motivations behind conducting research<br>3. Differentiate between various types of research, including exploratory, descriptive, and explanatory research.<br>4. Recognize the role of scientific methods in the research process.<br>5. Identify the key factors that necessitate the formulation of a research problem.<br>6. Formulate a well- defined research problem based on a critical review of existing literature.<br>7. Construct hypotheses that can be tested to address the research questions.<br>8. Evaluate the necessity of a well- structured research design in the research process.<br>9. Apply the basic principles of experimental design in research planning and execution. | 1. Define research, formulate problem, and describe the research process and research methods.<br>2. Understand and apply basic research methods including research design, data analysis and interpretation<br>3. Understand ethical issues in research, write research report, research paper, and publish the paper. |
| UNIT 2 | 1. Understand the various methods for collecting primary data, including questionnaires, schedules, and observation techniques.<br>2. Learn to apply different interview methods and recognize their suitability for specific research scenarios.<br>3. Evaluate and select appropriate data collection methods based on the research objectives<br>4. Comprehend the essential steps involved in designing a sampling plan from defining the target population to selecting a sample<br>5. Acquire the skills to select a random sample and develop sampling frames for real-world research applications<br>6. Formulate hypotheses with the characteristics of being specific, testable, and relevant to the research problem<br>7. Grasp the concept of Type-I and Type-II errors and their implications in the context of hypothesis testing | |

| | | |
|---|---|---|
| UNIT 3 | 1. Develop the skills to craft a well-structured research proposal, including defining research objectives, formulating hypotheses, and outlining research methods.<br>2. Learn how to effectively create a compelling title that accurately represents the research and attracts readers.<br>3. Learn various aspects of writing a research paper, including crafting an effective abstract, creating an engaging introduction, mastering the materials and methods section, presenting results clearly, constructing a thoughtful discussion, acknowledging of Research, Ethical issues in research contributions, and using proper citation styles for references.<br>4. Understand the rights and permissions related to publishing, including copyright considerations and ethical guidelines for using others' work.<br>5. Learn when and how to use abbreviations and acronyms in scientific writing.<br>6. Explore the process of writing a thesis based on research outcomes.<br>7. Discuss the ethical issues and responsibilities involved in conducting and reporting research, including issues related to plagiarism, authorship, and data Integrity | |

(B.Sc. CS Co-ordinator)

COURSE OUTCOME
T.Y.B.Sc. COMPUTER SCIENCE SEM 5
2023-2024 Syllabus

**Paper 1: Artificial Intelligence**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Identify problems where artificial intelligence techniques are applicable<br>2) compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human- centred problems<br>3) To classify the different types of agents | 1) After completion of this course, learner should get a clear understanding of AI<br>2) Different search algorithms used for solving problems<br>3) The learner should also get acquainted with different learning algorithms and models used in machine learning. |
| UNIT 2 | 1) To formulate and choose best hypothesis<br>2) To understand and the architecture of Artificial Neural Networks<br>3) To understand the working of SVM<br>4) To Justify the use of ensemble learning | |
| UNIT 3 | 1) Demonstrate proficiency in applying scientific method to models of probabilistic learning<br>2) To describe Reinforcement Learning and its type. | |

**Paper 2: Information & Network Security**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand security trends, OSI Security Architecture, and security attacks.<br>2. Learn classical encryption techniques including symmetric ciphers, substitution, and transposition.<br>3. Explore the principles and strength of DES, AES, and Triple DES.<br>4. Grasp the basics of public-key cryptography and the RSA algorithm. | 1. Analyze and evaluate security trends, attacks, and mechanisms, and propose effective security solutions based on the OSI security architecture.<br>2. Apply classical encryption techniques, such as substitution and transposition ciphers, to encrypt and decrypt messages and analyze their security implications.<br>3. Implement public-key cryptography algorithms, including RSA, and demonstrate the ability to securely exchange keys and establish secure communication channels.<br>4. Design and implement secure authentication mechanisms, including message authentication codes and digital signatures, to ensure data integrity and non-repudiation.<br>5. Evaluate and implement various security measures, such as IP security, web security protocols (e.g., SSL/TLS), intrusion detection systems, and firewall configurations, to protect networks and systems from unauthorized access and attacks. |
| UNIT 2 | 1. Understand key management and the Diffie-Hellman Key Exchange.<br>2. Learn about message authentication, hash functions, and their security.<br>3. Explore digital signatures, authentication protocols, and the Digital Signature Standard.<br>4. Grasp authentication applications like Kerberos, X.509 Authentication, and Public-Key Infrastructure (PKI). | |
| UNIT 3 | 1. Learn electronic mail security with Pretty Good Privacy (PGP) and S/MIME.<br>2. Understand IP security, including architecture, authentication headers, and key management.<br>3. Explore web security, focusing on SSL/TLS and Secure Electronic Transactions.<br>4. Grasp intrusion detection, malicious software threats, and firewall design principles. | |

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**Paper 3: Linux Server Administration**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. | 1) Learner will be able to develop Linux based systems and maintain.<br>2) Learner will be able to install appropriate service on Linux server as per requirement.<br>3) Learner will have proficiency in Linux server administration. |
| UNIT 2 | 1) Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.<br>2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS. | |
| UNIT 3 | 1) Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.<br>2) To illustrate various intranet services in Linux and there configuration steps. | |

**Paper 4: Game Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Understand basic concept of mathematics used in computer graphics<br>2) Acquire knowledge on different types of transformations<br>3) Understand difference of CPU and GPU | Learner should study Graphics and gaming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn. |
| UNIT 2 | 1) Understand DIrectX Pipeline<br>2) Understand trigonometry formulas and types of curves<br>3) Acquire knowledge of types of interpolation<br>Understand analytical geometry concept | |
| UNIT 3 | 1) Understand rendering engines concept<br>2) Understand difference between AR, VR and MR<br>3) Understand working in Unity<br>Develop games using Unity concepts | |

**Paper 5: Project Management**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the definition, characteristics, and importance of project management.<br>2. Learn project selection methods, initiation, and scope management.<br>3. Master project time management, including activity sequencing and schedule development.<br>4. Grasp cost management techniques, budget monitoring, and Earned Value Management (EVM). | 1. Apply project management principles, processes, and best practices to plan, execute, and control projects effectively.<br>2. Develop project charters, define project scopes, and create work breakdown structures (WBS) to establish project objectives and deliverables.<br>3. Create project schedules, estimate resource requirements, and monitor project progress using appropriate project management techniques.<br>4. Employ quality assurance and control measures to ensure project deliverables meet stakeholder expectations and industry standards.<br>5. Demonstrate effective leadership and teamwork skills, as well as the ability to manage stakeholders, resolve conflicts, and make ethical decisions in project management settings. |
| UNIT 2 | 1. Learn project quality and risk management, including quality assurance, control, and risk assessment.<br>2. Understand project resource and procurement management, focusing on team development, conflict resolution, and vendor management.<br>3. Master project integration processes, change management, and project closure.<br>4. Gain insights into lessons learned and knowledge transfer for future projects. | |
| UNIT 3 | 1. Understand Agile principles, methodologies, and their application in project management.<br>2. Learn effective people management, including leadership, team building, and emotional intelligence.<br>3. Master project governance structures, ethical considerations, and professional responsibility.<br>4. Explore technology's role, virtual teams, and tools for project planning and collaboration. | |

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(B.Sc. CS Co-ordinator)

# COURSE OUTCOME
## T.Y.B.Sc. COMPUTER SCIENCE SEM 6
## 2023-2024 Syllabus

**Paper 1: Data Science**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand the definition, scope, and applications of Data Science.<br>2. Learn about different data types and sources.<br>3. Master data preprocessing techniques like cleaning, transformation, and feature selection.<br>4. Gain proficiency in data wrangling, feature engineering, and using popular Data Science libraries. | 1. Apply data preprocessing techniques to clean and transform raw data, handle missing values and outliers, and merge datasets.<br>2. Implement machine-learning algorithms to perform tasks such as regression, classification, clustering, and ensemble learning.<br>3. Evaluate and compare different machine learning models using appropriate evaluation metrics and cross-validation techniques.<br>4. Create informative and visually appealing data visualizations to communicate insights and patterns in data.<br>5. Understand the principles and practices of data management, including data governance, data quality assurance, and data privacy considerations. |
| UNIT 2 | 1. Master exploratory data analysis (EDA) and data visualization techniques.<br>2. Understand supervised and unsupervised machine learning concepts.<br>3. Learn regression analysis and model evaluation techniques.<br>4. Explore key machine learning algorithms and model optimization methods. | |
| UNIT 3 | 1. Understand model evaluation metrics like accuracy, precision, recall, F1-score, and AUC.<br>2. Learn principles and tools for effective data visualization and storytelling.<br>3. Master data management activities, including ETL processes and data governance.<br>4. Grasp data privacy and security considerations. | |

**Paper 2: Cloud Computing and Web Services**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Explain the core concepts of the cloud computing paradigm<br>2) Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies. | 1) After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing<br>2) The possible applications for state- of-the-art cloud computing using open source technology.<br>3) Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.<br>4) They should explain the core issues of cloud computing such as security, privacy, and interoperability. |
| UNIT 2 | 1) Implement different types of Virtualization technologies and Service Oriented Architecture systems | |
| UNIT 3 | 1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges<br>2) Illustrate the fundamental concepts of cloud storage | |

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**Paper 3: Wireless and Sensor Networks**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Learn the Introduction to WSN and its need in todays world.<br>2. Understand Deployment architecture, Topology used in deployment.<br>3. Different components of WSN<br>4. Hardware and Software requirements of WSN.<br>5. Learn about MANETS and efficient use of battery. | 1) After completion of this course, learner should be able to list various applications of wireless sensor networks,<br>2) Describe the concepts, protocols, design,<br>3) implementation and use of wireless sensor networks.<br>4) Also implement and evaluate new ideas for solving wireless sensor network design issues. |
| UNIT 2 | To PRovide knowledge of MAC Protocols used for WSN and ROuting protocols for route updates.<br>Protocols used for Transport layer like conversion of existing TCP to suite the environment of WSN for efficient use of power. | |
| UNIT 3 | 1. To provide knowledge about history of WSN and its application,<br>2. Learn about Cellular system in telecom<br>3. How does the HAndover and Takeover of call works<br>4. Satellite functioning and different architecture.<br>5. Learn ts application in GEO,LEO and MEO. | |

**Paper 4: Ethical Hacking**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1) Acquire knowledge on types of attacks and their prevention mechanisms<br>2) Understand different foot printing and scanning techniques | 1) Apply ethical hacking methodologies to conduct comprehensive security assessments and penetration tests.<br>2) Perform effective foot printing and reconnaissance techniques to gather critical information about target systems.<br>3) Identify and exploit vulnerabilities in various network and system components using appropriate tools and techniques.<br>4) Evaluate the security posture of web servers, web applications, and wireless networks, and recommend appropriate countermeasures.<br>5) Demonstrate an understanding of ethical and legal considerations in conducting ethical hacking activities and adhere to professional codes of conduct. |
| UNIT 2 | 1) Learn different password cracking techniques<br>2) Understand different sniffing techniques and its countermeasures | |
| UNIT 3 | 1) Understand SQL injection and Buffer overflow with countermeasures<br>2) Learn wireless hacking techniques. | |

**Paper 5: Customer Relationship Management**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1 | 1. Understand CRM basics and contexts.<br>2. Learn customer acquisition and retention.<br>3. Enhance customer value with CRM tools.<br>4. Grasp CRM's impact on business performance. | 1. Students will be able to define and explain the various forms of CRM and their relevance to business contexts.<br>2. Students will acquire the skills to manage the customer journey effectively, including implementing customer acquisition and retention programs.<br>3. Students will understand the importance of customer-perceived value and its impact on customer satisfaction, loyalty, and business performance.<br>4. Students will be able to apply strategic and operational CRM approaches, such as customer portfolio management and marketing automation, to enhance organizational effectiveness.<br>5. Students will develop proficiency in analytical CRM techniques, including data management, analytics for strategy and tactics, and the successful implementation of CRM systems. They will also be able to analyze and draw insights from real-life case studies and success stories related to CRM |
| UNIT 2 | 1. Learn customer portfolio management and strategies.<br>2. Understand marketing automation and its benefits.<br>3. Explore sales force automation tools.<br>4. Grasp service automation and its applications. | |
| UNIT 3 | 1. Learn to develop and manage customer-related databases and integrate data.<br>2. Understand analytics, big data, AI, ML, and DL for CRM.<br>3. Master CRM implementation, from strategy development to performance evaluation.<br>4. Study case studies and success stories in CRM. | |

(B.Sc. CS Co-ordinator)

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**COURSE OUTCOME**
**F.Y.B.Sc. COMPUTER SCIENCE SEM 1**
**2022-2023 Syllabus**

**Course: Digital Systems & Architecture**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Fundamentals of Digital Logic: Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps, Combinational Circuits: Adders, Mux, De-Mux, Sequential Circuits: Flip-Flops (SR, JK & D), Counters: synchronous and asynchronous Counter<br>Computer System: Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures: Bus Interconnections, Input / Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access | 1) Students are able to understand basic functions of computers.<br>2) To learn about how computer systems work and underlying principles<br>3) To understand the basics of digital electronics needed for computers | 1) To learn about how computer systems work and underlying principles<br>2) To understand the basics of digital electronics needed for computers<br>3) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>4) To understand the basics of processor structure and operation<br>5) To understand how data is transferred between the processor and I/O devices |
| UNIT 2:<br>Memory System Organization: Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory. Cache Memory: Design Principles, Memory mappings, Replacement Algorithms, Cache performance, Cache Coherence. Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels<br>Processor Organization: Instruction Formats, | 1) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>2) Understand types of machine instructions<br>3) Understand difference between RISC and CISC<br>4) Understand different types of memory | |

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| | | |
|---|---|---|
| Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization, Structure and Function, Register Organization, Basic Microprocessor operations: Data Transfer (Register / Memory) Operations, Arithmetic & Logical Operations, Instruction Cycle, Instruction Pipelining, Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors: Design Issues | | |
| UNIT 3:<br>Control Unit: Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control. Fundamentals of Advanced Computer Architecture: Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Array Processors, Clusters, and NUMA Computers. Multiprocessor Systems: Structure & Interconnection Networks, Multi-Core Computers: Introduction, Organization and Performance. | 1) To understand the basics of processor structure and operation<br>2) To learn advanced computer architecture | |

**Course: Introduction to Programming with Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Overview of Python: History & Versions, Features of | 1. Understand structure and model of the | 1) Ability to store, manipulate and |

| | | |
|---|---|---|
| Python, Execution of a Python Program, Flavours of Python, Innards of Python, Python Interpreter, Memory Management in Python, Garbage Collection in Python, Comparison of Python with C and Java, Installing Python, Writing and Executing First Python Program, Getting Help, IDLE<br>Data Types, Variables and Other Basic Elements: Comments, Docstrings, Data types- Numeric Data type, Compound Data Type, Boolean Data type, Dictionary, Sets, Mapping, Basic Elements of Python, Variables<br>Input and Output Operations: Input Function, Output Statements, The print() function, The print("string") function, The print(variables list) function, , The print(object) function, The print(formatted string) function, Command Line Arguments<br>Control Statements: The if statement, The if ... else Statement, The 'if ... elif ... else' Statement, Loop Statement- while loop, for loop, Infinite loop, Nested loop, The else suite, break statement, continue statement, pass statement, assert statement, return statement | Python programming language | access data in Python<br>2) Ability to implement basic Input / Output operations in Python<br>3) Ability to define the structure and components of a Python program.<br>4) Ability to learn how to write loops and decision statements in Python.<br>5) Ability to learn how to write functions and pass arguments in Python.<br>6) Ability to create and use Compound data types in Python |
| UNIT 2:<br>Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, | 1. Understand structure and model of the Python programming language | |

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| Membership operators, Identity operators, Precedence of Operators, Associativity of Operators Arrays: Creating Arrays, Indexing and Slicing of Arrays, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic slicing, Advanced Indexing, Dimensions of Arrays, Attributes of an Array, The ndim Attribute, The shape Attribute, The size Attribute, The itemsize Attribute Functions, Function definition and call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, Difference between a Function and a Method, Pass Value by Object Reference, Parameters and Arguments, Formal and Actual Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Arbitrary Arguments, Recursive Functions, Anonymous or Lambda Functions, Using Lambda with the filter() Function, Using Lambda with the map() Function, Using Lambda with the reduce() Function<br>**Modules** Introduction to **Modules** in Python | | |

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| UNIT 3.<br>Strings: Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing and Slicing, Repeating and Concatenating Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting Substrings, Immutability, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting Strings, Searching in the Strings, Testing Methods, Formatting Strings, Finding the Number of Characters and Words, Inserting Substrings into a String<br>List and Tuples: Lists, List Functions and Methods, List Operations, List Slices, Nested Lists, Tuples, Functions in Tuple<br>Dictionaries: Creating a Dictionary, Operators in Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions, Sorting the Elements of a Dictionary using Lambda, Ordered Dictionaries | 1. Create, run and evaluate Python Programs using core data structures like Lists, Dictionaries and tuples.<br>2. Interpret the concepts of Object-Oriented Programming as used in Python. | |

**Course: LINUX Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT I<br>**Linux operating system and Basics** : History, GNU Info and Utilities, Various Linux Distributions, The Unix/Linux architecture, Features of Unix/Linux, Starting the shell, Shell prompt, Command structure, File Systems and Directory Structure, man pages, more documentation pages **Basic Bash shell commands:** General purpose utility Commands, basic commands, Various file types, attributes and File handling Commands, Handling Ordinary Files. More file a ributes **Advanced Bash shell commands:**Simple Filters, Filters using regular expressions. **The Linux environment variable:** Setting, Locating and removing environment variables like PATH etc, Default shell environment variables, Using command aliases. | 1. Gives a basic introduction to Linux.<br>2. To understand importance of Linux in the real world.<br>3. Demonstrated various methods to install Linux.<br>4. Difference between CLI vs GUI.<br>5. To learn general purpose commands to start with Linux. | 1. Work with Linux file system structure, Linux Environment<br>2. Handle shell commands for scripting, with features of regular expressions, redirections<br>3. Implement file security permissions<br>4. Work with vi, sed and awk editors for shell scripting using various control structures<br>5. Install softwares like compilers and develop programs in C and Python programming languages on Linux Platform |
| UNIT 2:<br>**Understanding Linux file permission:** Linux security, Using Linux groups, Decoding file permissions, Changing security setting, Sharing files. **Linux Security:** Understanding Linux Security, uses of root, sudo command, working with passwords, Understanding ssh. **Networking**: TCP/IP Basics, TCP/IP Model, Resolving IP addresses, Applications, ping, telnet, ftp, DNS **Working withEditors:** awk, | 1. Discussed various text editors in Linux.<br>2. File system used in Linux.<br>3. Students have been explained about security in Linux.<br>4. Discussed networking commands to check network-related tasks in Linux. | |

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| sed and Introduction to vi | | |
| UNIT 3:<br>**Basic script building:** Using multiple commands, Creating script files, Displaying messages, Using variables, Redirecting Input and Output, Pipes performing math, Exiting the script. **Using structured commands:** Working with if-then, if-then-else and nested if statements, test command, Compound condition testing, while command, until command, case command. **Script and Process control** : Handling signals, Running scripts in background mode, Running scripts without a console, Job control, Job scheduling commands: ps, nice, renice, at, batch, cron table, Running the script at boot | 1. Basic commands to work with file manipulation and shell scripting commands. | |

**Course: Open Source Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of OpenSource Software, FOSS does not mean no cost. History: BSD, | 1. Understand the concept and principles of Open Source Software (OSS).<br>2. Recognize the need for OSS and its role in software development.<br>3. Differentiate between Free Software and Open-Source Software.<br>4. Understand the philosophy of software freedom and the development process of Open-Source Software.<br>5. Identify and understand various OSS licenses, including Apache, BSD, PL, LGPL.<br>6. Grasp the concepts of | 1. Differentiate between Open Source and Proprietary software and Licensing.<br>2. Recognize the applications, benefits and features of Open-Source Technologies<br>3. Gain knowledge to start, manage open-source projects. |

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| The Free Software Foundation and the GNU Project. Open-Source Principles and Methodology: Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization. Licensing: What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent. | copyrights, copyleft, and patents in relation to OSS | |
| UNIT 2:<br>Open-Source projects: Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Open-source media. Collaboration: Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student's choice. Open-Source Ethics and Social Impact: Open source vs. closed source, Open-source Government, Ethics of Open- | 1. Understand the concepts of Open-Source Hardware, Open-Source Design, Open-Source Teaching, and Open-Source Media.<br>2. Explore collaboration in Open-Source projects, including community building and effective communication.<br>3. Learn how to contribute to existing Open-Source projects, including utilizing platforms like GitHub, following community etiquette, and engaging in testing and issue reporting.<br>4. Understand the concepts of shared software and shared source.<br>5. Recognize the use of Open-Source as a business strategy. | |

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| source, Social and Financial impacts of open-source technology, Shared software, Shared source, Open Source as a Business Strategy | | |
| UNIT 3<br>Understanding Open-Source Ecosystem: Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris, Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies Case Studies: Example Projects: Apache Web server, BSD, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, Git, GCC, GDB, GitHub, Open Office, LibreOffice Study: Understanding the developmental models, licensing, mode of funding, commercial/non-commercial use. | 1. Understand the Open-Source operating systems and their significance, including GNU/Linux, Android, Free BSD, and Open Solaris.<br>2. Gain knowledge of Open-Source hardware and its applications.<br>3. Familiarize themselves with various development tools, IDEs, debuggers, and programming languages used in the Open-Source ecosystem.<br>4. Understand the LAMP stack (Linux, Apache, MySQL, PHP) and other Open-Source database technologies.<br>5. Study the developmental models, licensing, and modes of funding for Open-Source projects, including their commercial and non-commercial use. | |

**Course: Discrete Mathematics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Functions:<br>Definition of function; Domain, co-domain, range of a function; Examples of standard functions such as identity and constant functions, absolute value function, logarithmic and exponential functions, flooring and ceiling functions; | 1) Students are able to understand the concept of functions.<br>2) Understand types of relation<br>3) Acquire concept of partially ordered set<br>4) Implement recurrence relation concepts | 1) Define mathematical structures (relations, functions, graphs) and use them to model real life situations.<br>2) Understand, construct and solve simple mathematical problems.<br>3) Solve puzzles based on counting principles. |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| Injective, surjective and bijective functions, Composite and inverse functions. Relations. Definition and examples of relation, Properties of relations, Representation of relations using diagraphs and matrices, Equivalence relation, Partial Order relation, Hasse Diagrams, maximal, minimal, greatest, least element, Lattices. Recurrence Relations: Definition and Formulation of recurrence relations; Solution of a recurrence relation; Solving recurrence relations- Back tracking method, Linear homogeneous recurrence relations with constant coefficients; Homogeneous solution of linear homogeneous recurrence relation with constant coefficients; Particular solution of non-linear homogeneous recurrence relation with constant coefficients; General solution of non-linear homogeneous recurrence relation with constant coefficients; Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane, Sorting Algorithms. | | 4) Provide basic knowledge about models of automata theory and the corresponding formal languages.<br>5) Develop an attitude to solve problems based on graphs and trees, which are widely used in software. |
| UNIT 2:<br>Counting Principles: Basic Counting Principles (Sum and Product Rule); Pigeonhole Principle (without proof) - Simple examples; Inclusion Exclusion Principle (Sieve formula) (without proof), Counting using Tree | 1) Understand concept of counting principle<br>2) Problem solving based on Permutation and combination<br>3) Acquire basic knowledge about models of automata theory and the | |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| diagrams<br>Permutations and Combinations:<br>Permutation without and with repetition; Combination without and with repetition; Binomial numbers and identities; Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem (without proof) and applications; Multionomial numbers, Multinomial theorem (without proof) and applications.<br>Languages, Grammars and Machines:<br>Languages and Grammars – Introduction, Phase structure grammar, Types of grammar, derivation trees; Finite-State Machines with Output; Finite-State Machines with No Output; Regular Expression and Regular Language. | corresponding formal languages. | |
| UNIT 3:<br>Graphs:<br>Graphs and Graph Models; Graph terminologies and Special types of graphs; Definition and elementary results; Representing graphs, Linked representation of a graph; Graph Isomorphism; Connectivity in graphs – path, trail, walk; Euler and Hamilton paths; Planar graphs, Graph coloring and chromatic number.<br>b) Trees:<br>Definition, Tree terminologies and elementary results; Linked representation of binary trees; Ordered rooted tree, Binary trees, Complete and extended binary trees, Expression trees, Binary | 1) Understand the concept of graphs and trees, which are widely used in software.<br>2) Learn algorithms of operation on Graph<br>3) Implement Graph traversal techniques<br>4) Implement tree traversal techniques | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Search tree. Algorithms for searching and inserting in binary search trees. Algorithms for deleting in a binary search tree. Traversing binary trees | | |

**Course: Descriptive Statistics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Data Types and Data Presentation: Data types. Attribute, Variable. Discrete and Continuous variable. Univariate and Bivariate distribution. Types of Characteristics. Different types of scales: nominal, ordinal, interval and ratio. Data presentation: Frequency distribution, Histogram, Ogive curves.<br>Introduction to R: Data input. Arithmetic Operators. Vector Operations. Matrix Operations. Data Frames. Built-in Functions. Frequency Distribution. Grouped Frequency Distribution. Diagrams and Graphs. Summary statistics for raw data and grouped frequency distribution.<br>Measures of Central tendency: Concept of average/central tendency, characteristics of good measure of central tendency. Arithmetic Mean (A.M.), Median, Mode - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined arithmetic mean. | Provide basic learning about different types of data and presenting tools.<br><br>Introduction to R Software and basic uses.<br><br>To understand different centered values like mean, median and mode percentile and decile<br><br>Learn to represent the data using graphs | To provide complete learning about statistical data like attribute, variable and its representation methods using graphs like Frequency distribution, Histogram.<br><br>Complete understanding of R Software and its uses in Statistical Analysis.<br><br>To make students familiar with Central tendency like Mean and Median for grouped and ungrouped data..<br><br>To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance.<br><br>Concept of Moments<br><br>To make learner enable to find the correlation between different variables and further apply the regression analysis to find the exact relation between them |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Partition Values: Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data | | |
| UNIT 2:<br>Measures dispersion: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.)<br>Moments: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments.<br>Measures of Skewness and Kurtosis: Concept of Skewness and Kurtosis, measures based on moments, quartiles. | Provide learning of Raw and Central Moments.<br><br>Students should understand the symmetry in data using skewness value and kurtosis graph.<br>. | |
| UNIT 3:<br>Correlation: Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, | Provide learning and understanding of Correlation between 2 variables and its application in analysis<br><br>Concept of Regression analysis and its use in predicting the future values Concept of Multiple regression and linear regression. | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| properties. Spearman's rank correlation coefficient. Definition, examples of with and without repetition. Concept of Multiple correlation. Regression: Concept of dependent (response) and independent (predictor) variables, concept of regression, Types and prediction, difference between correlation and regression, Relation between correlation and regression. Linear Regression - Definition, examples using least square method and regression coefficient, coefficient of determination, properties. Concept of Multiple regression and Logistic regression. | | |

**Course: Soft Skills Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>**Introduction to Soft Skills**<br>**Soft Skills: An Introduction** – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.<br>**Personality Development:** Knowing Yourself, Positive Thinking, Johari's Window, Physical Fitness.<br>**Emotional Intelligence:** Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, | Students should understand about knowing self and Johari's Window.<br><br>Difference between Emotional and Intelligence Quotient.<br><br>To provide learning about Professional and Personal etiquette.<br><br>Learn about the 3M Model of communication, Verbal and Nonverbal Communication. | 1) To know about various aspects of soft skills and learn ways to develop personality<br>2) Understand the importance and type of communication in a personal and professional environment.<br>3) To provide insight into much needed technical and non-technical qualities in career planning.<br>4) Learn about Leadership, team building, decision making and stress management |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence<br>**Positivity and Motivation:** Developing Positive Thinking and Attitude; Driving out Negativity, Meaning and Theories of Motivation; Enhancing Motivation Levels<br>**Etiquette and Mannerism:** Introduction, Professional Etiquette, Technology Etiquette<br>**Ethical Values:** Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics. | | |
| UNIT 2:<br>**Basic Skills in Communication:**<br>**Components of effective communication:** Communication process and handling them. Composing effective messages, Non – Verbal Communication: its importance and nuances: Facial Expression, Posture, Gesture, Eye contact, appearance (dress code).<br>**Communication Skills:** Spoken English, Phonetics, Accent, Intonation<br>**Employment Communication:** Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter | Introduction to JOb Interview, Resume and CV.<br><br>To make the cover letter and Job Application.<br><br>Learn to Present in professional life.<br><br>Understand the steps of Interview and FAQ.<br>Group discussion process and arrangement , topics involved in group discussions | |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| **Job Interviews:** Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews<br>**Group Discussion:** Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits | | |
| UNIT 3:<br>**Academic and Professional Skills:**<br>**Professional Presentation:** Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation<br>**Creativity at Workplace:** Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method.<br>**Capacity Building: Learn, Unlearn and Relearn**: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building<br>**Leadership and Team Building:** Leader and Leadership, Leadership | To understand the workplace creativity and get the work completed in innovative ways.<br><br>Develop ethical values.<br><br>Build the capacity of learning right point and unlearn not required or wrong points.<br><br>Increase the decision making capabilities.<br><br>Learn to understand stress and method to overcome by proper time management. | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams. **Decision Making and Negotiation:** Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts **Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress | | |

**F.Y.B.Sc. COMPUTER SCIENCE SEM 2**

**Course: Design & Analysis of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to algorithms - What is algorithm, analysis of algorithm, Types of complexity, Running time analysis, How to Compare Algorithms, Rate of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega-Ω Notation, Theta-Θ Notation, Asymptotic Analysis, Performance characteristics of algorithms, Estimating running time / number of steps of executions on paper, Idea of Computability<br>Introduction to Data Structures - What is data structure, types, Introduction to Array(1-d & 2-d), Stack and List data structures, operations on these data structures, advantages | 1) To Define the basic concepts of algorithms and analyze the performance of algorithms.<br>2) Students are able to understand the use of different types of data structure. | 1) Students should be able to understand and evaluate e fficiency of the programs that they write based on performance of the algorithms used.<br>2) Students should be able to appreciate the use of various data structures as per need.<br>3) To select, decide and apply appropriate design principle by understanding the requirements of any real life problems |

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| disadvantages and applications of these data structures like solving linear equations, Polynomial Representation, Infix-to-Postfix conversion | | |
| UNIT 2:<br>Recursion - What is recursion, Recursion vs Iteration, recursion applications like Factorial of a number, Fibonacci series & their comparative analysis with respect to iterative version, Tower of hanoi problem<br>Basic Sorting Techniques - Bubble, Selection and Insertion Sort & their comparative analysis<br>Searching Techniques - Linear Search and its types, Binary Search and their comparative analysis<br>Selection Techniques - Selection by Sorting, Partition-based Selection Algorithm, Finding the Kth Smallest Elements in Sorted Order & their comparative analysis<br>String Algorithms - Pattern matching in strings, Brute Force Method & their comparative analysis | 1) Students able to understand concept of recursion<br>2) To Discuss various searching and sorting algorithms. | |
| UNIT 3:<br>Algorithm Design Techniques - Introduction to various types of classifications/design criteria and design techniques<br>Greedy Technique - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - file merging problem<br>Divide-n-Conquer - Concept, | 1) Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming.<br>2) Apply dynamic programming approach to solve suitable problems<br>3) Describe the divide- | |

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| Advantages & Disadvantages. Applications. Implementation using problems like - merge sort, Strassen's Matrix Multiplication<br>Dynamic Programming - Concept, Advantages & Disadvantages. Applications. Implementation using problems like - Fibonacci series, Factorial of a number, Longest Common subsequence<br>Backtracking Programming - Concept, Advantages & Disadvantages. Applications. Implementation using problems like N-Queen Problem | and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide - and-conquer algorithms. | |

**Course: Advanced Python Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Working with files: Files, opening and closing a file, working with text files containing strings, knowing whether a file exists or not, working with binary files, the 'with' statement, the seek() and tell() methods, random accessing of binary files, zipping and unzipping files, working with directories, running other programs from python program<br>Regular expressions: What is a regular expression?, sequence characters in regular expressions, quantifiers in regular expressions, special characters in regular expressions, using regular expression on files, retrieving information from an html file. | Understand how to read/write to files using python.<br><br>Identify to catch their own errors that happen during execution of programs.<br><br>Remember the concept of pattern matching. | 1) Ability to implement OOP concepts in Python including Inheritance and Polymorphism<br>2) Ability to work with files and perform operations on it using Python.<br>3) Ability to implement regular expression and concept of threads for developing efficient program<br>4) Ability to implement exception handling in Python applications for error handling.<br>5) Knowledge of working with databases. |

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| Threads in python: Difference between process and thread, types of threads, benefits of threads, creating threads, single tasking and multitasking, thread synchronization, deadlock in threads, daemon threads<br>Date and time in python: Date and time now, combining date and time, formatting dates and times, finding durations using "time delta", comparing two dates, sorting dates, stopping execution temporarily, knowing the time taken by a program, calendar module | | designing GUI in Python and implement networking in Python |
| UNIT 2:<br>Database in python: Using SQL with python, retrieving rows from a table, inserting rows into a table, deleting rows from a table, updating rows in a table, creating database tables through python, Exception handling in databases.<br>Exceptions in python: Errors in a python program, compile & run-time errors, logical error, exceptions-exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions, logging the exceptions<br>Networking: Protocols,server-client architecture, tcp/ip and udp communication<br>Graphical user interface: Creating a GUI in python, Widget classes, Working with Fonts and Colours, working with Frames, Layout manager, Event handling | Understand how to read/write to files using python.<br><br>Identify to catch their own errors that happen during execution of programs<br><br>Remember the concept of pattern matching. | |
| UNIT 3:<br>OOPs in python: Features of | Apply knowledge to connect | |

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| Object Oriented Programming system (oops)- classes and objects, encapsulation, abstraction, inheritance, polymorphism, constructors and destructors<br>Classes and objects: Creating a class, the self-variable, types of variables, namespaces, types of methods, instance methods, class methods, static methods, passing members of one class to another class, inner classes<br>Inheritance and polymorphism: Inheritance in python, types of inheritance-single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, constructors in inheritance, overriding super class constructors and methods, the super() method, method resolution order (mro), polymorphism, duck typing, operator overloading, method overloading, method overriding,<br>Abstract classes and interfaces: Abstract class, abstract method, interfaces in python, abstract classes vs. Interfaces | to the database to move the data to/from the application.<br><br>Evaluate and create programs to connect to computers, read from URL and send email. | |

**Course: Introduction to OOPs using C++**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to Programming Concepts: Object oriented programming paradigm, basic concepts of object oriented programming, benefits of object oriented programming, object oriented languages, applications of object oriented | 1. Understand the Object-Oriented Programming (OOP) paradigm and its basic concepts.<br>2. Gain knowledge of programming tokens, keywords, identifiers, and constants in C++. | 1. Work with numeric, character and textual data and arrays.<br>2. Understand the importance of OOP approach over procedural language.<br>3. Understand how to model classes and |

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| programming. Tokens- keywords, identifiers, constants-integer, real, character and string constants, backslash constants, features of C++ and its basic structure, simple C++ program without class, compiling and running C++ program. Data Types, Data Input Output and Operators: Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators. Decision Making, Loops, Arrays and Strings: Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and string and string manipulations Unified Modeling Language (UML): Introduction to UML & class diagrams. Classes, Abstraction & Encapsulation: Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function. | | relationships using UML.<br>4. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism.<br>5. Handle basic file operations. |
| UNIT 2:<br>Constructors and Destructors: Default constructor, parameterized constructor, copy constructor, private constructor, destructors. Working with objects:Accessor - mutator methods, static data and static function, access specifiers, array of objects. Polymorphism - Binding-static binding & overloading, constructor overloading | 1. Understand the concept of constructors and destructors in object-oriented programming.<br>2. Gain proficiency in working with objects, including implementing accessor and mutator methods.<br>3. Explore the concept of arrays of objects in | |

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| function overloading, operator overloading, overloading unary and binary operators. Modelling Relationships in Class Diagrams: Association, AggregationComposition and examples covering these principles | C++. | |
| UNIT 3:<br>Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes. Modelling Relationships: Generalization-Specialization and examples covering these principles Run time Polymorphism - Dynamic Binding, Function overriding, virtual function, pure virtual function, virtual base class, abstract class. Pointers: Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer, pointers to derived classes File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling. Applying OOP to solve real life applications: To cover case studies like library management, order management etc. to design classes covering all relationships | 1. Understand the concept of inheritance in object-oriented programming.<br>2. Learn about runtime polymorphism, dynamic binding, function overriding, and the use of virtual functions. | |

**Course: Database Systems**

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| UNIT 1<br>Introduction to DBMS – Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture Data models - Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network) Entity Relationship Model - Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER) ER to Table- Entity to Table, Relationship to tables with and without key constraints. DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables DML Statements – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause | 1. To understand the basic use of database<br>2. Various models like RDBMS, Network model, etc<br>3. To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc<br>4. Constraints used in database management system<br>5. To understand how to convert ER to table so that we can implement these tables in database application<br>6. Describe fundamental elements of RDBMS<br>7. Design E-R diagram to represent simple database applications scenarios | 1. To appreciate the importance of database design<br>2. Analyze database requirements and determine the entities involved in the system and their relationship to one another<br>3. Write simple queries to MySQL related to String, Maths and Date Functions<br>4. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands<br>5. Understand the normalization and its role in the database design process<br>6. Handle data permissions<br>7. Create indexes and understands the role of Indexes in optimization search. |
| UNIT 2:<br>Relational data model– Domains, attributes, Tuples | 1. To understand Functional dependencies, schema so that the table relationship is | |

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| and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint Relational Algebra operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division) Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables – inner join, outer join (left outer, right outer, full outer) Subqueries – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries | can be understood which will further help to create tables in database.<br>2. To illustrate DDL statements, DML statements, Joins to update, alter or delete any record from the database without changing other records of tables.<br>3. Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL.<br>4. Criticize a database and improve the design by normalization. | |
| UNIT 3:<br>Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control, Backing Up and Restoring databases Views (creating, altering dropping, renaming and manipulating views) DCL Statements | 1. To understand types of in built functions so that they can manipulate database records easily.<br>2. String functions, math functions, date function,<br>3. To understand about the DBA, permissions and security<br>4. Basic of Database protection & Distributed databases | |

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| (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges). Transaction control commands – Commit, Rollback Index Structures of Files: Introduction, Primary index, Clustering Index, Multilevel indexes | | |

**Course: Calculus**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>DERIVATIVES AND ITS APPLICATIONS:<br>Review of Functions, limit of a function, continuity of a function, derivative function. Derivative In Graphing And Applications: Analysis of Functions: Increase, Decrease, Concavity, Relative Extrema; Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents. Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method. | 1) Understand the concept of limit, continuity, derivatives.<br>2) Problem solving on derivative in graphing and applications | 1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions.<br>2) Ability to appreciate real world applications which use these concepts.<br>3) Skill to formulate a problem through Mathematical modeling and simulation. |
| UNIT 2:<br>INTEGRATION AND ITS APPLICATIONS:<br>Integration: An Overview of the Area Problem, Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Numerical Integration: Simpson's Rule. Applications of Integration: Area between two curves, Length of a plane curve. | 1) Understand the concept of integration<br>2) Problem solving with different types of integration methods.<br>3) Problem solving on modeling with differential equation | |

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| Mathematical Modeling with Differential Equations: Modeling with Differential Equations,Separation of Variables, Slope Fields, Euler's Method, First-Order Differential Equations and Applications. | | |
| UNIT 3:<br>PARTIAL DERIVATIVES AND ITS APPLICATIONS: Functions of Several Variables: Functions of two or more variables, Limits and Continuity of functions of two or three variables.<br>Partial Derivatives: Partial Derivatives, Differentiat ility, Differentials, and Local Linearity, Chain Rule, Implicit Differentiation, Directional Derivatives and Gradients, Applications ofPartial Derivatives: Tangent Planes and Normal Vectors, Maxima and Minima of Functions of Two Variables. | 1) Understand the concept partial derivatives<br>2) Implement partial derivatives on different applications | |

**Course: Statistical Methods**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Probability: Random experiment, sample space, events types and operations of events, Probability definition: classical, axiomatic, Elementary Theorems of probability (without proof), Conditional probability, 'Bayes' theorem, independence, Examples on Probability.<br>Random Variables: Concept and definition of a discrete | To learn the concept of Probability and Bayes theorem and its definition<br><br>To learn about discrete and Continuous data with its related functions like pdf and pmf. | Calculate probability, conditional probability and independence.<br><br>Students should be able to learn about distribution and its application on the basis of example.<br><br>To Analyze and proof the hypothetical statements using test statistics.<br><br>Learn to read tabulated |

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| random variable and continuous random variable. Probability mass function, Probability density function and cumulative distribution function of discrete and continuous random variable. Properties of cumulative distribution function. | | values of different functions<br><br>Analysis or compare 2 and more samples together and conclude the outcome<br><br>Learn to calculate and analyze the Non parametric distribution and CHi square association. |
| UNIT 2:<br>Mathematical Expectation and Variance: Expectation of a function, Variance and S.D of a random variable, properties.<br>Standard Probability distributions: Introduction, properties, examples and applications of each of the following distributions: Binomial distribution, Normal distribution, Chi-square distribution, t distribution, F distribution | Learn about the Expectation and Variance of Random Variable<br><br>To understand and use the distribution like Binomial for discrete data, Normal for continuous, F for comparison of variance. | |
| UNIT 3:<br>Hypothesis testing: One sided, Two sided hypothesis, critical region, p-value, tests based on t, Normal and F, confidence intervals.<br>Analysis of Variance: One-way, two-way analysis of variance.<br>Non-parametric tests: Need of non-parametric tests, Sign test, Wilicoxon's signed rank test, run test, Kruskal-Walis tests, Chi square test. | Definition of Hypothesis and steps to conclude the hypothesis<br><br>Learn Methods of ANOVA and analyze more than 2 data simultaneously.<br><br>Learn method of Non parametric tests like sign test, wilcoxon test, kruskal wallis test and Post hoc analysis | |

SHETHLU & SIRUM V. COLLEGE OF SCIENCE & COMMERCE

**Course: E-Commerce & Digital Marketing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>**Introduction to E-Commerce and E- Business**: Definition and competing in the digital economy, Impact of E-Commerce on Business Models, FactorsDriving e-commerce and e-Business Models, Economics and social impact of e-Business, opportunities and Challenges, e-Commerce vs m-Commerce, Different e-Commerce Models (B2B, B2C, C2B, C2C, B2E), e-Commerce Applications: e-Trading, e-Learning, e-Shopping, Virtual Reality & Consumer Experience, Legal and Ethical issues in e-Commerce.<br>**Overview of Electronic Payment systems**: Types of Electronic payment schemes (Credit cards, Debit cards, Smartcards, Internet banking), E-checks, E-Cash Concepts and applications of EDI and Limitation<br>**Introduction & origin of Digital Marketing**: Traditional v/s Digital Marketing, Digital Marketing Strategy, The P-O-E-M Framework, Segmenting & Customizing Messages, The Digital landscape, Digital Advertising Market in India, Skills required in Digital Marketing, Digital Marketing Plan. | 1. Understand the concepts of E-commerce and E-business and their impact on business models<br>2. Understand the different types of electronic payment systems, such as credit cards, debit cards, smart cards, and internet banking.<br>3. Analyze the digital advertising market in India.<br>4. Develop a digital marketing plan. | 1. Understand the core concepts of E-Commerce<br>2. Understand the various online payment techniques<br>3. Understand the core concepts of digital marketing and the role of digital marketing in business. 4 Apply digital marketing strategies to increase sales and growth of business<br>5. Apply digital marketing through different channels and platforms<br>6. Understand the significance of Web Analytics and Google Analytics and apply the same. |
| UNIT 2:<br>**Social Media Marketing:** Meaning, Purpose, types of social media websites, Social Media Engagement, Target audience, Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools, LinkedIn Marketing: Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting, Twitter Marketing: Framing content strategy, Twitter Advertising Campaigns, YouTube Marketing: Video optimization, Promoting on YouTube, Monetization, YouTube Analytics<br>**Email Marketing:** Types of Emails, Mailing List, Email | 1. Understand the meaning, purpose, and types of social media websites.<br>2. Use email marketing tools and automation to improve email deliverability and engagement.<br>3. Understand the concept of content marketing and its importance in digital marketing. | |

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| Marketing tools, Email Deliverability & Email Marketing automation<br>**Mobile Marketing**: Introduction, Mobile Usage, Mobile Advertising, Mobile Marketing Types, Mobile Marketing Features, Mobile Campaign Development, Mobile Advertising Analytics<br>**Content Marketing:** Introduction, Content marketing statistics, Types of Content, Types of Blog posts, Content Creation, Content optimization, Content Management & Distribution, Content Marketing Strategy, Content creation tools and apps, Challenges of Content Marketing. | | |
| UNIT 3:<br>**Search Engine Optimization:** Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimize website, On-page and off-page optimization<br>**Search Engine Marketing:** Introduction to SEM, Introduction to Ad Words - Google Ad Words, Ad Words fundamentals, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation, Display marketing, Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA).<br>**Web Analytics:** Purpose, History, Goals & objectives, Web Analytic tools & Methods, Web Analytics Mistakes and Pitfalls.<br>**Google Analytics:** Basics of Google Analytics, Installing Google Analytics in website, Parameters of Google Analytics, Reporting and Analysis | 1. Understand the meaning and common techniques of search engine optimization (SEO).<br>2. Understand the concept of search engine marketing (SEM) and its importance in digital marketing.<br>3. Understand the basics of Google Analytics, including how to install it on a website and analyze its parameters. | |

Co-ordinator B.Sc.(CS)

S.Y.B.Sc. COMPUTER SCIENCE SEM 3

Course: Principles of Operating Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Introduction to Operating-Systems:** Definition of Operating System, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments<br>**Operating-System Structures:** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure<br>**Processes:** Process Concept, Process Scheduling, Operations on Processes, Inter process Communication<br>**Threads:** Overview, Multicore Programming, Multithreading Models | 1. To understand the services provided by and the design of an operating system.<br>2. To make aware of different types of Operating System and their services. | 1. Work with any type of operating system<br>2. Handle threads, processes, process synchronization<br>3. Implement CPU scheduling algorithms<br>4. Understand the background role of memory management<br>5. Design file system. |
| UNIT 2:<br>**Process Synchronization:** General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors<br>**CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling<br>**Deadlocks:** System Model, Deadlock Characterization, Methods for Handling | 1. Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.<br>2. Analyze important algorithms eg. Process scheduling and memory management algorithms<br>3. Students should understand the data structures and algorithms used to implement an OS.<br>4. To learn different process scheduling | |

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| Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock | algorithms and synchronization techniques to achieve better performance of a computer system.<br>5. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems. | |
| UNIT 3:<br>**Main Memory:** Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table<br>**Virtual Memory:** Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing<br>**Mass-Storage Structure:** Overview, Disk Structure, Disk Scheduling, Disk Management<br>**File-System Interface:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing<br>**File-System Implementation:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management | 1. To understand the structure and organization of the file system.<br>2. To understand different approaches to memory management.<br>3. Describe the role of paging, segmentation and virtual memory in operating systems.<br>4. Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms. | |

**Course: Linear Algebra**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>**Field**: Introduction to complex numbers, complex numbers in Python, abstracting over fields, Playing with GF (2)<br>**Vectors**: Vectors are functions, Vector addition, Scalar-vector multiplication, combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations, Support Vector Machine – Introduction, Mechanism<br>**The Vector Space**: Linear combination, Spar The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and otherwise | 1. To understand the fundamental concepts of complex numbers<br>2. Introduction to the principles and mechanisms of Support Vector Machines (SVMs)<br>3. To recognize vectors as functions mapping to mathematical sets.<br>4. Understanding the concepts of linear combinations and spans. | 1. Appreciate the relevance and applications of Linear Algebra in the field of Computer Science<br>2. Understand the concepts through program implementation.<br>3. Instill a computational thinking while learning linear algebra.<br>4. Express clear understanding of the concept of a solution to a system of equations.<br>5. Find eigenvalues and corresponding eigenvectors for a square matrix. |
| UNIT 2:<br>**Matrix**: Matrices as vectors, Column space and row space, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix multiplication, Inner product and outer product, From function inverse to matrix inverse<br>**Basis**: Coordinate systems, two greedy algorithms for finding a set of generators, Linear dependence, Basis, Unique representation, Change of basis, first look, Computational problems involving finding a basis<br>**Dimension**: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator | 1. To understand matrices as vectors and their properties.<br>2. Perform matrix-vector and vector-matrix multiplications using linear combinations and dot products.<br>3. To study linear functions involving matrices.<br>4. Explore coordinate systems and their significance.<br>5. Define and calculate the dimension and rank of vector spaces.<br>6. Perform Gaussian elimination to transform matrices into echelon form. | |

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| **Gaussian elimination**. Echelon form, Gaussian elimination over GF(2). Solving a matrix-vector equation using Gaussian elimination. | | |
| UNIT 3:<br>**Inner Product**: The inner product for vectors over the reals, Orthogonality.<br>**Orthogonalization**: Projection orthogonal to multiple vectors, projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, orthogonal complement.<br>**Eigenvalues and Eigenvectors:** Characteristic Polynomials of degree 2 and 3, Eigenvalues and eigenvectors, Properties of eigenvalues and eigenvectors, Cayley–Hamilton Theorem, Minimal Polynomial. Coordinate representation in terms of eigenvectors, The Internet worm, Markov Chains, Google Page Rank algorithm. | 1. To understand the inner product for vectors over the real numbers.<br>2. Explore the concept of orthogonality and its significance.<br>3. Perform projection orthogonal to multiple vectors.<br>4. Analyze the properties and applications of eigenvalues and eigenvectors.<br>5. Represent vectors in coordinate form using eigenvectors. | |

**Course: Data Structures**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Abstract Data Type:** Different Data Types, different types of data structures & their classifications, Introduction to ADT, Creating user-specific ADT<br>**Linked Structures**: ADT for linked list, Advantages & Disadvantages, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, applications of linked list like polynomial equation | 1. Gain an understanding of various data types and data structures, including their classifications, and learn the concept of Abstract Data Types (ADT) and how to create user-specific ADTs for specific applications.<br>2. Master and Applythe concept of linked data structures, specifically | 1. Create different types of data structures.<br>2. Understand which data structure to be used based on the type of the problem.<br>3. Apply combined knowledge of algorithms and data structures to write highly effective programs in various domains. |

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| **Stacks**: Stack ADT for Stack, Advantages & Disadvantages, Applications of stack like balanced delimiter, prefix to postfix notation<br>**Queues**: Queue ADT, Advantages & Disadvantages, linked representations. Circular Queue operations, Dequeues, applications of queue like job scheduling queues | the ADT for linked lists, and comprehend the advantages and disadvantages of linked lists.<br>3. Develop the ability to perform operations like traversing, searching, prepending, and removing nodes in singly linked lists, and understand the practical applications of linked lists, such as polynomial equations.<br>4. Explore the Stack ADT, understand its advantages and disadvantages, and become proficient in applying stack data structures.<br>5. To solve problems like balanced delimiter checking and conversion from prefix to postfix notation.<br>6. Familiarize learning with the Queue ADT, its advantages and disadvantages, and learn about linked representations of queues.<br>7. Develop the skills to perform operations on circular queues and dequeues, and understand the practical applications of queues, including job scheduling queues. | |
| UNIT 2:<br>**Doubly Linked list**: ADT of doubly linked list, Advantages & Disadvantages, Insertion and deletion of nodes at various positions | 1. Develop a comprehensive understanding of doubly linked lists, including their | |

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| **Trees**: ADT for Tree Structure, Advantages & disadvantages, Binary Tree-Properties, Implementation and Traversals, Binary Search Tree, Balanced BST, Threaded Binary Trees, AVL Trees, Applications of Tree like Huffman Coding,<br>**Priority Queues & Heaps**: Priority Queue, Priority Queue ADT, Advantages and Disadvantages, Applications, Heaps, types of heaps, Heapifying the element. | advantages and disadvantages.<br>2. Gain proficiency in performing insertion and deletion operations at various positions within a doubly linked list.<br>3. Master the ADT for tree structures and traversal methods.<br>4. Practical applications of trees, such as Huffman coding.<br>5. Gain expertise in the Priority Queue ADT.<br>6. Learn about heaps, including different types of heaps, and develop the ability to heapify elements effectively, facilitating efficient priority queue operations. | |
| UNIT 3:<br>**Graph**: Introduction, Graph ADT, Advantages and Disadvantages, Graph Representation using adjacency matrix and adjacency list, Graph operations like insertion and deletion of nodes, Graph Traversals using BFS & DFS, Applications of Graphs like shortest path algorithms,<br>**Hashing**: Hash Table ADT, Advantages & Disadvantages, Concept of hashing, hash table, hash functions, collision, collision avoidance techniques, Applications of hashing | 1. Understanding of graphs and its applications.<br>2. Gain proficiency in representing graphs using both adjacency matrices and adjacency lists.<br>3. Learn to perform graph operations.<br>4. Explore and Implement graph traversal techniques using Breadth-First Search (BFS) and Depth-First Search (DFS)<br>5. Practical applications of graphs in algorithms like shortest path algorithms.<br>6. Explore the concept of hashing, hash tables, hash functions, and | |

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| | collision handling techniques. Develop the ability to apply hashing in various practical scenarios, understanding its applications in data storage and retrieval. | |

**Course: Advanced Database Concepts**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Overview of PL/SQL:** Advantages of PL/SQL, Main Features of PL/SQL, Architecture of PL/SQL<br>**Fundamentals of PL/SQL:** Character Sets, Lexical Units, Declarations, References to Identifiers, Scope and Visibility of Identifiers, Assigning Values to Variables, Expressions, Error-Reporting Functions, Data Types.<br>**Control Statements:** Conditional Selection Statements, LOOP Statements, Sequential Control Statements, GOTO, and NULL Statements.<br>**Sequences:** creating sequences, referencing, altering, and dropping a sequence.<br>**Stored Procedures and Functions:** Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures. Functions: Calling function and recursion function. | 1. Understand the advantages, features and architecture of PL/SQL, .<br>2. Familiarize with character sets used in PL/SQL.<br>3. Implement conditional selection statements in PL/SQL.<br>4. Reference, alter, and drop sequences as needed.<br>5. Create, execute, alter, and view stored procedures and understand the concept of functions in PL/SQL. | 1. Master concepts of stored procedure, functions, cursors and triggers and its use.<br>2. Learn about using PL/SQL for data management.<br>3. Use efficiently Collections and re :ords.<br>4. Understand concepts and implementations of transaction management and crash recovery. |
| UNIT 2:<br>**Collections and Records:** Associative Arrays, Varrays | 1. Understand the concepts of associative arrays, | |

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| (Variable-Size Arrays), Nested Tables, Collection Constructors, Assigning Values to Collection Variables, Multidimensional Collections, Collection Comparisons, Collection Methods, Collection Types Defined in Package Specifications, Record Variables, Assigning Values to Record Variables.<br>**Error Handling:** Compile-Time Warnings, Overview of Exception Handling, Internally Defined Exceptions, Predefined Exceptions, User-Defined Exceptions, Redeclared Predefined Exceptions, Raising Exceptions Explicitly, Exception Propagation, Unhandled Exceptions.<br>**Cursors:** Overview of Cursor, Types of cursors, Invalid cursor Exception.<br>**Static and Dynamic SQL:** Static SQL: Description of Static SQL, Cursors Overview, Processing Query Result Sets, Cursor Variables, CURSOR Expressions, Transaction Processing and Control, Autonomous Transactions. Dynamic SQL: Native Dynamic SQL, DBMS_SQL Package, SQL Injection. | Varrays (Variable-Size Arrays), and nested tables in PL/SQL.<br>2. Explore various collection types defined in package specifications.<br>3. Identify compile-time warnings and handle them appropriately.<br>4. Understand the concept of cursors in PL/SQL and their types.<br>5. Describe static and dynamic SQL and its use in PL/SQL. | |
| UNIT 3:<br>**Triggers:** Overview of Triggers, implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting, and modifying triggers, and enforcing data integrity through triggers.<br>**Packages:** Overview of a Package, Need of Packages, Package Specification, | 1. Implement triggers by creating them for various events (e.g., insert, delete, update).<br>2. Explore the use of triggers for enforcing data integrity in a database.<br>3. Understanding the need for packages and their benefits. | |

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| Package Body, Package Instantiation and Initialization<br>**Transaction Management:** ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.<br>**Crash Recovery:** ARIES algorithm, The log-based recovery, recovery related structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash Redo and Undo phases | 4. Explore the ACID properties of transactions.<br>5. Understand the concept of serializability and its importance.<br>6. Gain knowledge of the ARIES algorithm for crash recovery.<br>7. Learn how to recover a database system from a system crash, including the Redo and Undo phases. | |

**Course: Java based Application Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Introduction:** History, Features of Java, Java Development Kit, Java Application Programming Interface, Java Virtual Machine Java Program Structure, Java Tokens.<br>**OOPS**: Introduction, Class, Object, Static Keywords, Constructors, this keyword, Inheritance, Inner class, Anonymous Inner class, super keyword, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces<br>**Packages:** Introduction to predefined packages, User Defined Packages, Access specifiers<br>**Exception Handling:** Introduction, Pre-Defined Exceptions, try-catch-finally, | 1. Understand the JDK, JRE,JVM architecture<br>2. In depth knowledge of OOPs concept<br>3. Implement Exception Handling and Multithreading in dynamic programming<br>4. Usage of Packages in Monolithic and Microservice Architecture | 1. Design basic application in java using Graphical User Interface.<br>2. The learner will be able to develop applications using swings<br>3. The learner will be able to develop web based applications using servlet and jsp<br>4. The learner will be able to connect databases with java through<br>5. The learner will be able to perform programs using JSON objects |

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| throws, throw, User Defined Exceptions<br>**Multithreading**: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, wait() notify() notify all() methods | | |
| UNIT 2:<br>**Collection Framework**: Introduction, java.util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes.<br>**Introduction to JFC and Swing**- Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Toolbars, Implementing Action interface, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components, Colors and File Choosers, Tables and Trees, Printing with 2D API and Java Print Service API.<br>**Event Handling:** Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes.<br>**JDBC:** Introduction, JDBC Architecture, JDBC Drivers, JDBC Connectivity Model, java.sql package, Using Statement, PreparedStatement, CallableStatement, ResultSet, Scrollable and Updatable ResultSet, Navigating and manipulating data, ResultSetMetaData, Managing Transactions in | 1. Understand the Collection framework.<br>2. Implement the features of JFC and Swing framework.<br>3. Solving the connectivity of JDBC using Connectors and API<br>4. Working of Event Handling in Code | |

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| JDBC: JDBC Exception classes, BLOB & CLOB | | |
| UNIT 3:<br>**Servlets**: Introduction, Servlet Life Cycle, Types of Servlet, Servlet Configuration with Deployment Descriptor, Working with ServletContext and ServletConfig Object, Attributes in Servelt, Response and Redirection using Request Dispacher and using sendRedirect Method, Filter API, Manipulating Responses using Filter API, Session Tracking using Cookies, HTTPSession, Hidden Form Fields and URL Rewriting,Types of Servlet Event :ContextLevel and SessionLevel.<br>**Java Server Pages (JSP)** Introduction to JSP, Comparison with Servlet, JSP Architecture, JSP Life Cycle, JSP Scripting Elements, JSP Directives, JSP Action, JSP Implicit Objects, JSP Expression Language, JSP Standard Tag Libraries, JSP Custom Tag, JSP Session Management, JSP Exception Handling, JSP CRUD Applications.<br>**JSON**: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java | 1. In depth knowledge of Servlets, JSP frameworks on browser<br>2. Passing Data from Front end to backend using HTTP Methods<br>3. Understand the concept of JSON for API and forms. | |

**Course: Web Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>**HTML5:** Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats | 1) Understand basic concept of HTML<br>2) Understand types of CSS how to apply on website | 1. Design valid, well-formed, scalable, and meaningful pages using emerging technologies<br>2. Understand the various platforms, devices, display resolutions, viewports, and |

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| Image Maps, Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page<br>**CSS**: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element. | | browsers that render websites<br>3. Develop and implement client-side and server-side scripting language programs.<br>4. Develop and implement Database Driven Websites.<br>5. Design and apply XML to create a markup language for data and document centric applications. |
| UNIT 2<br>**JavaScript:** Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, defining a return Statement, Calling Functions with Timer, JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model, Form Validation using JavaScript<br>**XML:** Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML Entity References, DTD,<br>XSLT: XSLT Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, xsl:attribute-set, xsl:value-of | 1) Student learn popup boxes used in JavaScript<br>2) Understand JavaScript objects<br>3) Learn Form validation using JavaScript<br>4) Understand comparison XML and HTML<br>5) Student learn about XSLT | |
| UNIT 3 | 1) Understand concept | |

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| **AJAX**: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, handling asynchronous requests using AJAX<br>**PHP**: Variables and Operators, Program Flow, Arrays, working with Files and Directories, working with Databases, Working with Cookies, Sessions and Headers<br>**Introduction to jQuery**: Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects. | AJAX, PHP and jQuery<br>2) Develop website using database concept with PHP | |

**Course: Creative Content Writing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Basics of Content writing:** Introduction to Content Writing, Learning Tone in Writing and Its Types, Comprehending style in writing and its Types, Common Grammatical Errors.<br>**Best Practices for Writing for the Web:** Making our story Elegant, Professional, Write with an Attitude, Keep Verbs Active, List Items, Chunk Information, Title and Subtitle, Organize for Your Audience.<br>**Things Marketers Write:** The Ideal Length for Blog Posts, Podcast, Facebook Posts, Tweets, and Other Marketing Content. | 1. Gain a foundational understanding of content writing, including the principles of effective communication and its role in various contexts.<br>2. Identify different tones and styles in writing and their applications, and recognize and correct common grammatical errors to enhance the quality of written content.<br>3. Learn best practices for creating web content that is elegant, professional, and engaging, focusing on the importance of tone, attitude, and active verbs.<br>4. Acquire the skills to structure web content | 1. Understand the fundamentals of content creation for Blog, Website etc.<br>2. Acquire the ability to write and edit in a variety of styles and procedures<br>3. To develop the creative abilities.<br>4. To acquire essential language skills for editors. |

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| | effectively, including the use of lists, chunking information, and creating titles and subtitles tailored to the intended online audience.<br>5. Understand the significance of content length in various marketing channels, such as blog posts, podcasts, Facebook posts, and tweets, and learn to adapt writing style accordingly.<br>6. Develop the ability to tailor marketing content to meet specific platform requirements and audience preferences, optimizing the impact of marketing messages in different online spaces. | |
| UNIT 2:<br>**Social Media Wr'ting:** Writing for Twitter, writing with Hashtags, Writing Social Media with Humor, writing for Facebook, writing for LinkedIn, Writing Your LinkedIn Profile, writing for Email, Writing Landing Pages, Writing Headlines, writing a Home Page, Writing the About Us Page, Writing Better Blog Posts, Writing Annual Reports.<br>**Infographics:** Visual Communication- What Are Infographics?, The Science of Visualization, Creating Infographics- Purpose, The Art of Observation, Processing Your Ideas, Designing Your Infographics, Publishing Your Infographics. | 1. Develop the skills to write concise and engaging content tailored to specific social media platforms, including Twitter, Facebook, and LinkedIn, while utilizing appropriate hashtags and humor where applicable.<br>2. Learn effective email writing techniques, create compelling landing pages, craft attention-grabbing headlines, and construct engaging website content, including home pages, About Us pages, and blog posts, to effectively | |

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| | communicate messages in the digital landscape.<br>3. Gain an understanding of the principles of visual communication and the role of infographics in conveying complex information in a visually appealing manner.<br>4. Explore the science behind effective data visualization and develop the ability to create purpose-driven infographics by observing, processing ideas, and designing visually compelling graphics for various purposes, including reports and presentations. | |
| UNIT 3:<br>**Content Tools:** Research and Knowledge Management Tools, Writing Tools, Productivity Tools, Editing Tools, A Few Great Style Guides, Non-Text Writing Tools, Blog Idea Generators, Google Authorship, Image Sources, Tools for Content Writing.<br>**Ethical and Legal aspects of content writing:** Learn Legal English, Learn Legal Vocabulary In Legal Writing, IPR Laws, and Copywriting, Plagiarism laws in Content Writing. | 1. Acquire proficiency in using a variety of research and knowledge management tools to gather and organize information effectively for content creation.<br>2. Using writing, productivity, and editing tools to enhance the quality and efficiency of content creation, while also becoming familiar with style guides and non-text writing tools for diverse content needs.<br>3. Develop a comprehensive understanding of legal English and | |

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| | vocabulary as it relates to legal writing, equipping you with the necessary language skills to navigate legal content.<br>4. Explore intellectual property rights (IPR) laws and copyright regulations relevant to content writing, and understand the legal and ethical implications of plagiarism in content creation and publishing. | |

**S.Y.B.Sc. COMPUTER SCIENCE SEM 4**

**Course: Theory of Computation**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Automata Theory: Defining Automaton, Finite Automaton, Transitios and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines, Minimizing Automata.<br>Formal Languges: Defining Grammar, Derivations, Languges generated by Grammar, Comsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata | 1) To understand Automata Theory<br>2) Identifying DFA and NDFA.<br>3) Defining Grammer and Languages<br>4) Distinguish different computing languages and classify their respective types | 1. Understand Grammar and Languages<br>2. Learn about Automata theory and its application in Language Design<br>3. Learn about Turing Machines and Pushdown Automata<br>4. Understand Linear Bound Automata and its applications |
| UNIT 2:<br><br>Regular Sets and Regular Grammar: Regular Grammar, | 1) analyze and design finite automata, pushdown automata, Turing machines, | |

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| Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG Pushdown Automata: Definitions, Acceptance by PDA, PDA and CFG | formal languages, and grammars.<br>2) To Apply transformation between multiple representations of finite automata.<br>3) Problem solving based on Regular Sets and Regular Grammar | |
| UNIT 3:<br><br>Linear Bound Automata: The Linear Bound Automata Model, Linear Bound Automata and Languages, Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine, Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems | 1) To state and explain the Church-Turing thesis and its significance.<br>2) Problem solving based on Linear Bound Automata | |

**Course: Computer Networks**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Introduction:** Networking standards and Administrations, networks, | 1. Understanding networking standards and administrations and their roles in | 1. Learn basic networking concepts and layered architecture. |

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| network types – LAN, MAN, WAN<br>**Network Models**: The OSI model, TCP/IP protocol suite<br>**Introduction to Physical layer**: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance<br>**Digital transmissions**: Digital-to-digital conversion, analog-to-digital conversion, transmission modes<br>**Analog transmissions**: digital-to-analog conversion, analog-to-analog conversion<br>**Bandwidth Utilization – Multiplexing and Spectrum spreading**: Multiplexing, Spread Spectrum<br>**Transmission media**: Guided Media, Unguided Media<br>**Switching**: Introduction, Circuit Switched Network, Packet Switching | modern communication systems.<br>2. To Explain networking models, particularly the OSI model and the TCP/IP protocol suite.<br>3. Master the fundamentals of the physical layer in networking.<br>4. Implement digital-to-digital and analog-to-digital conversion processes.<br>5. Develop an understanding of bandwidth utilization techniques, including multiplexing and spread spectrum methods.<br>6. Apply the concept of switching in networking. | 2. Understand the concepts of networking, which are important for them to be known as a 'networking professionals'. |
| UNIT 2<br>**Introduction to Data Link Layer**: Link layer addressing, Data Link Layer Design Issues<br>**Error detection and correction**: -Block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.<br>**Data Link Control**: DLC services, data link layer protocols, HDLC, Point-to-point protocol.<br>**Media Access Control**: Random access, controlled access, channelization,<br>**Wired LANs – Ethernet**: Ethernet Protocol, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet | 1. Understanding of the Data Link Layer, addressing and design issues.<br>2. Explain and Implement concepts of error detection and correction techniques.<br>3. Gain proficiency in Data Link Control (DLC) services, data link layer protocols, and explore specific protocols such as HDLC and Point-to-Point Protocol (PPP) used for reliable data transfer over network links.<br>4. Understand the principles of media access control. | |

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| **Wired Network:** Telephone Network, Cable Network, SONET, ATM<br>**Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks<br>**Introduction to Network Layer:** Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets,<br>**Network Layer Protocols :** Internet Protocol, ICMPv4, Mobile IP | 5. Gain insight into wireless local area networks (LANs).<br>6. To apply knowledge of network layer protocol | |
| UNIT 3:<br>**Unicast Routing:** Introduction, routing algorithms, unicast routing protocols.<br>**Next generation IP:** IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.<br>**Introduction to the Transport Layer:** Transport Layer Protocol, User Datagram Protocol, Transmission Control Protocol, SCTP.<br>**Introduction to Application Layer:** Client Server Programming, Iterative Programming,<br>**Standard Client-Server Protocols:** WWW, HTTP, FTP, Electronic Mail, TELNET, Secure Cell, DNS, SNMP<br>**Quality of Service:** Data Flow to improve QoS, Flow control to improve QoS, Integrated service (Intserv), Differentiated Service(Diffserv). | 1. Simulate routing protocols<br>2. Identify Transport layers protocols and its applications.<br>3. To implement client server protocol and explore its use.<br>4. Understand various QoS requirements and standards. | |

**Course: Software Engineering**

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>Introduction: The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Component-Based Development, The Unified Process Phases, Agile Development- Agility, Agile Process, Extreme Programming<br>Requirement Analysis and System Modeling: Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS , Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram | 1) Understand the fundamental concepts of Software Engineering Lifecycle models.<br>2) Summarize the software requirement specifications and the SRS documents.<br>3) Understanding of different software architectural styles. | 1. Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements<br>2. Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.<br>3. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice<br>4. Able to use modern engineering tools necessary for software project management, time management and software reuse. |
| UNIT 2:<br>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design<br>Software Measurement and Metrics: Product Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation- | 1) Describe software engineering layered technology and Process frame work.<br>2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the Requirements.<br>3) Perform various life cycle activities like Analysis, Design, | |

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| Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for Software Quality<br>Software Project Management: Estimation in Project Planning Process – Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision, Project Scheduling - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts | Implementation, Testing and Maintenance | |
| UNIT 3:<br>Risk Management - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan<br>Software Quality Assurance: Elements of SQA, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Six Sigma, Software Reliability, The ISO 9000 Quality Standards, Capability Maturity Model<br>Software Testing : Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design | 1) Demonstrate the software project management skills through case studies.<br>2) Understanding of software testing approaches.<br>3) Describe software measurement and software risks<br>4) Understanding on quality control and how to ensure good quality software. | |

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**Course: IoT Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>**Fundamentals of IoT:** Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.<br>**System on Chip:** What is System on chip? Structure of System on Chip. SoC Elements: FPGA, GPU, APU, Compute Units.<br>**Different types of IoT/SoC Platforms:** Introduction tr Raspberry Pi, Arduino & NodeMCU, Introduction to SoC-ARM Architecture, atmega328 architecture | 1. Understand the concept of IoT (Internet of Things) and its significance.<br>2. Gain insights into the historical development and evolution of IoT.<br>3. Analyze the structure and components of a typical SoC.<br>4. Introduce and understand popular IoT platforms such as Raspberry Pi, Arduino, and NodeMCU. | 1. understand SoC and IoT<br>2. use different types of IoT Platforms and interfaces<br>3. understand and implement an idea of various types of applications built using IoT |
| UNIT 2:<br>**Interfacing with IoT Platforms:** Basic hardware components like LED, Button, Camera, 8X8 LED Grid, Motor etc and interfacing them for input/output with IoT devices using PWM, UART, GPIO, I2C, SPI<br>**Using Sensor & Actuators:** Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor, Level Sensors, Ultrasonic sensors, Interfacing of Actuators, Interfacing of Relay Switch and Servo Motor<br>**IoT and Protocols IoT Security:** HTTP, UPnP, CoAP, MQTT, XMPP, Privacy and Security Issues in IoT | 1. Understand basic hardware components like LEDs, buttons, cameras, 8x8 LED grids, motors, etc.<br>2. Explore communication protocols such as PWM, UART, GPIO, I2C, and SPI for IoT device interaction.<br>3. Learn to interface various sensors including temperature, humidity, motion, light, and gas sensors.<br>4. Understand the role of protocols in IoT communication.<br>5. Explore the importance of security in IoT ecosystems. | |

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| UNIT 3:<br>**IoT & Web:** Web server for IoT, Sending/Receiving data between web server & IoT device, Cloud for IoT, Node RED, M2M vs IoT Communication Protocols, Basics of WSNs, WSN architecture and types,<br>**IoT Applications:** Modern IoT case studies / applications used in the areas of transportation, agriculture, health care etc<br>**Edge Computing:** Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M. | 1. Establish a web server for IoT applications.<br>2. Learn how to use Node-RED for IoT application development.<br>3. Explore WSN architectures and the different types of WSNs.<br>4. Study modern IoT case studies and applications in various sectors, including transportation, agriculture, healthcare, and more.<br>5. Define the purpose and concept of edge computing in IoT.<br>6. Evaluate the advantages and disadvantages of each communication model in various IoT scenarios. | |

**Course: Android Application Developn :nt**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Introduction to Kotlin:** Basics of Kotlin, type conversions, comments, Kotlin operators, variables in Kotlin, packages, visibility modifiers, control flow statements, Concept of OOPS in Kotlin, classes in Kotlin, delegation and extension functions, the companion object,<br>**Advanced Concepts in Kotlin:** declaring and calling functions, parameters, and arguments in Kotlin, default argument, variable number of arguments, unit-returning | 1)Students will understand the basics of kotlin data type, control structure, concept of OOPS, companion, extension, etc.<br><br>2) After Basics of Kotlin students will learn advanced concepts of kotlin, Like. Writing/ Calling of function, lambda expression, Collections and its types, null safety, exception handling.<br><br>3)Once Students learn the basic and advanced concept of Kotlin. After that they learn | 1. Build useful mobile applications using Kotlin language on Android<br>2. Install and configure Android Studio for application development<br>3. Master basic to intermediate concepts of Kotlin required for mobile application development<br>4. Use built-in widgets and components, work with the database to store data<br>5. Master key Android programming concepts and deploy the application on Google Play |

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| function, explicit return type, lambda expression, coroutines, Collections in Kotlin, Mutable and Immutable Collections, Ranges, type Checks, casting concept, this expression, Null safety, exception handling, annotations<br>**App Development with Android Studio**: Android Architecture, Android Application Framework, Android Virtual Device, Creating and running First Android Application, working with Physical Android Device, Adding Kotlin Files in Android Studio<br>**Basics Of Android**- Application Components: Activities, Intent, and Broadcast Receiver, Services, Fragment, Activity Life Cycle, Content Provider, Widgets, and Notifications | Android Architecture like (MVC,MVVM)<br>Creating the first Virtual Machine. Setting Android Studio.<br><br>4) Students will understand the basic concept of Android different components like. Activity, Fragment, Content Provider, Service, Notification, Etc. | |
| UNIT 2:<br>**Designing Android UI**: User Interface (UI), Layout and Its Types, Layout Attribute, working with Views, Android UI Controls, Styles and Themes, Event Handler, setting up themes in Manifest and from the application, dialog in activity, using intents, fragments<br>**Handle Images, Listview And Menu**: ImageView, ImageSwitcher, ListView, Menu, and its types, Designing menu in XML, Option menu, Context menu, popup menu, **Screen** Navigation, RecyclerView, Interaction of Views<br>**Data binding in Android-** AdapterView, Spinner, Gallery view, AutotextCompleteView, | 1. In this unit students will learn the designing of Android UI. Adding different types of Layout, Component, Style<br>2. Understand the advanced concept of IMageView, ListView, RecyclerView, Writing different types of Adapter, Understanding the use of Activity and Fragment Navigation.<br>3. Students will learn data binding techniques to avoid binding errors in runtime. Data binding also work with AdapterView Binding | |

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| screen orientation, Design the view dynamically **Implementing Data Persistence**: Data Storage-Shared Preference, Internal And External Storage Storing Data Using SQLite Databases, Content Provider, Firebase Real-Time Data | | |
| UNIT 3: **Graphics, Animations, and Integrating Media in Android:** Drawable Class, Animation in Android, MediaPlayer API and in Android, Mediaplayer and AudioManger Class, **Interacting With Camera** and input gestures: Android Camera, Input gestures-multiple touch, swipe, drag, scroll, zoom, Recording **Gathering Location Data: Managing Background Tasks:** Broadcaset Receivers, Services, Threads and Process, AsyncTask, JobScheduler, Manage device Awake State **Deploying Android applications on Google Play**-Publishing/Deploy the application, Versioning, signing Application | 1. Create and manipulate graphics using the Drawable class in Android.<br>2. Understand and apply Android Camera functionalities for capturing photos and videos.<br>3. Implement Broadcaset Receivers to respond to system events and external triggers. | |

**Course: Advanced Application Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1: **Node.js (N):** Introduction to Node.js. Installing Node.js. The package.json File. The Node.js Event Loop. The I/O Cycle. The Anatomy of a Node.js Module. Creating Node Modules. Exploring the Node.js HTTP Module. Creating an HTTP Webserver with Node.js. Responding to HTTP Requests. Routing in | 1. Working with the latest framework on Node JS for backend<br>2. Understand the unstructured database for MongoDB<br>3. Solving the complex data handling on MongoDB | 1. Store the data in NoSQL, document-oriented MongoDB database that brings performance and scalability.<br>2. Use Node.js and Express Framework for building fast, scalable network applications<br>3. Use AngularJS framework that offers declarative, two-way data binding for web applications. |

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| Node.js: Creating a Sample Node.js Application. **MongoDB(M):** Introduction to MongoDB. Installing MongoDB. Using MongoDB Compass. Using Mongo Shell Interface. Connecting to MongoDB. Creating Schemas and Models. Querying Documents Using find(). Inserting Documents Using create(). Updating Documents Using findOneAndUpdate(). Deleting Documents Using findOneAndDelete() & deleteMany() | | 4. Integrate the front-end and back-end components of the MEAN stack.<br>5. Develop robust mobile applications using Flutter. |
| UNIT 2:<br>**Server-Side Development with Express (E):** Introduction to the Express Framework. Installing and Testing Express. Creating a Node.js Express App. Restructuring an Express App. Creating Templates. Using Express Middleware Functions. Creating the List Page. Creating the Details Page. Creating the Edit Page. Creating the Add Page. Deleting Data. REST API Basics. Testing REST APIs. Refactoring APIs. **Understanding Angular.JS(A):** Getting Started with Angular. Creating an Angular Application. Angular Project File Structure. Anatomy of an Angular Component. One-way Data Binding. Two-way Data Binding. Using NgIf Directive. Using NgForOf Directive. Angular Modules. Creating NgModules Using Angular Router. Configuring Templates. Creating Navigations. Working with Template-driven Forms. Working with Reactive | 1. Working on Front end with Express framework<br>2. Connecting bridge from front end to back end using API<br>3. Multiple template handling functions on Node JS | |

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| Forms. Validating Form Data. Services Dependency Injection (DI). Reading Data from Database. Inserting Data into Database. Updating Data in the Database. Delete Data from Database. | | |
| UNIT 3:<br>**Understanding Flutter:** Importance of Flutter, Flutter Framework, Android Studio, Flutter SDK, Installing and Configuring Flutter SDK.<br>**Dart Programming**: main() function, Dart Variables, Dart Data Types, Dart Conditional Operators, Control Flow & Loops, Dart Functions - Functions, Function Structure, creating a Function, Function Returning Expression, Object-Oriented Programming (OOP) - Creating a Class, Adding Methods to Classes, Class — Getters and Setters, Class Inheritance, Abstract Class.<br>**Flutter Widgets Fundamentals**: Scaffold Widget, Image Widget, Container Widget, Column and Row Widgets, Icon Widget, Layouts in Flutter, Card Widget, Hot Reload and Hot Restart, Stateful and Stateless Widgets<br>**Navigation and Routing:** Button Widget, App Structure and Navigation, Navigate to a New Screen and Back, Navigate with Named Routes, Send and Return Data among Screens, Animate a Widget across Screens, WebView Widget in Flutter | 1. Understanding the Mobile technology<br>2. Working on Flutter and Data Programming<br>3. Implementing business logic in Dart<br>4. Solving problems on Dart Function | |

**Course: Research Methodology**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>**Introduction to Research Methodology**: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research.<br>**Defining the Research Problem:** Concept and need, Identification of Research problem, defining and delimiting Research problem.<br>**Formulating a Research Problem:** Reviewing Literature, formulating a Research Problem, Research Question, Identifying Variables, Constructing Hypothesis<br>**The Research Design**: Meaning, Need for Research Design, Important Concepts, Different Research Designs, Basic Principles of Experimental Designs. | 1. Understand the concept of research and its significance in various fields.<br>2. Identify the objectives and motivations behind conducting research.<br>3. Differentiate between various types of research, including exploratory, descriptive, and explanatory research.<br>4. Recognize the role of scientific methods in the research process.<br>5. Identify the key factors that necessitate the formulation of a research problem.<br>6. Formulate a well-defined research problem based on a critical review of existing literature.<br>7. Construct hypotheses that can be tested to address the research questions.<br>8. Evaluate the necessity of a well-structured research design in the research process.<br>9. Apply the basic principles of experimental design in research planning and execution. | 1. Define research, formulate problem and describe the research process and research methods<br>2. Understand and apply basic research methods including research design, data analysis and interpretation.<br>3. Understand ethical issues in research, write research report, research paper and publish the paper. |
| UNIT 2:<br>**Tools for Data Collection**: Collections of Primary Data, Collection of Data through questionnaire and Schedules, other Observation Interview Methods,<br>Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing | 1. Understand the various methods for collecting primary data, including questionnaires, schedules, and observation techniques.<br>2. Learn to apply different interview methods and recognize their suitability for specific research scenarios. | |

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| research tools viz. Questionnaire and rating scales etc. Reliability and validity of Research tools. **Sampling Design**: Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, how to Select a Random Sample. Probability and Non-Probability sampling types and criteria for selection. Developing sampling Frames. **Overview of Hypothesis Testing:** What is a Hypothesis? Characteristics of good Hypothesis. Basic Concepts. Procedure for Hypothesis Testing. Flow Diagram for Hypothesis Testing. Tests of Hypotheses and One sided and two-sided hypothesis. Type – I and Type – II errors. Null Hypothesis- Alternative Hypothesis. | 3. Evaluate and select appropriate data collection methods based on the research objectives.<br>4. Comprehend the essential steps involved in designing a sampling plan, from defining the target population to selecting a sample.<br>5. Acquire the skills to select a random sample and develop sampling frames for real-world research applications.<br>6. Formulate hypotheses with the characteristics of being specific, testable, and relevant to the research problem.<br>7. Grasp the concept of Type-I and Type-II errors and their implications in the context of hypothesis testing | |
| UNIT 3<br>**Technical Writing:** Writing a Research Proposal, what is a Scientific Paper? Ethics in Scientific Publishing. **Preparing the Text:** How to Prepare the Title, how to List the Authors and Addresses, how to Prepare the Abstract, how to Write the Introduction, how to Write the Materials and Methods Section, how to Write the Results, how to Write the Discussion, how to State the Acknowledgments, how to Cite the References. **Preparing the Tables and Figures:** How to Design Effective Tables, how to Prepare Effective Graphs, how to Prepare Effective Photographs. **Publishing the Paper:** Rights and Permissions, How to Submit the Manuscript, How and When to Use Abbreviations, How to Write a thesis. Outcome | 1. Develop the skills to craft a well-structured research proposal, including defining research objectives, formulating hypotheses, and outlining research methods.<br>2. Learn how to effectively create a compelling title that accurately represents the research and attracts readers.<br>3. Learn various aspects of writing a research paper, including crafting an effective abstract, creating an engaging introduction, mastering the materials and methods section, presenting results clearly, constructing a thoughtful discussion, acknowledging | |

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| of Research, Ethical issues in research | contributions, and using proper citation styles for references.<br>4 Understand the rights and permissions related to publishing, including copyright considerations and ethical guidelines for using others' work.<br>5. Learn when and how to use abbreviations and acronyms in scientific writing.<br>6. Explore the process of writing a thesis based on research outcomes.<br>7. Discuss the ethical issues and responsibilities involved in conducting and reporting research, including issues related to plagiarism, authorship, and data integrity. | |

Co-ordinator B.Sc. (CS)

## T.Y.B.Sc. COMPUTER SCIENCE SEM 5

**Course: Artificial Intelligence**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>What Is AI: Foundations, History and State of the Art of AI.<br>Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents.<br>Problem Solving by searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. | 1) Identify problems where artificial intelligence techniques are applicable<br>2) compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems<br>3) Toclassify the different types of agents | 1) After completion of this course, learner should get a clear understanding of AI<br>2) Different search algorithms used for solving problems.<br>3) The learner should also get acquainted with different learning algorithms and models used in machine learning. |
| UNIT 2:<br><br>Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning | 1) To formulate and choose best hypothesis<br>2) To understand and the architecture of Artificial Neural Networks<br>3) To understand the working of SVM<br>4) To Justify the use of ensemble learning | |
| UNIT 3:<br><br>Learning probabilistic models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm. Reinforcement | 1) Demonstrate proficiency in applying scientific method to models of probabilistic learning<br>2) To describe Reinforcement | |

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| learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning. | Learning and its type. | |

**Course: Linux Server Administration**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction:<br>Technical Summary of Linux Distributions, Managing Software<br>Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems, Core System Services, Process of configuring, compiling, Linux Kernel<br>Networking and Security: TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security | 1) Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. | 1) Learner will be able to develop Linux based systems and maintain.<br>2) Learner will be able to install appropriate service on Linux server as per requirement.<br>3) Learner will have proficiency in Linux server administration. |
| UNIT 2:<br>Internet Services: Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name | 1) Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.<br>2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS. | |

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| Service (DNS), Security | | |
| UNIT 3:<br>Intranet Services:<br>Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP),<br>Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications<br>File Servers, Email Services, Chat Applications, Virtual Private Networking. | 1) Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.<br>2) To illustrate various intranet services in Linux and there configuration steps. | |

**Course: Architecting of IoT**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to IOT, Design Principle and Standards.<br><br>IOT reference model and architecture, ITs deployment and operational view.<br><br>Learning about device domain | To provide the learning about IOT domain and its architectural view.<br><br>To Learn about Reference Model and Architectural view<br><br>Learning about Function of device domain and gateway domain. | Students should have a complete understanding of IOT Networks and its deployment.<br><br>Learn the different layer protocol to apply in applications for better security.<br><br>Learn the need of IPv4 and IPv6 along with all layer protocols. |
| UNIT 2:<br>Protocols involved in Data link and Network layer<br><br>PHY/MAC - 3GPP, Wireless HART, BLE.<br><br>IPV4 and IPV6 requirements, 6LowPAN, CORPL and other protocols | Learning f Data link layer like 3GPP and Wireless HART.<br><br>Understanding the difference between protocols.<br><br>Requirement of IPv4 and IPv6 and its differences<br><br>Learn the working about network layer protocol. | |
| UNIT 3: | Learn the functions of transport layer protocol like | |

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| Transport layer Protocol TCP, MPTCP etc.<br><br>Session LAyer Protocol - HTTP, CoAP etc.<br><br>Service Layer Protocol oneM2M, ETSI, M2M etc. | connection oriented, multipath TCP etc.<br><br>Understand the session layer protocol HTTP and CoAP to exchange the packets.<br><br>Machine to Machine Services. | |

**Course: Web Services**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Web services basics : What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform | 1) To implement a basic RESTful or SOAP web service using the JAX-WS framework in Java.<br>2) By learning about XML and SOAP, students will be able to implement data exchange between different systems in a standardized way, which can improve interoperability and simplify integration.<br>3) Understanding the Web Services Development Life Cycle (WSDLC) can help illustrate the process of developing, testing, and deploying web services in a structured and methodical way. | Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services |
| UNIT 2:<br>The REST Architectural style :<br><br>Introducing HTTP, The core architectural elements of a RESTful system, | 1) Understanding REST architecture.<br>2) Create Web services Application using REST API's<br>3) Apply JASON and | |

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| Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services | REST programming fundamentals | |
| UNIT 3:<br>Developing Service-Oriented Applications with WCF : What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming, WCF Feature Details, Web Service QoS | 1) Understanding Windows Communication foundation.<br>2) Analyze Windows Communication Foundation Architecture<br>3) Create .NET framework based WCF. | |

**Course: Game Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Mathematics for Computer Graphics, DirectX Kickstart: Cartesian Coordinate system: The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule Vectors: Vector Manipulation, | 1) Understand basic concept of mathematics used in computer graphics<br>2) Acquire knowledge on different types of transformations<br>3) Understand difference of CPU and GPU | Learner should study Graphics and gaming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn. |

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| multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas<br>Transformations: 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation<br>DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU? | | |
| UNIT 2:<br>DirectX Pipeline and Programming:<br>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels Direct3D 11 Rendering Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), | 1) Understand DIrectX Pipeline<br>2) Understand trigonometry formulas and types of curves<br>3) Acquire knowledge of types of interpolation<br>4) Understand analytical geometry concept | |

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| The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM)<br>Understanding Meshes or Objects, Texturing, Lighting, Blending<br>Interpolation and Character Animation:<br>Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships<br>Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions<br>Curves: Circle, Bezier, B-Splines<br>Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line. | | |
| UNIT 3:<br>Introduction to Rendering Engines: Understanding the current market Rendering Engines. Understanding AR, VR and MR:Depth Mappers, Mobile Phones, Smart Glasses, HMD's<br>Unity Engine: Multi-platform publishing, VR + AR: Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking. | 1) Understand rendering engines concept<br>2) Understand difference between AR, VR and MR<br>3) Understand working in Unity<br>4) Develop games using Unity concepts | |

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| UI, Navigation and Pathfinding, XR, Publishing Scripting, Scripting Overview, Scripting Tools and Event Overview<br>XR, VR, AR, MR, Conceptual Differences, SDK, Devices | | |

**T.Y.B.Sc. COMPUTER SCIENCE SEM 6**

**Course: Wireless Sensor Networks and Mobile Communication**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.<br>Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.<br>Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts. | Learn the Introduction to WSN and its need in todays world.<br><br>Understand Deployment architecture, Topology used in deployment.<br><br>Different components of WSN<br><br>Hardware and Software requirements of WSN.<br><br>Learn about MANETS and efficient use of battery. | 1) After completion of this course, learner should be able to list various applications of wireless sensor networks,<br>2) Describe the concepts, protocols, design,<br>3) implementation and use of wireless sensor networks.<br>4) Also implement and evaluate new ideas for solving wireless sensor network design issues. |
| UNIT 2:<br>Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study.<br>Routing Protocols : Data | To PRovide knowledge of MAC Protocols used for WSN and ROuting protocols for route updates.<br><br>Protocols used for Transport | |

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| Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks.<br>Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. | layer like conversion of existing TCP to suite the environment of WSN for efficient use of power. | |
| UNIT 3:<br><br>Introduction, Wireless Transmission and Medium Access Control: Applications, A short history of wireless communication.<br>Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.<br>Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT- 2000.<br>Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover. | To provide knowledge about history of WSN and its application,<br><br>Learn about Cellular system in telecom<br><br>How does the HAndover and Takeover of call works<br><br>Satellite functioning and different architecture.<br><br>Learn ts application in GEO,LEO and MEO. | |

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**Course: Cloud Computing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Cloud Computing Architecture, The cloud reference model, Infrastructure as a service, Platform as a service, Software as a service, Types of clouds. | 1) Explain the core concepts of the cloud computing paradigm<br>2) Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies. | 1) After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing<br>2) The possible applications for state-of-the-art cloud computing using open source technology.<br>3) Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.<br>4) They should explain the core issues of cloud computing such as security, privacy, and interoperability. |
| UNIT 2:<br><br>Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment, Open challenges of Cloud Computing | 1) Implement different types of Virtualization technologies and Service Oriented Architecture systems | |
| UNIT 3:<br>Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud | 1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges<br>2) Illustrate the | |

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| building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat | fundamental concepts of cloud storage | |

**Course: Information Retrieval**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction to Information Retrieval: Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval. | 1) Describe the objectives of information retrieval Systems.<br><br>2) To discuss the issues related to IR | 1) After completion of this course, learner should get an understanding of the field of information retrieval<br>2) its relationship to search engines.<br>3) It will give the learner an understanding to apply information retrieval models. |
| UNIT 2:<br>Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval. | 1) To understand the working of specialised search techniques<br>2) Describe Map-Reduce.<br>3) Analyze working of QA systems | |

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| UNIT 3:<br><br>Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures.<br>XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval. | 1) To understand the acrchitectutre of web search engine<br>2) To demonstrate XML retrieval. | |

**Course: Digital Image Processing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing<br>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter<br>Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, | 1) Review the fundamental concepts of a digital image processing system.<br>2) Understand the Human Visual Systems<br>3) Explain the fundamentals of digital image and its processing<br>4) Descibe the 2D Signals<br>5) Problem solvig in Image Convolution | 1) Learner should review the fundamental concepts of a digital image processing system.<br>2) Analyze the images in the frequency domain using various transforms.<br>3) Evaluate the techniques for image enhancement and image segmentation.<br>4) Apply various compression techniques.<br>5) They will be familiar with basic image processing techniques for solving real problems. |

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| Circular Convolution, Applications of Circular Convolution, 2D Correlation Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform | | |
| UNIT 2:<br>Image Enhancement :Image Enhancement in spatial domain, Enhancement trough Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic<br><br>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing, Logical operations, Morphological operations, Dilation and Erosion, Distance Transform Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image | 1) understand the need for image transforms different types of image transforms and their properties.<br>2) learn different techniques employed for the enhancement of images.<br>3) To identify different colour models and color image processing | |

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| UNIT 3:Image Segmentation Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard | 1) Understand the need for image compression<br>2) To learn the spatial and frequency domain techniques of image compression.<br>3) To implement image segmentation techniques | |

**Course: Ethical Hacking**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>**Information Security : Attacks and Vulnerabilities**<br>**Introduction to information security** : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle<br>**Types of malware** :Worms, viruses, Trojans, Spyware, Rootkits<br>**Types of vulnerabilities** : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database<br>**Types of attacks and their common prevention mechanisms** : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs<br>**Case-studies** : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax. | 1. Understand concept of information security<br>2. Understand types of malware and vulnerabilities<br>3. Acquire knowledge on types of attacks and their prevention mechanisms.<br>4. Discuss recent attacks. | 1. Learner will know to identify security vulnerabilities and weaknesses in the target applications<br>2. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines. |

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| WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit | | |
| UNIT 2<br>**Ethical Hacking – I (Introduction and pre-attack)**<br>**Introduction**: Black Hat vs Gray Hat vs White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory concerns, Black box vs White box vs Black box, Vulnerability assessment and Penetration Testing<br>**Approach : Planning** - Threat Modeling, set up security verification standards<br>Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs unauthenticated, internal vs external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, Preparing report, Fixing security gaps following the report<br>**Enterprise strategy**: Repeated PT, approval by security testing team, Continuous Application Security Testing,<br>**Phases:** Reconnaissance/foot- | 1. Discuss types of ethical hacking<br>2. Understand how penetration testing is important<br>3. Acquire knowledge of different phases of ethical hacking | |

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| printing/Enumeration. **Phases** Scanning, Sniffing | | |
| UNIT 3<br>**Ethical Hacking :Enterprise Security Phases : Gaining and Maintaining Access Systems hacking –** Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPSpoofing, SYN Flooding, Smurf attack, **Applications hacking** : SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, **Malware analysis** : Netcat Trojan, wrapping definition, reverse engineering **Phases** : Covering your tracks : Steganography, Event Logs alteration **Additional Security Mechanisms** : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines) | Acquire knowledge to test and exploit systems using various tools and understand the impact of hacking in real time machines. | |

Co-ordinator B.Sc.(CS)

**COURSE OUTCOME**
**F.Y.B.Sc. COMPUTER SCIENCE SEM 1**
**2021-2022 Syllabus**

**Course: Digital Systems & Architecture**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Fundamentals of Digital Logic: Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps. Combinational Circuits: Adders, Mux, De-Mux, Sequential Circuits: Flip-Flops (SR, JK & D), Counters: synchronous and asynchronous Counter Computer System: Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures. Bus Interconnections, Input / Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access | 1) Students are able to understand basic functions of computers.<br>2) To learn about how computer systems work and underlying principles<br>3) To understand the basics of digital electronics needed for computers | 1) To learn about how computer systems work and underlying principles<br>2) To understand the basics of digital electronics needed for computers<br>3) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>4) To understand the basics of processor structure and operation<br>5) To understand how data is transferred between the processor and I/O devices |
| UNIT 2:<br>Memory System Organization: Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory. Cache Memory: Design Principles, Memory mappings, Replacement Algorithms, Cache | 1) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>2) Understand types of machine instructions<br>3) Understand difference between RISC and CISC<br>4) Understand different | |

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| performance, Cache Coherence. Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels<br>Processor Organization: Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization, Structure and Function. Register Organization, Basic Microprocessor operations: Data Transfer (Register / Memory) Operations, Arithmetic & Logical Operations, Instruction Cycle, Instruction Pipelining. Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors: Design Issues | types of memory | |
| UNIT 3:<br>Control Unit: Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control.<br>Fundamentals of Advanced Computer Architecture: Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Array | 1) To understand the basics of processor structure and operation<br>2) To learn advanced computer architecture | |

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| Processors, Clusters, and NUMA Computers Multiprocessor Systems: Structure & Interconnection Networks, Multi-Core Computers: Introduction, Organization and Performance. | | |

**Course: Introduction to Programming with Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Overview of Python: History & Versions, Features of Python, Execution of a Python Program, Flavours of Python, Innards of Python, Python Interpreter, Memory Management in Python, Garbage Collection in Python, Comparison of Python with C and Java, Installing Python, Writing and Executing First Python Program, Getting Help, IDLE<br>Data Types, Variables and Other Basic Elements: Comments, Docstrings, Data types- Numeric Data type, Compound Data Type, Boolean Data type, Dictionary, Sets, Mapping, Basic Elements of Python, Variables<br>Input and Output Operations: Input Function, Output Statements, The print() function, The print("string") function, The print(variables list) function, , The print(object) | 1. Understand structure and model of the Python programming language | 1) Ability to store, manipulate and access data in Python<br>2) Ability to implement basic Input / Output operations in Python<br>3) Ability to define the structure and components of a Python program.<br>4) Ability to learn how to write loops and decision statements in Python.<br>5) Ability to learn how to write functions and pass arguments in Python.<br>6) Ability to create and use Compound data types in Python |

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| function, The print(formatted string) function, Command Line Arguments<br>Control Statements: The if statement, The if ... else Statement, The 'if ... elif ... else' Statement, Loop Statement- while loop, for loop, Infinite loop, Nested loop, The else suite, break statement, continue statement, pass statement, assert statement, return statement | | |
| UNIT 2:<br>Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators<br>Arrays: Creating Arrays, Indexing and Slicing of Arrays, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic slicing, Advanced Indexing, Dimensions of Arrays, Attributes of an Array, The ndim Attribute, The shape Attribute, The size Attribute, The itemsize | 1. Understand structure and model of the Python programming language | |

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| Attribute<br>Functions: Function definition and call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, Difference between a Function and a Method, Pass Value by Object Reference, Parameters and Arguments, Formal and Actual Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Arbitrary Arguments, Recursive Functions, Anonymous or Lambda Functions, Using Lambda with the filter() Function, Using Lambda with the map() Function, Using Lambda with the reduce() Function<br>Modules:Introduction to Modules in Python | | |
| UNIT 3:<br>Strings: Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing and Slicing, Repeating and Concatenating Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting | 1. Create, run and evaluate Python Programs using core data structures like Lists, Dictionaries and tuples.<br>2. Interpret the concepts of Object-Oriented Programming as | |

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| Substrings, Immutability, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting Strings, Searching in the Strings, Testing Methods, Formatting Strings, Finding the Number of Characters and Words, Inserting Substrings into a String List and Tuples: Lists, List Functions and Methods, List Operations, List Slices, Nested Lists, Tuples, Functions in Tuple Dictionaries: Creating a Dictionary, Operators in Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions, Sorting the Elements of a Dictionary using Lambda, Ordered Dictionaries | used in Python. | |

**Course: LINUX Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT I<br>**Linux operating system and Basics :** History, GNU Info and Utilities, Various Linux Distributions, The | 1. Gives a basic introduction to Linux.<br>2. To understand importance of Linux in the real world.<br>3. Demonstrated various | 1. Work with Linux file system structure, Linux Environment |

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| Unix/Linux architecture, Features of Unix/Linux, Starting the shell, Shell prompt, Command structure, File Systems and Directory Structure, man pages, more documentation pages<br>**Basic Bash shell commands:** General purpose utility Commands, basic commands, Various file types, attributes and File handling Commands, Handling Ordinary Files, More file attributes<br>**Advanced Bash shell commands:**Simple Filters, Filters using regular expressions.<br>**The Linux environment variable:** Setting, Locating and removing environment variables like PATH etc, Default shell environment variables, Using command aliases. | methods to install Linux.<br>4. Difference between CLI vs GUI.<br>5. To learn general purpose commands to start with Linux. | 2. Handle shell commands for scripting, with features of regular expressions, redirections<br>3. Implement file security permissions<br>4. Work with vi, sed and awk editors for shell scripting using various control structures<br>5. Install softwares like compilers and develop programs in C and Python programming languages on Linux Platform |
| UNIT 2:<br>**Understanding Linux file permission:** Linux security, Using Linux groups, Decoding file permissions, Changing security setting, Sharing files.<br>**Linux Security:** Understanding Linux Security, uses of root, sudo command, working with passwords, Understanding ssh.<br>**Networking**: TCP/IP Basics, TCP/IP Model, Resolving IP addresses, Applications, ping, telnet, | 1. Discussed various text editors in Linux.<br>2. File system used in Linux.<br>3. Students have been explained about security in Linux.<br>4. Discussed networking commands to check network-related tasks in Linux. | |

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| ftp, DNS<br>**Working withEditors:** awk, sed and Introduction to vi | | |
| UNIT 3:<br>**Basic script building:** Using multiple commands, Creating script files, Displaying messages, Using variables, Redirecting Input and Output, Pipes performing math, Exiting the script.<br>**Using structured commands:** Working with if-then, if-then-else and nested if statements, test command, Compound condition testing, while command, until command, case command.<br>**Script and Process control** : Handling signals, Running scripts in background mode, Running scripts without a console, Job control, Job scheduling commands: ps, nice, renice, at, batch, cron table, Running the script at boot | 1. Basic commands to work with file manipulation and shell scripting commands. | |

**Course: Open Source Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Open-Source: Open Source, Need and Principles of OSS, | 1. Understand the concept and principles of Open Source Software (OSS).<br>2. Recognize the need for OSS and its role in software | 1. Differentiate between Open Source and Proprietary software and Licensing. |

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| Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of OpenSource Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project. Open-Source Principles and Methodology: Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization. Licensing: What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent. | development.<br>3. Differentiate between Free Software and Open-Source Software.<br>4. Understand the philosophy of software freedom and the development process of Open-Source Software.<br>5. Identify and understand various OSS licenses, including Apache, BSD, PL, LGPL.<br>6. Grasp the concepts of copyrights, copyleft, and patents in relation to OSS. | 2. Recognize the applications, benefits and features of Open-Source Technologies<br>3. Gain knowledge to start, manage open-source projects. |
| UNIT 2:<br>Open-Source projects: Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, | 1. Understand the concepts of Open-Source Hardware, Open-Source Design, Open-Source Teaching, and Open-Source Media.<br>2. Explore collaboration in | |

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| Open-source Teaching, Open-source media. Collaboration: Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student's choice. Open-Source Ethics and Social Impact: Open source vs. closed source, Open-source Government, Ethics of Open-source, Social and Financial impacts of open-source technology, Shared software, Shared source, Open Source as a Business Strategy | Open-Source projects, including community building and effective communication.<br>3. Learn how to contribute to existing Open-Source projects, including utilizing platforms like GitHub, following community etiquette, and engaging in testing and issue reporting.<br>4. Understand the concepts of shared software and shared source.<br>5. Recognize the use of Open-Source as a business strategy. | |
| UNIT 3: Understanding Open-Source Ecosystem: Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database | 1. Understand the Open-Source operating systems and their significance, including GNU/Linux, Android, Free BSD, and Open Solaris.<br>2. Gain knowledge of Open-Source hardware and its applications.<br>3. Familiarize themselves with various development tools, IDEs, debuggers, and programming languages used in the Open-Source ecosystem. | |

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| technologies Case Studies: Example Projects: Apache Web server, BSD, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, Git, GCC, GDB, GitHub, Open Office, LibreOffice Study: Understanding the developmental models, licensing, mode of funding, commercial/non-commercial use. | 4. Understand the LAMP stack (Linux, Apache, MySQL, PHP) and other Open-Source database technologies.<br>5. Study the developmental models, licensing, and modes of funding for Open-Source projects, including their commercial and non-commercial use. | |

**Course: Discrete Mathematics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Functions:<br>Definition of function; Domain, co-domain, range of a function; Examples of standard functions such as identity and constant functions, absolute value function, logarithmic and exponential functions, flooring and ceiling functions; Injective, surjective and bijective functions; Composite and inverse functions.<br>Relations:<br>Definition and examples of relation; Properties of relations, Representation of relations using diagraphs and matrices; Equivalence relation; Partial Order relation, Hasse Diagrams, maximal, minimal, greatest, least element, Lattices. | 1) Students are able to understand the concept of functions.<br>2) Understand types of relation<br>3) Acquire concept of partially ordered set<br>4) Implement recurrence relation concepts | 1) Define mathematical structures (relations, functions, graphs) and use them to model real life situations.<br>2) Understand, construct and solve simple mathematical problems.<br>3) Solve puzzles based on counting principles.<br>4) Provide basic knowledge about models of automata theory and the corresponding formal languages.<br>5) Develop an attitude to solve problems based on graphs and trees, which are widely used in software. |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Recurrence Relations: Definition and Formulation of recurrence relations; Solution of a recurrence relation; Solving recurrence relations- Back tracking method, Linear homogeneous recurrence relations with constant coefficients; Homogeneous solution of linear homogeneous recurrence relation with constant coefficients; Particular solution of non-linear homogeneous recurrence relation with constant coefficients; General solution of non-linear homogeneous recurrence relation with constant coefficients; Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane, Sorting Algorithms. | | |
| UNIT 2:<br>Counting Principles: Basic Counting Principles (Sum and Product Rule); Pigeonhole Principle (without proof) - Simple examples; Inclusion Exclusion Principle (Sieve formula) (without proof); Counting using Tree diagrams.<br>Permutations and Combinations: Permutation without and with repetition; | 1) Understand concept of counting principle<br>2) Problem solving based on Permutation and combination<br>3) Acquire basic knowledge about models of automata theory and the corresponding formal languages. | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Combination without and with repetition; Binomial numbers and identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem (without proof) and applications; Multionomial numbers, Multinomial theorem (without proof) and applications.<br>Languages, Grammars and Machines:<br>Languages and Grammars – Introduction, Phase structure grammar, Types of grammar, derivation trees; Finite-State Machines with Output; Finite-State Machines with No Output; Regular Expression and Regular Language. | | |
| UNIT 3:<br>Graphs:<br>Graphs and Graph Models; Graph terminologies and Special types of graphs; Definition and elementary results; Representing graphs, Linked representation of a graph; Graph Isomorphism; Connectivity in graphs – path, trail, walk; Euler and Hamilton paths; Planar graphs, Graph coloring and chromatic number.<br>b) Trees:<br>Definition, Tree terminologies and elementary results; Linked | 1) Understand the concept of graphs and trees, which are widely used in software.<br>2) Learn algorithms of operation on Graph<br>3) Implement Graph traversal techniques<br>4) Implement tree traversal techniques | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| representation of binary trees; Ordered rooted tree, Binary trees, Complete and extended binary trees, Expression trees, Binary Search tree, Algorithms for searching and inserting in binary search trees, Algorithms for deleting in a binary search tree; Traversing binary trees | | |

**Course: Descriptive Statistics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Data Types and Data Presentation: Data types: Attribute, Variable, Discrete and Continuous variable, Univariate and Bivariate distribution. Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio. Data presentation: Frequency distribution, Histogram, Ogive curves. Introduction to R: Data input, Arithmetic Operators, Vector Operations, Matrix Operations, Data Frames, Built-in Functions. Frequency Distribution, Grouped Frequency Distribution, Diagrams and Graphs, Summary statistics for raw data and grouped frequency distribution. Measures of Central | Provide basic learning about different types of data and presenting tools.<br><br>Introduction to R Software and basic uses.<br><br>To understand different centered values like mean, median and mode percentile and decile<br><br>Learn to represent the data using graphs | To provide complete learning about statistical data like attribute, variable and its representation methods using graphs like Frequency distribution, Histogram.<br><br>Complete understanding of R Software and its uses in Statistical Analysis.<br><br>To make students familiar with Central tendency like Mean and Median for grouped and ungrouped data..<br><br>To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance.<br><br>Concept of Moments<br><br>To make learner enable to |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| tendency: Concept of average/central tendency, characteristics of good measure of central tendency, Arithmetic Mean (A.M.), Median, Mode - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined arithmetic mean. Partition Values: Quartiles, | | find the correlation between different variables and further apply the regression analysis to find the exact relation between them |
| UNIT 2:<br>Measures dispersion: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.)<br>Moments: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments.<br>Measures of Skewness and Kurtosis: Concept of Skewness and Kurtosis, | Provide learning of Raw and Central Moments.<br><br>Students should understand the symmetry in data using skewness value and kurtosis graph.<br>. | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| measures based on moments, quartiles. | | |
| UNIT 3:<br>Correlation: Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, properties; Spearman's rank correlation coefficient: Definition, examples of with and without repetition. Concept of Multiple correlation.<br>Regression: Concept of dependent (response) and independent (predictor) variables, concept of regression, Types and prediction, difference between correlation and regression, Relation between correlation and regression. Linear Regression - Definition, examples using least square method and regression coefficient, coefficient of determination, properties. Concept of Multiple regression and Logistic regression. | Provide learning and understanding of Correlation between 2 variables and its application in analysis<br><br>Concept of Regression analysis and its use in predicting the future values Concept of Multiple regression and linear regression. | |

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**Course: Soft Skills Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Softskill and Hard Skill.<br>Personality Development, Emotional Intelligence, Etiquette and Mannerism, Communication Today. | Students should understand about knowing self and Johari's Window.<br><br>Difference between Emotional and Intelligence Quotient.<br><br>To provide learning about Professional and Personal etiquette.<br><br>Learn about the 3M Model of communication, Verbal and Nonverbal Communication. | 1) To know about various aspects of soft skills and learn ways to develop personality<br>2) Understand the importance and type of communication in a personal and professional environment.<br>3) To provide insight into much needed technical and non-technical qualities in career planning.<br>4) Learn about Leadership, team building, decision making and stress management |
| UNIT 2:<br>Employment Communication: Like Introduction to Organization process<br>Professional Presentation: Presenting self for different prospects of presentation<br>Job Interviews: TO appear for Interview<br>Group Discussion: Importance and requirement | Introduction to JOb Interview, Resume and CV.<br><br>To make the cover letter and Job Application.<br><br>Learn to Present in professional life.<br><br>Understand the steps of Interview and FAQ.<br>Group discussion process and arrangement , topics involved in group discussions | |
| UNIT 3:<br>Creativity at Workplace: Create the Work enviornment<br>Ethical Values: Values and SOciety Ethics<br>Capacity Building: Learn, Unlearn and Relearn: To | To understand the workplace creativity and get the work completed in innovative ways.<br><br>Develop ethical values.<br><br>Build the capacity of | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| build the capacity of learning<br>Leadership and Team Building: Qualities required to be leader.<br>Decision Making and Negotiation: Quick and right decision makings<br>Stress and Time Management:To learn time and stress management | learning right point and unlearn not required or wrong points.<br><br>Increase the decision making capabilities.<br><br>Learn to understand stress and method to overcome by proper time management. | |

**F.Y.B.Sc. COMPUTER SCIENCE SEM 2**

**Course: Design & Analysis of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to algorithms - What is algorithm, analysis of algorithm, Types of complexity, Running time analysis, How to Compare Algorithms, Rate of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega-Ω Notation, Theta-Θ Notation, Asymptotic Analysis, Performance characteristics of algorithms, Estimating running time / number of steps of executions on paper, Idea of Computability<br>Introduction to Data Structures - What is data | 1) To Define the basic concepts of algorithms and analyze the performance of algorithms.<br>2) Students are able to understand the use of different types of data structure. | 1) Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used.<br>2) Students should be able to appreciate the use of various data structures as per need.<br>3) To select, decide and apply appropriate design principle by understanding the requirements of any real life problems |

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| structure, types, Introduction to Array(1-d & 2-d), Stack and List data structures, operations on these data structures, advantages disadvantages and applications of these data structures like solving linear equations, Polynomial Representation, Infix-to-Postfix conversion | | |
| UNIT 2:<br>Recursion - What is recursion, Recursion vs Iteration, recursion applications like Factorial of a number, Fibonacci series & their comparative analysis with respect to iterative version, Tower of hanoi problem<br>Basic Sorting Techniques - Bubble, Selection and Insertion Sort & their comparative analysis<br>Searching Techniques - Linear Search and its types, Binary Search and their comparative analysis<br>Selection Techniques - Selection by Sorting, Partition-based Selection Algorithm, Finding the Kth Smallest Elements in Sorted Order & their comparative analysis<br>String Algorithms - Pattern matching in strings, Brute Force Method & their comparative analysis | 1) Students able to understand concept of recursion<br>2) To Discuss various searching and sorting algorithms. | |
| UNIT 3:<br>Algorithm Design Techniques - Introduction | 1) Ability to understand and design algorithms using | |

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| to various types of classifications/design criteria and design techniques<br>Greedy Technique - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - file merging problem<br>Divide-n-Conquer - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - merge sort, Strassen's Matrix Multiplication<br>Dynamic Programming - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - Fibonacci series, Factorial of a number, Longest Common subsequence<br>Backtracking Programming - Concept, Advantages & Disadvantages, Applications, Implementation using problems like N-Queen Problem | greedy strategy, divide and conquer approach, dynamic programming.<br>2) Apply dynamic programming approach to solve suitable problems<br>3) Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide -and-conquer algorithms. | |

**Course: Advanced Python Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Working with files: Files, opening and closing a file, working with text files containing strings, knowing | Understand how to read/write to files using python.<br>Identify to catch their own errors that happen during | 1) Ability to implement OOP concepts in Python including Inheritance and |

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| whether a file exists or not, working with binary files, the 'with' statement, the seek() and tell() methods, random accessing of binary files, zipping and unzipping files, working with directories, running other programs from python program<br>Regular expressions: What is a regular expression?, sequence characters in regular expressions, quantifiers in regular expressions, special characters in regular expressions, using regular expression on files, retrieving information from an html file,<br>Threads in python: Difference between process and thread, types of threads, benefits of threads, creating threads, single tasking and multitasking, thread synchronization, deadlock in threads, daemon threads<br>Date and time in python: Date and time now, combining date and time, formatting dates and times, finding durations using "time delta", comparing two dates, sorting dates, stopping execution temporarily, knowing the time taken by a program, calendar module | execution of programs<br><br>Remember the concept of pattern matching. | Polymorphism<br>2) Ability to work with files and perform operations on it using Python.<br>3) Ability to implement regular expression and concept of threads for developing efficient program<br>4) Ability to implement exception handling in Python applications for error handling.<br>5) Knowledge of working with databases, designing GUI in Python and implement networking in Python |
| UNIT 2:<br>Database in python: Using | Understand how to read/write | |

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| SQL with python, retrieving rows from a table, inserting rows into a table, deleting rows from a table, updating rows in a table, creating database tables through python, Exception handling in databases.<br>Exceptions in python: Errors in a python program, compile & run-time errors, logical error, exceptions-exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions, logging the exceptions<br>Networking: Protocols,server-client architecture, tcp/ip and udp communication<br>Graphical user interface: Creating a GUI in python, Widget classes, Working with Fonts and Colours, working with Frames, Layout manager, Event handling | to files using python.<br><br>Identify to catch their own errors that happen during execution of programs<br><br>Remember the concept of pattern matching. | |
| UNIT 3:<br>OOPs in python: Features of Object Oriented Programming system (oops)-classes and objects, encapsulation, abstraction, inheritance, polymorphism, constructors and destructors<br>Classes and objects: Creating a class, the self-variable, types of variables, namespaces, types of methods, instance | Apply knowledge to connect to the database to move the data to/from the application.<br><br>Evaluate and create programs to connect to computers, read from URL and send email. | |

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| methods, class methods, static methods, passing members of one class to another class, inner classes<br>Inheritance and polymorphism: Inheritance in python, types of inheritance- single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, constructors in inheritance, overriding super class constructors and methods, the super() method, method resolution order (mro), polymorphism, duck typing, operator overloading, method overloading, method overriding,<br>Abstract classes and interfaces: Abstract class, abstract method, interfaces in python, abstract classes vs. Interfaces | | |

**Course: Introduction to OOPs using C++**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to Programming Concepts: Object oriented programming paradigm, basic concepts of object oriented programming, benefits of object oriented programming, object oriented languages, applications of object oriented programming. Tokens-keywords, | 1. Understand the Object-Oriented Programming (OOP) paradigm and its basic concepts.<br>2. Gain knowledge of programming tokens, keywords, identifiers, and constants in C++. | 1. Work with numeric, character and textual data and arrays.<br>2. Understand the importance of OOP approach over procedural language.<br>3. Understand how to model classes and relationships using UML. |

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| identifiers, constants-integer, real, character and string constants, backslash constants, features of C++ and its basic structure, simple C++ program without class, compiling and running C++ program. Data Types, Data Input Output and Operators: Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators. Decision Making, Loops, Arrays and Strings: Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and string and string manipulations Unified Modeling Language (UML): Introduction to UML & class diagrams. Classes, Abstraction & Encapsulation: Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function. | | 4. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism.<br>5. Handle basic file operations. |
| UNIT 2: Constructors and Destructors: Default constructor, parameterized constructor, copy constructor, private constructor, destructors. | 1. Understand the concept of constructors and destructors in object-oriented programming.<br>2. Gain proficiency in | |

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| Working with objects:Accessor - mutator methods, static data and static function, access specifiers, array of objects. Polymorphism - Binding-static binding & overloading, constructor overloading function overloading, operator overloading, overloading unary and binary operators. Modelling Relationships in Class Diagrams: Association, AggregationComposition and examples covering these principles | working with objects, including implementing accessor and mutator methods.<br>3. Explore the concept of arrays of objects in C++. | |
| UNIT 3:<br>Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes. Modelling Relationships: Generalization-Specialization and examples covering these principles Run time Polymorphism - Dynamic Binding, Function overriding, virtual function, pure virtual function, virtual base class, abstract class. Pointers: Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer, pointers to derived | 1. Understand the concept of inheritance in object-oriented programming.<br>2. Learn about runtime polymorphism, dynamic binding, function overriding, and the use of virtual functions. | |

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| classes File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling. Applying OOP to solve real life applications: To cover case studies like library management, order management etc. to design classes covering all relationships | | |

**Course: Database Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1: Introduction to DBMS – Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture Data models - Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network) Entity Relationship Model - Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER) ER to Table- Entity to Table, | 1. To understand the basic use of database.<br>2. Various models like RDBMS, Network model, etc.<br>3. To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc.<br>4. Constraints used in database management system.<br>5. To understand how to convert ER to table so that we can implement these tables in database application.<br>6. Describe fundamental elements of RDBMS.<br>7. Design E-R diagram to represent simple database applications scenarios. | 1. To appreciate the importance of database design.<br>2. Analyze database requirements and determine the entities involved in the system and their relationship to one another.<br>3. Write simple queries to MySQL related to String, Maths and Date Functions.<br>4. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands.<br>5. Understand the normalization and |

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| Relationship to tables with and without key constraints. DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables DML Statements – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause | | its role in the database design process.<br>6. Handle data permissions.<br>7. Create indexes and understands the role of Indexes in optimization search. |
| UNIT 2:<br>Relational data model– Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint Relational Algebra operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division) Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, | 1. To understand Functional dependencies, schema so that the table relationship is can be understood which will further help to create tables in database.<br>2. To illustrate DDL statements, DML statements, Joins to update, alter or delete any record from the database without changing other records of tables.<br>3. Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL.<br>4. Criticize a database and improve the design by normalization. | |

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| replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables – inner join, outer join (left outer, right outer, full outer) Subqueries – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries | | |
| UNIT 3:<br>Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control, Backing Up and Restoring databases Views (creating, altering dropping, renaming and manipulating views) DCL Statements (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges), Transaction control commands – Commit, Rollback Index Structures of Files: Introduction, Primary index, Clustering Index, Multilevel indexes | 1. To understand types of in built functions so that they can manipulate database records easily.<br>2. String functions, math functions, date function,<br>3. To understand about the DBA, permissions and security<br>4. Basic of Database protection & Distributed databases | |

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**Course: Data Structures**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators.<br>Application<br>Arrays: Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Data Type, Application<br>Sets and Maps: Sets-Set ADT, Selecting Data Structure, List based Implementation,<br>Maps-Map ADT, List Based Implementation,<br>Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarrays, Application<br>Algorithm Analysis: Complexity Analysis-Big-O Notation, Evaluating Python Code,<br>Evaluating Python List, Amortized Cost, Evaluating Set ADT, Application<br>Searching and Sorting: Searching-Linear Search, Binary Search,<br>Sorting-Bubble, Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List,<br>Maintaining sorted Lists. | 1. To understand data types, arrays, ADT, searching, and sorting concepts | 1) Learn about Data structures, its types and significance in computing<br>2) Explore about Abstract Data types and its implementation<br>3) Ability to program various applications using different data structure in Python |
| UNIT 2:<br>Linked Structures: Introduction, Singly Linked List-Traversing, Searching, | 1. To learn various types of data structures like linked list, stack, queue, | |

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| Prepending and Removing Nodes, Bag ADT-Linked List Implementation. Comparing Implementations, Linked List Iterators, More Ways to Build Kinked Lists, Applications-Polynomials Stacks: Stack ADT, Implementing Stacks-Using Python List, Using Linked List, Stack Applications-Balanced Delimiters, Evaluating Postfix Expressions Queues: Queue ADT, Implementing Queue-Using Python List, Circular Array, Using List, Priority Queues-Priority Queue ADT, Bounded and unbounded Priority Queues Advanced Linked List: Doubly Linked Lists-Organization and Operation, Circular Linked List-Organization and Operation, Multi Lists | list, etc.<br>2. Also make student understand where these data structures can be implemented. | |
| UNIT 3:<br>Recursion: Recursive Functions, Properties of Recursion, Its working, Recursive Applications<br>Hash Table: Introduction, Hashing-Linear Probing, Clustering, Rehashing, Separate Chaining, Hash Functions<br>Advanced Sorting: Merge Sort, Quick Sort, Radix Sort, Sorting Linked List<br>Binary Trees: Tree Structure, Binary | 1. To discuss various technique to index data in data structure.<br>2. Illustrate tree data structure, hash function, searching trees, heap sort, traversal and recursive function. | |

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| Tree-Properties, Implementation and Traversals, Expression Trees, Heaps and Heapsort,Search Trees | | |

**Course: Calculus**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: DERIVATIVES AND ITS APPLICATIONS: Review of Functions, limit of a function, continuity of a function, derivative function. Derivative In Graphing And Applications: Analysis of Functions: Increase, Decrease, Concavity, Relative Extrema; Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents, Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method. | 1) Understand the concept of limit, continuity, derivatives.<br>2) Problem solving on derivative in graphing and applications | 1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions.<br>2) Ability to appreciate real world applications which use these concepts.<br>3) Skill to formulate a problem through Mathematical modeling and simulation. |
| UNIT 2: INTEGRATION AND ITS APPLICATIONS: Integration: An Overview of the Area Problem, Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Numerical Integration: | 1) Understand the concept of integration<br>2) Problem solving with different types of integration methods.<br>3) Problem solving on modeling with differential equation | |

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| Simpson's Rule. Applications of Integration: Area between two curves, Length of a plane curve. Mathematical Modeling with Differential Equations: Modeling with Differential Equations,Separation of Variables, Slope Fields, Euler's Method, First-Order Differential Equations and Applications. | | |
| UNIT 3: PARTIAL DERIVATIVES AND ITS APPLICATIONS: Functions of Several Variables: Functions of two or more variables, Limits and Continuity of functions of two or three variables. Partial Derivatives: Partial Derivatives, Differentiability, Differentials, and Local Linearity, Chain Rule, Implicit Differentiation, Directional Derivatives and Gradients, Applications ofPartial Derivatives: Tangent Planes and Normal Vectors, Maxima and Minima of Functions of Two Variables. | 1) Understand the concept partial derivatives<br>2) Implement partial derivatives on different applications | |

**Course: Statistical Methods**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1: Probability: Random experiment, sample space, | To learn the concept of Probability and Bayes theorem and its definition | Calculate probability, conditional probability and independence. |

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| events types and operations of events, Probability definition: classical, axiomatic, Elementary Theorems of probability (without proof). Conditional probability, 'Bayes' theorem, independence, Examples on Probability. Random Variables: Concept and definition of a discrete random variable and continuous random variable. Probability mass function, Probability density function and cumulative distribution function of discrete and continuous random variable. Properties of cumulative distribution function. | To learn about discrete and Continuous data with its related functions like pdf and pmf. | Students should be able to learn about distribution and its application on the basis of example.<br><br>To Analyze and proof the hypothetical statements using test statistics.<br><br>Learn to read tabulated values of different functions.<br><br>Analysis or compare 2 and more samples together and conclude the outcome.<br><br>Learn to calculate and analyze the Non parametric distribution and CHi square association. |
| UNIT 2:<br>Mathematical Expectation and Variance: Expectation of a function, Variance and S.D of a random variable, properties.<br>Standard Probability distributions: Introduction, properties, examples and applications of each of the following distributions: Binomial distribution, Normal distribution, Chi-square distribution, t distribution, F distribution | Learn about the Expectation and Variance of Random Variable<br><br>To understand and use the distribution like Binomial for discrete data, Normal for continuous, F for comparison of variance. | |
| UNIT 3:<br>Hypothesis testing: One sided, Two sided hypothesis, critical region, | Definition of Hypothesis and steps to conclude the hypothesis | |

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| p-value, tests based on t, Normal and F, confidence intervals.<br>Analysis of Variance:<br>One-way, two-way analysis of variance.<br>Non-parametric tests:<br>Need of non-parametric tests, Sign test, Wilicoxon's signed rank test, run test, Kruskal-Walis tests, Chi square test. | Learn Methods of ANOVA and analyze more than 2 data simultaneously.<br><br>Learn method of Non parametric tests like sign test, wilcoxon test, kruskal wallis test and Post hoc analysis | |

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Course: E-Commerce & Digital Marketing

| UNIT NO. & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>**Introduction to E-Commerce and E-Business:** Definition and competing in the digital economy, Impact of E-Commerce on Business Models, FactorsDriving e-commerce and e-Business Models, Economics and social impact of e-Business, opportunities and Challenges, e-Commerce vs mCommerce, Different e-Commerce Models (B2B, B2C, C2B, C2C, B2E), e-Commerce Applications: e-Trading, e-Learning, e-Shopping, Virtual Reality & Consumer Experience, Legal and Ethical Issues in e-Commerce. **Overview of Electronic Payment systems:** Types of Electronic payment schemes (Credit cards, Debit cards, Smartcards, Internet banking), Echecks, E-Cash Concepts and applications of EDI and Limitation **Introduction & origin of Digital Marketing:** Traditional v/s Digital Marketing, Digital Marketing Strategy, The P-O-E-M Framework, Segmenting & Customizing Messages, The Digital landscape, Digital Advertising Market in India, Skills required in Digital Marketing, Digital Marketing Plan. | 1. Understand the concepts of E-commerce and E-business and their impact on business models.<br>2. Analyse the legal and ethical issues associated with E-commerce.<br>3. Understand the different types of electronic payment systems, such as credit cards, debit cards, smart cards, and internet banking.<br>4. Understand the origin and evolution of digital marketing. | 1) Understand the core concepts of E-Commerce.<br>2) Understand the various online payment techniques<br>3) Understand the core concepts of digital marketing and the role of digital marketing in business.<br>4) Apply digital marketing strategies to increase sales and growth of business<br>5) Apply digital marketing through different channels and platforms<br>6) Understand the significance of Web Analytics and Google Analytics and apply the same. |
| UNIT 2:<br>**Social Media Marketing:** Meaning, Purpose, types of social media websites, Social Media Engagement, Target audience, Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools, LinkedIn Marketing: Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting, Twitter Marketing: Framing content strategy, Twitter Advertising Campaigns, YouTube Marketing: Video optimization, Promoting on YouTube, Monetization, YouTube Analytics | 1. Understand the meaning, purpose, and types of social media websites.<br>2. Use email marketing tools and automation to improve email deliverability and engagement.<br>3. Understand the importance of mobile marketing and the different types of mobile marketing campaigns and features.<br>4. Analyze content marketing statistics and identify different | |

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| **Email Marketing:** Types of Emails, Mailing List, Email Marketing tools, Email Deliverability & Email Marketing automation<br>**Mobile Marketing:** Introduction, Mobile Usage, Mobile Advertising, Mobile Marketing Types, Mobile Marketing Features, Mobile Campaign Development, Mobile Advertising Analytics<br>**Content Marketing:** Introduction, Content marketing statistics, Types of Content, Types of Blog posts, Content Creation, Content optimization, Content Management & Distribution, Content Marketing Strategy, Content creation tools and apps, Challenges of Content Marketing. | types of content and blog posts. | |
| UNIT 3:<br>**Search Engine Optimization:** Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimize website, On-page and off-page optimization<br>**Search Engine Marketing:** Introduction to SEM, Introduction to Ad Words - Google Ad Words, Ad Words fundamentals, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation, Display marketing, Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA).<br>**Web Analytics:** Purpose, History, Goals & objectives, Web Analytic tools & Methods. Web Analytics Mistakes and Pitfalls. Google Analytics: Basics of Google Analytics, Installing Google Analytics in website, Parameters of Google Analytics, Reporting and Analysis | 1. Understand the meaning and common techniques of search engine optimization (SEO).<br>2. Learn about Google AdWords and its fundamentals, including ad placement, ad ranks, and creating ad campaigns.<br>3. Understand the purpose and history of web analytics, as well as its goals and objectives.<br>4. Understand the basics of Google Analytics, including how to install it on a website and analyze its parameters. | |

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## S.Y.B.Sc. COMPUTER SCIENCE SEM 3

**Course: Theory of Computation**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Automata Theory: Defining Automaton, Finite Automaton, Transitios and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines, Minimizing Automata.<br>Formal Languges: Defining Grammar, Derivations, Languges generated by Grammar, Comsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata | 1) To understand Automata Theory<br>2) Identifying DFA and NDFA.<br>3) Defining Grammer and Languages<br>4) Distinguish different computing languages and classify their respective types | 1. Understand Grammar and Languages<br>2. Learn about Automata theory and its application in Language Design<br>3. Learn about Turing Machines and Pushdown Automata<br>4. Understand Linear Bound Automata and its applications |
| UNIT 2:<br><br>Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar<br>Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG Pushdown | 1) analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.<br>2) To Apply transformation between multiple representations of finite automata.<br>3) Problem solving based on Regular Sets and Regular Grammar | |

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| Automata: Definitions, Acceptance by PDA, PDA and CFG | | |
| UNIT 3:<br><br>Linear Bound Automata: The Linear Bound Automata Model, Linear Bound Automata and Languages.<br>Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine,<br>Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems | 1) To state and explain the Church-Turing thesis and its significance.<br>2) Problem solving based on Linear Bound Automata | |

**Course: Core JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>The Java Language: Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays<br>OOPS: Introduction, Class, Object, Static Keywords, | 1) Understand the concept of OOPs as well as the purpose and usage principles of Inheritance, polymorphism, encapsulation etc.<br>2) Understand the | 1. Object oriented programming concepts using Java.<br>2. Knowledge of input, its processing and getting suitable output.<br>3. Understand, design, implement and evaluate classes and applets. |

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| Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces<br>String Manipulations: String, String Buffer, String Tokenizer<br>Packages: Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java.swing), User Defined Packages, Access specifiers | basic concepts of classes and objects.<br>3) Understand JVM Concept , Data types and Operators, Strings.<br>4) To implement String methods<br>5) 2. 3. 4. Understand Internet Programming Using Java Applets & Graphic Programming & Make use of array, constructors, Inheritance, Packages and Interfaces. 5. | 4. Knowledge and implementation of AWT package. |
| UNIT 2:<br>Exception Handling: Introduction, Pre-Defined Exceptions,<br>Try-Catch-Finally, Throws, throw, User Defined Exception examples<br>Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods<br>I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams, File, Random access File, Serialization<br>Networking: Introduction, Socket, Server socket, Client –Server Communication | 1) To recognise the exceptions<br>2) Understand the concept of Exceptional Handling<br>3) To model multithreading<br>4) To generate Client server code in Java | |
| UNIT 3: | 1) To determine the | |

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| Wrapper Classes: Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes<br>Collection Framework: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes<br><br>Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class<br>AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area | Wrapper classes<br>2) To use the inbuilt util package.<br>3) To implement interface<br>4) To illustrate the use of AWT packages<br>5) To relate event driven programming.<br>6) Understand the concept of Exceptional Handling/Event Handling & Java I/O Handling. | |

**Course: Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br><br>Introduction and Operating-Systems Structures: Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments Operating-System | 1) To understand the services provided by and the design of an operating system.<br>2) To make aware of different types of Operating System and their services. | 1. To provide a understanding of operating system, its structures and functioning<br><br>2. Develop and master understanding of algorithms used by operating systems for various purposes. |

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| Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure<br>Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication<br><br>Threads: Overview, Multicore Programming, Multithreading Models | | |
| UNIT 2:<br>Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors<br>CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling<br>Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from | 1) Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.<br>2) Analyze important algorithms eg. Process scheduling and memory management algorithms<br>3) Students should understand the data structures and algorithms used to implement an OS.<br>4) To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. | |

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| Deadlock | 5) Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems. | |
| UNIT 3:<br><br>Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table<br>Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing<br>Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management<br>File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing<br>File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management | 1) To understand the structure and organization of the file system.<br>2) To understand different approaches to memory management.<br>3) Describe the role of paging, segmentation and virtual memory in operating systems.<br>4) Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms. | |

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**Course: Database Management Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Stored Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures.<br>Triggers: Concept of triggers, Implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers.<br>Sequences: creating sequences, referencing, altering and dropping a sequence.<br>File Organization and Indexing: Cluster, Primary and secondary indexing, Index data structure: hash and Tree based indexing, Comparison of file organization: cost model, Heap files, sorted files, clustered files. Creating, dropping and maintaining indexes. | 1) To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage.<br>2) To understand concept of trigger, data integrity, sequence and file organization to further implement on projects. | 1. Master concepts of stored procedure and triggers and its use.<br>2. Learn about using PL/SQL for data management<br>3. Understand concepts and implementations of transaction management and crash recovery |
| UNIT 2:<br>Fundamentals of PL/SQL: Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE | 1) To understand basics of PL/SQL.<br>2) Different operators in PL/SQL.<br>3) To learn different data types in PL/SQL.<br>4) To illustrate case | |

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| Expressions Handling, Null Values in Comparisons and Conditional Statements, PL/SQL Datatypes: Number Types, Character Types, Boolean Type, Datetime and Interval Types, Overview of PL/SQL Control Structures: Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IFTHEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements | statements and conditional statements. | |
| UNIT 3:<br>Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.<br>DCL Statements: Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK<br>Crash Recovery: ARIES algorithm. The log based recovery, recovery related | 1) Understanding concept of tracsaction management and crash recovery. | |

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| structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash, Redo and Undo phases. | | |

**Course: Combinatorics and Graph Theory**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Describing Combinatorics and graph theory.<br>Understanding Strings, BInomial Coefficients and Multinomial Coefficients.<br>Solving Examples based on combinatorics using Induction method. | To provide knowledge about Enumeration method, sudoku puzzle.<br><br>TO provide learning about Strings and sets.<br><br>Solving Combinatorics using a recursive method.<br><br>Learning the method of induction to get the combinatorial results. | Students should be able to develop different methods of solving the example.<br><br>Enhance the ability to think differently and solve the example with all possible outcomes.<br><br>Use Graph theory to identify best path from source to sink.<br><br>Student should able to identify path and cycles using different combinatorial methods.<br><br>Identify Network path in the given graph using Tree method, Ford Fulkerson method and augmenting methods. |
| UNIT 2:<br>Learning about Graph theory, Basic Notations.<br><br>Eulerian and Hamiltonian Graph, Types of graph.<br><br>Understanding labeling of trees, Applying probability to combinatorics.<br><br>Learn about Ramsey Numbers | Understand the graph and basic notations like vertices,edges.<br><br>To identify all possible paths and cycles in the given graph using Eulerian and Hamiltonian methods.<br><br>Applying Ramsey Number theory to Combinatorics | |
| UNIT 3:<br><br>Learning about NEtwork flows in Combinatorics. | Learn about basic Notations like path and node. | |

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| Solving example based on Bipartite and Chain Partitioning.<br><br>Understand Polya's Enumeration. | Learn Labeling algorithm using Ford Fulkerson method.<br><br>Augmenting the given path to identify the best possible route.<br><br>Coloring of Vertices using polya's enumeration. | |

**Course: Physical Computing and IoT Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>SoC and Raspberry Pi<br>System on Chip: What is System on chip? Structure of System on Chip.<br>SoC products: FPGA, GPU, APU, Compute Units.<br>ARM 8 Architecture: SoC on ARM 8, ARM 8 Architecture Introduction<br>Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi.<br>Raspberry Pi Boot: Learn how this small SoC boots without BIOS.<br>Configuring boot sequences and hardware. | 1) To learn about SoC architectures; Learn how Raspberry Pi.<br>2) Learn to program Raspberry Pi.<br>3) Understanding basic architecture of SoC. | 1. Enable learners to understand System On Chip Architectures.<br>2. Introduction and preparing Raspberry Pi with hardware and installation.<br>3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's<br>4. Learn how to make consumer grade IoT safe and secure with proper use of protocols. |
| UNIT 2:<br>Programming Raspberry Pi<br>Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux | 1) To learn linux commands which is used to operate Raspberry pi.<br>2) Understand nodejs<br>3) Raspberry Pi basic | |

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| Commands<br>Programing interfaces:<br>Introduction to Node.js, Python.<br>Raspberry Pi Interfaces:<br>UART, GPIO, I2C, SPI<br>Useful Implementations:<br>Cross Compilation, Pulse Width Modulation, SPI for Camera. | interfaces like UART, GPIO, I2C, SPI, etc.<br>4) To illustrate raspberry pi with camera module. | |
| UNIT 3:<br>Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program.<br>IoT and Protocols<br>IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP.<br>IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED.<br>IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability. | 1) Implementation of internet of Things and Protocols.<br>2) Understanding IoT security protocols like HTTP. UPnp, CoAP, MQTT, and XMPP.<br>3) Students understand Node RED to implement IoT devices with an application. | |

**Course: Skill Enhancement: Web Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - | 1) Understand basic concept of HTML<br>2) Understand types of CSS how to apply on website | 1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies.<br>2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites<br>3. To develop and implement client-side and server-side scripting language programs. |

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| Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page<br>CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an<br>HTML Document, CSS properties to work with background of a Page, CSS<br>properties to work with Fonts and Text Styles, CSS properties for positioning an<br>element | | 4. To develop and implement Database Driven Websites.<br>5. Design and apply XML to create a markup language for data and document centric applications. |
| UNIT 2:<br>JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements,<br>Popup Boxes, Functions – Defining and Invoking a Function, Defining Function<br>arguments, Defining a Return Statement, Calling Functions with Timer, JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model,<br>Form Validation using JavaScript<br>XML: Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML | 1) Student learn popup boxes used in JavaScript<br>2) Understand JavaScript objects<br>3) Learn Form validation using JavaScript<br>4) Understand comparison XML and HTML<br>5) Student learn about XSLT | |

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| Document, XML Entity References, DTD, XSLT: XSLT Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set, xsl:value-of | | |
| UNIT 3: AJAX: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX PHP: Variables and Operators, Program Flow, Arrays, Working with Files and Directories, Working with Databases, Working with Cookies, Sessions and Headers Introduction to jQuery: Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects | 1) Understand concept AJAX, PHP and jQuery<br>2) Develop website using database concept with PHP | |

**S.Y.B.Sc. COMPUTER SCIENCE SEM 4**

**Course: Fundamentals of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Introduction to algorithm, Why to analysis algorithm, | 1) To Define the basic concepts of algorithms and | 1. To understand basic principles of algorithm design and why algorithm |

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| Running time analysis, How to Compare Algorithms, Rate of Growth, Commonly Used Rates of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega-Ω Notation, Theta-Θ Notation, Asymptotic Analysis, Properties of Notations, Commonly used Logarithms and Summations, Performance characteristics of algorithms, Master Theorem for Divide and Conquer, Divide and Conquer Master Theorem: Problems & Solutions, Master Theorem for Subtract and Conquer Recurrences, Method of Guessing and Confirming | analyze the performance of algorithms.<br>2) To Discuss various algorithm design techniques for developing algorithms. | analysis is important<br>2. To understand how to implement algorithms in Python<br>3. To understand how to transform new problems into algorithmic problems with efficient solutions<br>4. To understand algorithm design techniques for solving different problems<br>5. Understand the concepts of algorithms for designing good program<br>6. Implement algorithms using Python |
| UNIT 2:<br><br>Tree algorithms: What is a Tree? Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals, Expression Trees, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL (Adelson-Velskii and Landis) Trees<br>Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, | 1) To Discuss various searching, sorting and graph traversal algorithms.<br>2) Analyze the asymptotic performance of algorithms.<br>3) Explain the major graph algorithms and their analyses<br>4) To implement Graph Traversal Techniques | |

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| Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree<br><br>Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order | | |
| UNIT 3:<br><br>Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method<br>Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique<br>Divide and Conquer Algorithms: Introduction, What is Divide and Conquer Strategy? Divide and Conquer Visualization, Understanding Divide and Conquer, Advantages of Divide and Conquer, Disadvantages of Divide and Conquer, Master Theorem, Divide and | 1) Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming,<br>2) Demonstrate a familiarity with major algorithms and data structures.<br>3) Apply dynamic programming approach to solve suitable problems<br>4) Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divideand-conquer algorithms. | |

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| Conquer Applications Dynamic Programming: Introduction, What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy, Problems which can be solved using Dynamic Programming, Dynamic Programming Approaches, Examples of Dynamic Programming Algorithms, Understanding Dynamic Programming, Longest Common Subsequence | | |

**Course: Advanced JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Swing: Need for swing components, Difference between AWT and swing, Components hierarchy, Panes, Swing components: Jlabel, JTextField and JPasswordField, JTextAres, JButton, JCheckBox, JRadioButton, JComboBox and JList<br>JDBC: Introduction, JDBC Architecture, Types of Drivers, Statement, ResultSet, Read Only ResultSet, Updatable ResultSet, Forward Only ResultSet, Scrollable ResultSet, PreparedStatement, | 1) To learn the creation of pure Dynamic Web Application using JDBC.<br>2) To implement programs using Swing objects | 1) Understand the concepts related to Java Technology<br><br>2) Explore and understand use of Java Server Programming |

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| Connection Modes, SavePoint, Batch Updations, CallableStatement, BLOB & CLOB | | |
| UNIT 2:<br>Servlets: Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, Servlet Communication, Session Tracking Mechanisms<br>JSP: Introduction, JSP LifeCycle, JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard actions and customized actions, | 1) To learn Server-Side Programming using Servlets and Java Server Pages.<br>2) To implements Servlets | |
| UNIT 3:<br>Java Beans: Introduction, JavaBeans Properties, Examples<br>Struts 2: Basic MVC Architecture, Struts 2 framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL<br>JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java | 1) To acquire knowledge on creation of software componerits using JAVA Beans.<br>2) Understand the concept of MVC<br>3) Craing applications using JSON | |

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**Course: Computer Networks**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction Network Models:<br>Introduction to data communication, Components, Data Representation, Data Flow, Networks, Network Criteria, Physical Structures, Network types, Local Area Network, Wide Area Network, Switching, The Internet, Accessing the Internet, standards and administration Internet Standards.<br>Network Models, Protocol layering, Scenarios, Principles of Protocol Layering, Logical Connections, TCP/IP Protocol Suite, Layered Architecture, Layers in the TCP/IP Protocol Suite, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing. Detailed introduction to Physical Layer, Detailed introduction to Data-Link Layer, Detailed introduction to Network Layer, Detailed introduction to Transport Layer, Detailed introduction to Application Layer.<br>Data and Signals, Analog and Digital Data, Analog and Digital Signals, Sine Wave Phase, Wavelength, Time and Frequency Domains, Composite | Understanding about Netowrk Modesl and OSI Model.<br><br>To provide knowledge about different terminology used in computer networks.<br><br>Rules in Networking and TCP/IP Protocol suite.<br><br>Encapsulation and Decapsulation methods.<br><br>Multiplexing and demultiplexing methods.<br><br>Learn about Computer signals. | 1. Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'.<br>2. Useful to proceed with industrial requirements and International vendor certifications. |

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| Signals, Bandwidth, Digital Signal, Bit Rate, Bit Length, Transmission of Digital Signals, Transmission Impairments, Attenuation, Distortion, Noise, Data Rate Limits, Performance, Bandwidth, Throughput, Latency (Delay) | | |
| UNIT 2:<br>Introduction to Physical Layer and Data-Link Layer: Digital Transmission digital-to-digital conversion, Line Coding, Line Coding Schemes, analog-to-digital conversion, Pulse Code Modulation (PCM), Transmission Modes, Parallel Transmission, Serial Transmission. Analog Transmission, digital-to-analog Conversion, Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, analog-to-analog Conversion, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), Multiplexing, Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing. Transmission Media, Guided Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. Switching, Three | Learning about different Modulation techniques PCM.<br><br>Conversion of Signal as per the transmission medium.<br><br>Learn about types of cables and transmission medium.<br><br>Types of Shift key, Amplitude and Phase.<br><br>Learning about Switching methods. | |

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|---|---|---|
| Methods of Switching , Circuit Switched Networks, Packet Switching, Introduction to Data-Link Layer, Nodes and Links, Services, Two Sub-layers, Three Types of addresses, Address Resolution Protocol (ARP). Error Detection and Correction, introduction, Types of Errors, Redundancy, Detection versus Correction, | | |
| UNIT 3:<br>Network layer, Transport Layer<br>Media Access Control (MAC), random access, CSMA, CSMA/CD, CSMA/CA, controlled access, Reservation, Polling, Token Passing, channelization, FDMA, TDMA, CDMA.<br>Connecting Devices and Virtual LANs, connecting devices, Hubs, Link-Layer Switches, Routers, Introduction to Network Layer, network layer services, Packetizing, Routing and Forwarding, Other Services, IPv4 addresses, Address Space, Classful Addressing.<br>Unicast Routing, General Idea, Least-Cost Routing, Routing Algorithms, Distance-Vector Routing, Link-State Routing, Path-Vector Routing, Introduction to Transport Layer, Transport-Layer | Learning about Network layer working and major functions.<br><br>Error detection and Channelization.<br><br>IP addressing learning of IPV4 and IPV6.<br><br>Learn about Network device Like Router and Switches.<br><br>Difference between TCP and UDP | |

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| Services, Connectionless and Connection-Oriented Protocols. Transport-Layer Protocols, Service, Port Numbers, User Datagram Protocol, User Datagram, UDP Services, UDP Applications, Transmission Control Protocol, TCP Services, TCP Features, Segment. | | |

**Course: Software Engineering**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Introduction: The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Component-Based Development, The Unified Process Phases, Agile Development- Agility, Agile Process, Extreme Programming Requirement Analysis and System Modeling: Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS , Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, | 1) Understand the fundamental concepts of Software Engineering Lifecycle models.<br>2) Summarize the software requirement specifications and the SRS documents.<br>3) Understanding of different software architectural styles. | 1. Understand the process to be followed in SDLC.<br>2. Define formulate and analyze a problem.<br>3. Apply design and testing principles to software project development & Design Methodologies.<br>4. Apply the project management and analysis principles to software project development.<br>5. Knowledge about software development life cycle and problem articulation |

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| Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram | | |
| UNIT 2:<br>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design<br>Software Measurement and Metrics: Product Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation-Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for Software Quality<br>Software Project Management: Estimation in Project Planning Process –Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The | 1) Describe software engineering layered technology and Process frame work.<br>2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the Requirements.<br>3) Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance | |

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| Make/Buy Decision, Project Scheduling - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts | | |
| UNIT 3:<br>Risk Management - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan Software Quality Assurance: Elements of SQA, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Six Sigma, Software Reliability, The ISO 9000 Quality Standards, Capability Maturity Model Software Testing : Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design | 1) Demonstrate the software project management skills through case studies.<br>2) Understanding of software testing approaches.<br>3) Describe software measurement and software risks<br>4) Understanding on quality control and how to ensure good quality software. | |

**Course: Linear Algebra using Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Field: Introduction to complex numbers, numbers in Python , Abstracting over fields, Playing with GF(2), Vector Space: Vectors are | 1) To offer the learner the relevant linear algebra concepts through computer science applications.<br>2) Understanding | 1. Appreciate the relevance of linear algebra in the field of computer science.<br>2. Understand the concepts through program implementation |

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| functions. Vector addition. Scalar-vector multiplication. Combining vector addition and scalar multiplication. Dictionary-based representations of vectors. Dot-product. Solving a triangular system of linear equations. Linear combination. Span. The geometry of sets of vectors. Vector spaces. Linear systems homogeneous and otherwise | concepts of vector complex number span and also how to implement them practically in python | 3. Instill a computational thinking while learning linear algebra |
| UNIT 2<br>Matrix: Matrices as vectors. Transpose, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product. Linear functions, Matrix-matrix multiplication, Inner product and outer product<br>From function inverse to matrix inverse<br>Basis: Coordinate systems, Two greedy algorithms for finding a set of generators, Minimum Spanning Forest and GF(2), Linear dependence, Basis , Unique representation, Change of basis, first look, Computational problems involving finding a basis<br>Dimension: Dimension and rank, Direct sum, | 1) Understand concepts of matrix, basis, and dimension to implement in computer applications. | |

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| Dimension and linear functions, The annihilator | | |
| UNIT 3:<br>Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination, Finding a basis for the null space, Factoring integers, Inner Product: The inner product for vectors over the reals, Orthogonality, Orthogonalization: Projection orthogonal to multiple vectors, Projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, Orthogonal complement, Eigenvector: Modeling discrete dynamic processes, Diagonalization of the Fibonacci matrix, Eigenvalues and eigenvectors, Coordinate representation in terms of eigenvectors, The Internet worm, Existence of eigenvalues, Markov chains, Modeling a web surfer: PageRank. | Understand concepts of Guass Elimination, orthogonalization, eigen vector. | |

**Course: .NET Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>The .NET Framework: .NET Languages, Common Language Runtime, .NET Class Library | 1) Understand the .NET framework<br>2) Acquire knowledge of C# language<br>3) Implement | 1. Understand the .NET framework<br>2. Develop a proficiency in the C# programming language |

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| C# Language Basics: Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial Classes<br>ASP.NET: Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders, HTML Server Controls - View State, HTML Control Classes, HTML Control Events, HtmlControl Base Class, HtmlContainerControl Class, HtmlInputControl Class, Page Class, global.asax File, web.config File | programs on C# programming language<br>4) Understand concept and HTML Server Controls of ASP.NET | 3. Proficiently develop ASP.NET web applications using C#<br>4. Use ADO.NET for data persistence in a web application |
| UNIT 2:<br>Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events and AutoPostBack, Page Life Cycle<br>State Management: ViewState, Cross-Page | 1) Understand Web Controls in ASP.NET<br>2) Acquire knowledge on working of validators, master pages<br>3) Implement programs on website navigation | |

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| Posting, Query String, Cookies,<br>Session State, Configuring Session State, Application State<br>Validation: Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions<br>Rich Controls: Calendar Control, AdRotator Control, MultiView Control<br>Themes and Master Pages: How Themes Work, Applying a Simple Theme,Handling Theme Conflicts, Simple Master Page and Content Page, Connecting<br>Master pages and Content Pages, Master Page with Multiple Content Regions, Master Pages and Relative Paths<br>Website Navigation: Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control | | |
| UNIT 3:<br>ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access<br>Data Binding: Introduction, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls – SqlDataSource | 1) Understand concept of ADO.NET<br>2) Understand working with XML<br>3) Acquire knowledge of LINQ basics<br>4) Understand how AJAX used in ASP.NET<br>5) Develop web application in ASP.NET using C# | |

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| Data Controls: GridView, DetailsView, FormView<br>Working with XML: XML Classes – XMLTextWriter, XMLTextReader<br>Caching: When to Use Caching, Output Caching, Data Caching<br>LINQ: Understanding LINQ, LINQ Basics,<br>ASP.NET AJAX: ScriptManager, Partial Refreshes, Progress Notification,<br>Timed Refreshes | programming language. | |

Course:Skill Enhancement: Android Developer Fundamentals

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br><br>What is Android? Obtaining the required tools, creating first android app, understanding the components of screen, adapting display orientation, action bar, Activities and Intents, Activity Lifecycle and Saving State, Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View | 1) Demonstrate their understanding of the fundamentals of Android operating systems<br>2) To implement Basic Views | 1) Understand the requirements of Mobile programming environment<br>2) Learn about basic methods, tools and techniques for developing Apps<br>3) Explore and practice App development on Android Platform<br>4) Develop working prototypes of working systems for various uses in daily lives. |
| UNIT 2:<br>User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently | 1) To program various input controls<br>2) To design simple Andriod App | |
| UNIT 3:<br>Data - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite | 1) To understand the daata connectivity in Andriod<br>2) To understand the implementation of | |

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T.Y.B.Sc. COMPUTER SCIENCE SEM 5

**Course: Artificial Intelligence**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>What Is AI: Foundations, History and State of the Art of AI.<br>Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents.<br>Problem Solving by searching:<br>Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. | 1) Identify problems where artificial intelligence techniques are applicable<br>2) compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems<br>3) Toclassify the different types of agents | 1) After completion of this course, learner should get a clear understanding of AI<br>2) Different search algorithms used for solving problems.<br>3) The learner should also get acquainted with different learning algorithms and models used in machine learning. |
| UNIT 2:<br><br>Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning | 1) To formulate and choose best hypothesis<br>2) To understand and the architecture of Artificial Neural Networks<br>3) To understand the working of SVM<br>4) To Justify the use of ensemble learning | |

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| UNIT 3<br><br>Learning probabilistic models. Statistical Learning. Learning with Complete Data. Learning with Hidden Variables. The EM Algorithm. Reinforcement learning. Passive Reinforcement Learning. Active Reinforcement Learning. Generalization in Reinforcement Learning. Policy Search. Applications of Reinforcement Learning. | 1) Demonstrate proficiency in applying scientific method to models of probabilistic learning.<br>2) To describe Reinforcement Learning and its type. | |

**Course: Linux Server Administration**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction:<br>Technical Summary of Linux Distributions, Managing Software<br>Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems,<br>Core System Services, Process of configuring, compiling, Linux Kernel<br>Networking and Security: TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security | 1) Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. | 1) Learner will be able to develop Linux based systems and maintain.<br>2) Learner will be able to install appropriate service on Linux server as per requirement.<br>3) Learner will have proficiency in Linux server administration. |

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| UNIT 2:<br>Internet Services<br>Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server,<br>Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail<br>Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication,<br>OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security | 1) Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.<br>2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS. | |
| UNIT 3:<br>Intranet Services:<br>Network File System (NFS), Samba, Distributed File Systems (DFS), Network<br>Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications<br>File Servers, Email Services, Chat Applications, Virtual Private Networking. | 1) Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.<br>2) To illustrate various intranet services in Linux and there configuration steps. | |

**Course: Architecting of IoT**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to IOT, Design Principle and Standards. | To provide the learning about IOT domain and its architectural view. | Students should have a complete understanding of IOT Networks and its |

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| IOT reference model and architecture, ITs deployment and operational view.<br><br>Learning about device domain | To Learn about Reference Model and Architectural view<br><br>Learning about Function of device domain and gateway domain. | deployment.<br><br>Learn the different layer protocol to apply in applications for better security.<br><br>Learn the need of IPv4 and IPv6 along with all layer protocols. |
| UNIT 2:<br>Protocols involved in Data link and Network layer<br><br>PHY/MAC - 3GPP, Wireless HART, BLE.<br><br>IPV4 and IPV6 requirements, 6LowPAN, CORPL and other protocols | Learning f Data link layer like 3GPP and Wireless HART.<br><br>Understanding the difference between protocols.<br><br>Requirement of IPv4 and IPv6 and its differences<br><br>Learn the working about network layer protocol. | |
| UNIT 3:<br><br>Transport layer Protocol TCP, MPTCP etc.<br><br>Session LAyer Protocol - HTTP, CoAP etc.<br><br>Service Layer Protocol oneM2M, ETSI, M2M etc. | Learn the functions of transport layer protocol like connection oriented, multipath TCP etc.<br><br>Understand the session layer protocol HTTP and CoAP to exchange the packets.<br><br>Machine to Machine Services. | |

**Course: Web Services**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Web services basics : What Are Web Services? | 1) To implement a basic RESTful or SOAP web service using the | Emphasis on SOAP based web services and associated standards such |

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| Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform | JAX-WS framework in Java.<br>2) By learning about XML and SOAP, students will be able to implement data exchange between different systems in a standardized way, which can improve interoperability and simplify integration.<br>3) Understanding the Web Services Development Life Cycle (WSDLC) can help illustrate the process of developing, testing, and deploying web services in a structured and methodical way. | as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services |
| UNIT 2:<br>The REST Architectural style :<br>Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services | 1) Understanding REST architecture.<br>2) Create Web services Application using REST APIs<br>3) Apply JASON and REST programming fundamentals | |

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| UNIT 3:<br>Developing Service-Oriented Applications with WCF : What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming, WCF Feature Details, Web Service QoS | 1) Understanding Windows Communication foundation.<br>2) Analyze Windows Communication Foundation Architecture<br>3) Create .NET framework based WCF. | |

**Course: Game Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Mathematics for Computer Graphics, DirectX Kickstart:<br>Cartesian Coordinate system: The Cartesian XY-plane, Function Graphs,<br>Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras<br>in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule<br>Vectors: Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, | 1) Understand basic concept of mathematics used in computer graphics<br>2) Acquire knowledge on different types of transformations<br>3) Understand difference of CPU and GPU | Learner should study Graphics and gaming concepts with present working style of developers where<br>everything remains on internet and they need to review it, understand it, be a part of community and learn. |

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| Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas<br>Transformations: 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation<br>DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU? | | |
| UNIT 2:<br>DirectX Pipeline and Programming:<br>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels<br>Direct3D 11 Rendering | 1) Understand DirectX Pipeline<br>2) Understand trigonometry formulas and types of curves<br>3) Acquire knowledge of types of interpolation<br>4) Understand analytical geometry concept | |

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| Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM)<br>Understanding Meshes or Objects, Texturing, Lighting, Blending, Interpolation and Character Animation.<br>Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships<br>Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions<br>Curves: Circle, Bezier, B-Splines<br>Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line. | | |
| UNIT 3:<br>Introduction to Rendering Engines: Understanding the current market Rendering Engines. | 1) Understand rendering engines concept<br>2) Understand difference between | |

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| Understanding AR, VR and MR Depth Mappers. Mobile Phones, Smart Glasses, HMD's Unity Engine Multi-platform publishing, VR + AR Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline. Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing. Scripting: Scripting Overview, Scripting Tools and Event Overview XR: VR, AR, MR, Conceptual Differences, SDK, Devices | AR, VR and MR<br>3) Understand working in Unity<br>4) Develop games using Unity concepts | |

**T.Y.B.Sc. COMPUTER SCIENCE SEM 6**

**Course: Wireless Sensor Networks and Mobile Communication**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.<br>Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, | Learn the Introduction to WSN and its need in todays world.<br><br>Understand Deployment architecture, Topology used in deployment.<br><br>Different components of WSN<br><br>Hardware and Software requirements of WSN.<br><br>Learn about MANETS and efficient use of battery. | 1) After completion of this course, learner should be able to list various applications of wireless sensor networks,<br>2) Describe the concepts, protocols, design,<br>3) implementation and use of wireless sensor networks.<br>4) Also implement and evaluate new ideas for solving wireless sensor network design issues. |

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| Operating systems and execution environments, introduction to TinyOS and nesC.<br>Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts. | | |
| UNIT 2:<br>Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study.<br>Routing Protocols : Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks.<br>Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. | To PRovide knowledge of MAC Protocols used for WSN and ROuting protocols for route updates.<br><br>Protocols used for Transport layer like conversion of existing TCP to suite the environment of WSN for efficient use of power. | |
| UNIT 3:<br><br>Introduction, Wireless Transmission and Medium Access Control: | To provide knowledge about history of WSN and its application,<br><br>Learn about Cellular | |

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| Applications, A short history of wireless communication. Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT-2000. Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover. | system in telecom<br><br>How does the HAndover and Takeover of call works<br><br>Satellite functioning and different architecture.<br><br>Learn ts application in GEO,LEO and MEO. | |

**Course: Cloud Computing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Elements of | 1) Explain the core concepts of the cloud computing paradigm<br>2) Describe the principles of Parallel and Distributed Computing and evolution of cloud | 1) After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud |

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| Parallel Computing. Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds. | computing from existing technologies. | computing<br>2) The possible applications for state-of-the-art cloud computing using open source technology.<br>3) Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.<br>4) They should explain the core issues of cloud computing such as security, privacy, and interoperability. |
| UNIT 2:<br><br>Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing | 1) Implement different types of Virtualization technologies and Service Oriented Architecture systems | |
| UNIT 3:<br>Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production | 1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges<br>2) Illustrate the fundamental concepts of cloud storage | |

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| environments, Building a production environment, Application orchestration using OpenStack Heat | | |

**Course: Information Retrieval**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br><br>Introduction to Information Retrieval: Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval. | 1) Describe the objectives of information retrieval Systems.<br><br>2) To discuss the issues related to IR | 1) After completion of this course, learner should get an understanding of the field of information retrieval<br>2) its relationship to search engines.<br>3) It will give the learner an understanding to apply information retrieval models. |
| UNIT 2:<br>Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval. | 1) To understand the working of specialised search techniques<br>2) Describe Map-Reduce.<br>3) Analyze working of QA systems | |

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| UNIT 3:<br><br>Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures. XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval. | 1) To understand the acrchitechutre of web search engine<br>2) To demonstrate XML retrieval. | |

**Course: Digital Image Processing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing<br>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter Convolution and Correlation : 2D Convolution through | 1) Review the fundamental concepts of a digital image processing system.<br>2) Understand the Human Visual Systems<br>3) Explain the fundamentals of digital image and its processing<br>4) Descibe the 2D Signals<br>5) Problem solvig in Image Convolution | 1) Learner should review the fundamental concepts of a digital image processing system.<br>2) Analyze the images in the frequency domain using various transforms.<br>3) Evaluate the techniques for image enhancement and image segmentation.<br>4) Apply various compression techniques.<br>5) They will be familiar |

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| graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation<br>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform | | with basic image processing techniques for solving real problems. |
| UNIT 2:<br>Image Enhancement :Image Enhancement in spatial domain, Enhancement trough Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic<br><br>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing, Logical | 1) understand the need for image transforms different types of image transforms and their properties.<br>2) learn different techniques employed for the enhancement of images.<br>3) To identify different colour models and color image processing | |

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| operations, Morphological operations, Dilation and Erosion, Distance Transform<br>Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image | | |
| UNIT 3:Image Segmentation: Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform<br>Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard | 1) Understand the need for image compression<br>2) To learn the spatial and frequency domain techniques of image compression.<br>3) To implement image segmentation techniques | |

**Course: Ethical Hacking**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Information Security : Attacks and Vulnerabilities<br>Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle<br>Types of malware :Worms, viruses, Trojans, Spyware, Rootkits<br>Types of vulnerabilities : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database<br>Types of attacks and their common prevention mechanisms : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs | 1) Understand concept of information security<br>2) Understand types of malware and vulnerabilities<br>3) Acquire knowledge on types of attacks and their prevention mechanisms<br>4) Discuss recent attacks | Learner will know to identify security vulnerabilities and weaknesses in the target applications.<br>They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines. |

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| Case-studies : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit | | |
| UNIT 2:<br>Ethical Hacking – I (Introduction and pre-attack)<br>Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking. Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing.<br>Approach : Planning - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, | 1) Discuss types of ethical hacking<br>2) Understand how penetration testing is important<br>3) Acquire knowledge of different phases of ethical hacking | |

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| Preparing report, Fixing security gaps following the report Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing. Phases: Reconnaissance/foot-printing/Enumeration, Phases: Scanning, Sniffing | | |
| UNIT 3: Ethical Hacking :Enterprise Security Phases : Gaining and Maintaining Access : Systems hacking – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPSpoofing, SYN Flooding, Smurf attack, Applications hacking : SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, Malware analysis : Netcat Trojan, wrapping definition, reverse engineering Phases : Covering your tracks : Steganography, Event Logs alteration Additional Security Mechanisms : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines) | Acquire knowledge to test and exploit systems using various tools and understand the impact of hacking in real time machines. | |

Coordinator B.Sc.C.S.

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**COURSE OUTCOME**
**F.Y.B.Sc. COMPUTER SCIENCE SEM 1**
**2020-2021 Syllabus**

**Course: Computer Organization and Design**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Computer Abstractions and Technology: Basic structure and operation of a computer, functional units and their interaction. Representation of numbers and characters.<br>Logic circuits and functions:<br>Combinational circuits and functions: Basic logic gates and functions, truth tables; logic circuits and functions. Minimization with Karnaugh maps. Synthesis of logic functions with and-or-not gates, nand gates, nor gates. Fan-in and fan-out requirements; tristate buffers. Half adder, full adder, ripple carry adder. (Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers.<br>Sequential circuits and functions: State diagram and state table; finite state machines and their synthesis. | 1) Students are able to understand basic functions of computers.<br>2) To learn about how computer systems work and underlying principles<br>3) To understand the basics of digital electronics needed for computers | 1) To learn about how computer systems work and underlying principles<br>2) To understand the basics of digital electronics needed for computers<br>3) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>4) To understand the basics of processor structure and operation<br>5) To understand how data is transferred between the processor and I/O devices |
| UNIT 2:<br>Instruction set architectures:<br><br>Memory organization, addressing and operations; word size, big-endian and little-endian arrangements. Instructions, sequencing. | 1) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>2) Understand types of machine instructions<br>3) Understand difference between | |

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| Instruction sets for RISC and CISC<br><br>(examples Altera NIOS II and Freescale ColdFire). Operand addressing modes, pointers, indexing for arrays. Machine language, assembly language, assembler directives. Function calls, processor runtime stack, stack frame. Types of machine instructions: arithmetic, logic, shift, etc. Instruction sets, RISC and CISC examples. | RISC and CISC | |
| UNIT 3:<br>Basic Processor Unit: Main components of a processor: registers and register files, ALU, control unit, instruction fetch unit, interfaces to instruction and data memories. Datapath. Instruction fetch and execute; executing arithmetic/logic, memory access and branch instructions; hardwired and microprogrammed control for RISC and CISC.<br>Basic I/O: Accessing I/O devices, data transfers between processor and I/O devices. Interrupts and exceptions: interrupt requests and processing. | 1) To understand the basics of processor structure and operation<br>2) To understand how data is transferred between the processor and I/O devices | |

**Course: Programming with Python- I**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Reasons for Python as the learner's first programming | 1) To understand why Python is a useful | 1) Students should be able to understand the concepts of programming before |

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| language. Introduction to the IDLE interpreter (shell) and its documentation. Expression evaluation. similarities and differences compared to a calculator. expressions and operators of types int, float, boolean. Built-in function type. Operator precedence. Enumeration of simple and compound statements. The expression statement. The assert statement, whose operand is a boolean expression (values true or false). The assignment statement. dynamic binding of names to values. (type is associated with data and not with names). automatic and implicit declaration of variable names with the assignment statement. assigning the valueNone to a name. The del (delete) statement. Input/output with print and input functions. A statement list (semicolonseparated list of simple statements on a single line) as a single interpreter command. The import statement for already-defined functions and constants. The augmented assignment statement. The built-inhelp() function. Interactive and script modes of IDLE, running a script, restarting the shell. | scripting language for developers<br>2) Understand the process of designing programs<br>3) Acquire knowledge about programming<br>4) To implement inbuilt functions of Python | actually starting to write programs.<br>2) Students should be able to develop logic for Problem Solving.<br>3) Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.<br>4) Students should be able to apply the problem solving skills using syntactically simple language i.e. |

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| The compound statement def to define functions. the role of indentation for delimiting the body of a compound statement, calling a previously defined function. Compound data types str, tuple and list (enclosed in quotes, parentheses and brackets, respectively). Indexing individual elements within these types. Strings and tuples are immutable, lists are mutable. Built-in functions min, max, sum. Interactive solution of model problems, (e.g., finding the square root of a number or zero of a function), by repeatedly executing the body of a loop (where the body is a statement list). | | |
| UNIT 2:<br>Advantages of functions, function parameters, formal parameters, actual parameters, global and local variables. The range function, the iterative for statement. The conditional statements if, if-else, if-elif-else. The iterative statements while, while-else, for-else. The continue statement to skip over one iteration of a loop, the break statement to exit the | 1. Describe functions in Python<br>2. Demonstrate conditional statements<br>3. Discuss the compound statements<br>4. Construct programs to solve problems using functions, dictionary | |

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| loop<br>Nested compound statements. Dictionaries concept of key-value pairs, techniques to create, update and delete dictionary items. Problem-solving using compound types and statements. | | |
| UNIT 3:<br><br>Anonymous functions. List comprehensions. Gentle introduction to object-oriented programming; using the built-in dir() function, enumerate the methods of strings, tuples, lists, dictionaries. Using these methods for problem-solving with compound types | 1. Understand the working of anonymous functions<br>2. Cursory explanation of OOPS concepts<br>3. Illustrate Tuples and List<br>4. Programming using Tuples and List. | |

**Course: Free and Open Source Software**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction<br>Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. History: | 1) To understand the meaning of the open source.<br>2) To learn about various terms in open source software like FOSS, GNU, license, | 1) Upon completion of this course, students should have a good working knowledge of Open Source ecosystem, its use, impact and importance. |

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| BSD.<br>The Free Software Foundation and the GNU Project.<br>Methodologies<br>Open Source History, Initiatives, Principle and methodologies, Philosophy<br><br>Software Freedom, Open Source Development Model Licenses and Patents: What Is A License, Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copy lefts, Patents<br>Economics of FOSS : Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization<br>Social Impact<br>Open source vs. closed source, Open source government, Open source ethics.<br>Social and Financial impacts of open source technology, Shared software, Shared source, Open Source in Government. | patents, copyrights, etc.<br>3) To learn and understand about various open source software. | 2) This course shall help student to learn Open Source methodologies, case studies with real life examples. |
| UNIT 2:<br>Case Studies<br>Example Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Open Office. Study: Understanding the developmental models, licensings, mode of funding,commercial/non-commercial use. Open Source Hardware, Open Source<br>Design, Open source | 1) Discuss various examples of open source software like Android, Linux, etc.<br>2) To illustrate how to use various open source software. | |

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| Teaching: Open source media.<br>Collaboration, Community and Communication<br>Contributing to Open Source Projects<br>Introduction to github, interacting with the community on github, Communication and etiquette, testing open source code, reporting issues,<br>contributing code.<br>Introduction to wikipedia, contributing to Wikipedia Or contributing to any prominent open source project of student's choice.<br>Starting and Maintaining own Open Source Project. | | |
| UNIT 3:<br>Understanding Open Source Ecosystem<br>Open Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris.<br>Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies | 1) To learn various technologies like docker, programming languages, etc.<br>2) To understand Linux and other FOSS technologies like hardware, virtualization, etc. | |

**Course: Database Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to DBMS – Database, DBMS – Definition, Overview of | 1) To understand the basic use of database.<br>2) Various models like | 1) Students should be able to evaluate business |

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| DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture<br>Data models -<br>Client/Server Architecture<br>Object Based Logical Model, Record Based Logical Model ( relational, hierarchical, network)<br>Entity Relationship Model - Entities, attributes, entity sets, relations, relationship sets<br>Additional constraints ( key constraints, participation constraints, weak entities, aggregation / , generalization, Conceptual Design using ER ( entites VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)<br>Relational data model– Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint<br>ER to Table- Entity to Table, Relationship to tables with and without key constraints. | RDBMS, Network model, etc<br>3) To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc.<br>4) Constraints used in database management system.<br>5) To understand how to convert ER to table so that we can implement these tables in database application<br>6) Describe fundamental elements of RDBMS.<br>7) Design E-R diagram to represent simple database applications scenarios. | information problem and find the requirements of a problem in terms of data<br>2) Students should be able to design the database schema with the use of appropriate data types for storage of data in database<br>3) Students should be able to create, manipulate, query and back up the databases |
| UNIT 2<br>Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition.<br>Relational Algebra operations (selection, projection, set operations | 1) To understand Functional dependencies, schema so that the table relationship is can be understood which will further help to create tables in database<br>2) To illustrate DDL statements, DML statements, Joins to | |

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| union intersection, difference cross product, Joins –conditional, equi join and natural joins division)<br>DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables, Backing Up and Restoring databases<br>DML Statements – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause | update, alter or delete any record from the database without changing other records of tables.<br>3) Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL.<br>4) Criticize a database and improve the design by normalization. | |
| UNIT 3:<br>Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables – inner join, outer join (left outer, right outer, full outer) Subqueries – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries | 1) To understand types of in built functions so that they can manipulate database records easily.<br>2) String functions, math functions, date function,<br>3) To understand about the DBA, permissions and security<br>4) Basic of Database protection & Distributed databases | |

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| Database Protection Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control Views (creating, altering dropping, renaming and manipulating views) DCL Statements (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges) | | |

**Course: Discrete Mathematics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Recurrence Relations (a) Functions: Definition of function. Domain, co domain and the range of a function. Direct and inverse images. Injective, surjective and bijective functions. Composite and inverse functions. (b) Relations: Definition and examples, Properties of relations , Partial Ordering sets, Linear Ordering Hasse Diagrams , Maximum and Minimum elements, Lattices (c) Recurrence Relations: Definition of recurrence relations, Formulating recurrence relations, solving recurrence relations- Backtracking method, Linear homogeneous recurrence relations with constant coefficients. Solving linear homogeneous recurrence relations with | 1) Students are able to understand the concept of functions.<br>2) Understand types of relation<br>3) Acquire concept of partially ordered set<br>4) Implement recurrence relation concepts | 1) To provide an overview of the theory of discrete objects, starting with relations and partially ordered sets.<br>2) Study about recurrence relations, generating functions and operations on them.<br>3) Give an understanding of graphs and trees, which are widely used in software.<br>4) Provide basic knowledge about models of automata theory and the corresponding formal languages. |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| constant coefficients of degree two when characteristic equation has distinct roots and only one root. Particular solutions of non linear homogeneous recurrence relation. Solution of recurrence relation by the method of generation functions, Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane. Sorting Algorithms. | | |
| UNIT 2<br>Counting Principles , Languages and Finite State Machine<br>(a) Permutations and Combinations: Partition and Distribution of objects, Permutation with distinct and indistinct objects, Binomial numbers, Combination with identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem, Combination with indistinct objects.<br>(b) Counting Principles: Sum and Product Rules, Two-way counting, Tree diagram for solving counting problems, Pigeonhole Principle (without proof); Simple examples, Inclusion Exclusion Principle (Sieve formula) (Without proof).<br>(c) Languages, Grammars and Machines: Languages , regular Expression and | 1) Problem solving based on Permutation and combination<br>2) Understand concept of counting principle<br>3) Acquire basic knowledge about models of automata theory and the corresponding formal languages. | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Regular languages. Finite state Automata. grammars. Finite state machines. Gödel numbers. Turing machines. | | |
| UNIT 3<br>Graphs and Trees<br>(a) Graphs : Definition and elementary results. Adjacency matrix, path matrix. Representing relations using diagraphs. Warshall's algorithm- shortest path . Linked representation of a graph. Operations on graph with algorithms - searching<br><br>in a graph; Insertion in a graph. Deleting from a graph. Traversing a graph- Breadth-First search and Depth-First search.<br><br>(b) Trees: Definition and elementary results. Ordered rooted tree. Binary trees. Complete and extended binary trees, representing binary trees in memory. traversing binary trees. binary search tree, Algorithms for searching and inserting<br>in binary search trees. Algorithms for deleting in a binary search tree | 1) Understand the concept of graphs and trees, which are widely used in software.<br>2) Explain algorithms of operation on Graph<br>3) Implement Graph traversal techniques<br>4) Implement tree traversal techniques | |

**Course: Descriptive Statistics and Introduction to Probability**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Different types of Data | Provide basic learning about different types of data and presenting tools. | To provide complete learning about statistical data and its representation |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| required for analysis<br>Presentation of Data using different tools<br>Calculating the centered value on the basis of observation<br>To Learn about Variance in the given data | To understand different centered values like mean, median and mode<br><br>Learn about different Methods to calculate variation in the data | methods<br><br>TO make students familiar with Central tendency and dispersion methods<br><br>To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance.<br><br>To provide detailed learning about Probability and related examples and ensure students learn about Bayes theorem and conditional probabilities. |
| UNIT 2:<br><br>To Understand Spreadness of data in the given set of observations.<br><br>To check the symmetricity of data using skewness and kurtosis.<br><br>To analyze the regression analysis using Karl Pearson's methods.<br><br>Learn the scatterness of data using slope of line and least square method. | Provide learning of Raw and Central Moments.<br><br>Students should understand the symmetry in data using skewness value and kurtosis graph.<br><br>Learn about scatter plot and Karl pearson's coefficient<br><br>Provide learning about least square method and regression coefficient. | |
| UNIT 3:<br><br>To Learn the different terms used in probability like random sample, event, experiment, types of events.<br><br>Definition of Probability and examples based on probability.<br><br>Addition and Multiplication statements, Bayes theorem and conditional probability | Provide information about Probability ensure basic learning of terminology and definition of probability.<br><br>Students should be able to solve the example based on probability.<br><br>Learning about Statements and Conditional probability | |

**Course: Soft Skills Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Introduction to Softskill and Hard Skill.<br>Personality Development, Emotional Intelligence, Etiquette and Mannerism, Communication Today. | Student should understand about knowing self and Johari's Window.<br><br>Difference between Emotional and Intelligence Quotient.<br><br>To provide learning about Professional and Personal etiquette.<br><br>Learn about 3M Model of communication. Verbal and Non Verbal Communicaiton. | 1) To know about various aspects of soft skills and learn ways to develop personality<br>2) Understand the importance and type of communication in personal and professional environment.<br>3) To provide insight into much needed technical and non-technical qualities in career planning.<br>4) Learn about Leadership, team building, decision making and stress management |
| UNIT 2:<br>Employment Communication: Like Introduction to Organization process<br>Professional Presentation: Presenting self for different prospects of presentation<br>Job Interviews: TO appear for Interview<br>Group Discussion: Importance and requirement | Introduction to JOb Interview, Resume and CV.<br><br>To make the cover letter and Job Application.<br><br>Learn to Present in professional life.<br><br>Understand the steps of Interview and FAQ.<br>Group discussion process and arrangement , topics involved in group discussions | |
| UNIT 3:<br>Creativity at Workplace: Create the Work enviornment<br>Ethical Values: Values and SOciety Ethics<br>Capacity Building: Learn, Unlearn and Relearn: To build the capacity of learning<br>Leadership and Team Building: Qualities required to be leader.<br>Decision Making and Negotiation: Quick and right decision makings<br>Stress and Time | To understand the workplace creativity and get the work completed in innovative ways.<br><br>Develop ethical values.<br><br>Build the capacity of learning right point and unlearn not required or wrong points.<br><br>Increase the decision making capabilities.<br><br>Learn to understand stress and method to overcome | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| Management To learn time and stress management | by proper time management | |

**F.Y.B.Sc. COMPUTER SCIENCE SEM 2**

**Course: Programming with C**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Structure of C program. Header and body. Use of comments. Interpreters vs compilers.<br>Python vs C. Compilation of a program. Formatted I/O: printf() scanf()<br>Data: Variables, Constants, data types like: int, float, char, double and void, short and long size qualifiers, signed and unsigned qualifiers.<br>Compare with datatypes in Python.<br>Compare static typing in C vs dynamic typing in Python.<br>Variables: Declaring variables, scope of the variables according to block, hierarchy of data types. Compare explicit declarations in C with implicit declarations in Python.<br>Types of operators: Arithmetic, relational, logical, compound assignment, increment and decrement, conditional or ternary, bitwise and comma operators.<br>Precedence and order of evaluation, statements and Expressions. | 1) Students understand the difference between Python and C.<br>2) Students should be able to use different data types in a computer program.<br>3) Students should be able to design programs involving decision structures, loops and functions. | 1) Students should be able to write, compile and debug programs in C language.<br>2) Students should be able to use different data types in a computer program.<br>3) Students should be able to design programs involving decision structures, loops and functions.<br>4) Students should be able to explain the difference between call by value and call by reference.<br>5) Students should be able to understand the dynamics of memory by the use of pointers.<br>6) Students should be able to use different data structures and create/update basic data files. |

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| Automatic and explicit type conversion.<br>Iterations: Control statements for decision making: (i) Branching: if statement, else.. if statement, (does the writer mean if-else or nested ifs)switch statement. (ii) Looping:<br>while loop, do.. while, for loop. (iii) Jump statements: break, continue and goto. | | |
| UNIT 2:<br>Arrays: (One and two dimensional), declaring array variables, initialization of arrays, accessing array elements. Compare array types of C with list and tuple types of Python.<br>Data Input and Output functions: Character I/O format: getch(), getche(), getchar(), getc(), gets(), putchar(), putc(), puts().<br>Manipulating Strings: Declaring and initializing String variables, Character and string handling functions. Compare with Python strings.<br>Functions: Function declaration, function definition, Global and local variables, return statement, Calling a function by passing values. Recursion: Definition, Recursive functions. | 1) Understand concept and use of array<br>2) Able to understand data input and output functions<br>3) Students should be able to explain the difference between call by value and call by reference | |
| UNIT 3:<br>Pointer: Fundamentals, Pointer variables, Referencing and de-referencing, Pointer Arithmetic, Using Pointers with Arrays, Using Pointers with Strings, Array of | 1) Understand concept of pointers<br>2) Students should be able to understand the dynamics of memory by the use of pointers<br>3) Students should be | |

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| Pointers.<br>Pointers as function arguments. Functions returning pointers.<br>Dynamic Memory Allocation: malloc(), calloc(), realloc(), free() and sizeof operator.<br>Compare with automatic garbage collection in Python.<br>Structure: Declaration of structure, reading and assignment of structure variables, Array of structures, arrays within structures, structures within structures. Compare C structures with Python tuples.<br>Unions: Defining and working with unions.<br>File handling: Different types of files like text and binary, Different types of functions:<br>fopen(), fclose(), fgetc(), fputc(), fgets(), fputs(), fscanf(), fprintf(), getw(), putw(), fread(), fwrite(), fseek(). | able to use different data structures and create/update basic data files. | |

**Course: Programming with Python – II**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Python File Input-Output: Opening and closing files, various types of file modes, reading and writing to files, manipulating directories.<br>Iterables, iterators and their problemsolving applications.<br>Exception handling: What is an exception, various keywords to handle exceptions such try, catch, except. | 1) To understand concept of File I/O, Exception Handling and Regullar expression.<br>2) To implement programs based on File I/O, Exception Handling and Regullar expression.<br>3) Evaluate pupils by designing regular expressions. | 1) Students should be able to understand how to read/write to files using python.<br>2) Students should be able to catch their own errors that happen during execution of programs.<br>3) Students should get an introduction to the concept of pattern matching.<br>4) Students should be made familiar with the concepts of GUI controls |

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| else, finally, raise<br>Regular Expressions<br>Concept of regular expression, various types of regular expressions, using match function. | | and designing GUI applications<br>5) Students should be able to connect to the database to move the data to/from the application<br>6) 6)Students should know how to connect to computers, read from URL and send email |
| UNIT 2<br>What is GUI, Advantages of GUI, Introduction to GUI library, Layout management,<br>events and bindings, fonts, colours, drawing on canvas (line, oval, rectangle, etc.)<br>Widgets such as : frame, label, button, checkbutton, entry, listbox, message, radiobutton, text, spinbox etc | 1) To Analyse the use of GUI in real world application.<br>2) To implement tkinter widgets<br>, | |
| UNIT 3:<br><br>Database connectivity in Python: Installing mysql connector, accessing connector<br>module module, using connect, cursor, execute & close functions, reading single &<br>multiple results of query execution, executing different types of statements,<br>executing transactions, understanding exceptions in database connectivity.<br>Network connectivity:<br>Socket module, creating | 1) To differentiate between the front end and back-end<br>2) To implement database commands and connectivity<br>3) To create simple database application.<br>4) Applying networking concepts using python | |

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| server-client programs<br>sending email<br>reading from URL | | |

**Course: Linux**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction<br>History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution.<br>Why learn Linux? Importance of Linux in software ecosystem: web servers, supercomputers, mobile, servers.<br>Installation<br>Installation methods, Hands on Installation using CD/DVD or USB drive.<br>Linux Structure<br>Linux Architecture, Filesystem basics, The boot process, init scripts, runlevels, shutdown process, Very basic introductions to Linux processes, Packaging methods: rpm/deb, Graphical Vs Command line. | 1. Gives a basic introduction to Linux.<br>2. To understand importance of Linux in the real world.<br>3. Demonstrated various methods to install Linux.<br>4. Difference between CLI vs GUI. | 1) Upon completion of this course, students should have a good working knowledge of Linux, from both<br>a graphical and command line perspective, allowing them to easily use any Linux distribution.<br>2) This course shall help students to learn advanced subjects in computer science practically.<br>3) Student shall be able to progress as a Developer or Linux System Administrator using the acquired<br>skill set. |
| UNIT 2:<br>Graphical Desktop Session Management, Basic Desktop Operations, Network Management, Installing<br>and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors, Multimedia applications, Command Line | 1. Discussed various text editors in Linux.<br>2. To learn general purpose commands to start with Linux.<br>3. File system used in Linux. | |

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| Command line mode options, Shells, Basic Commands, General Purpose Utilities, Installing Software, User management, Environment variables, Command aliases.<br>Linux Documentation man pages, GNU info, help command, More documentation sources<br>File Operations Filesystem, Filesystem architecture, File types, File attributes, Working with files.<br>Backup, compression | | |
| UNIT 3:<br>Security<br>Understanding Linux Security, Uses of root, sudo command, working with passwords, Bypassing user authentication, Understanding ssh<br>Networking<br>Basic introduction to Networking, Network protocols: http, ftp etc., IP address, DNS, Browsers, Transferring files.<br>ssh, telnet, ping, traceroute, route, hostname, networking GUI.<br>Basic Shell Scripting<br>Features and capabilities, Syntax, Constructs, Modifying files, Sed, awk command,<br>File manipulation utilities, Dealing with large files and Text, String manipulation, Boolean expressions, File tests, Case, Debugging, Regular expressions | 1. Students have been explained about security in Linux.<br>2. Discussed networking commands to check network-related tasks in Linux.<br>3. Basic commands to work with file manipulation. | |

**Course: Data Structures**

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>Abstract Data Types<br>Introduction, The Date Abstract Data Type, Bags, Iterators<br>Application<br>Arrays, Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Data Type, Application<br>Sets and Maps, Sets-Set ADT, Selecting Data Structure, List based Implementation,<br>Maps-Map ADT, List Based Implementation,<br>Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarrays, Application<br>Algorithm Analysis:<br>Complexity Analysis-Big-O Notation, Evaluating Python Code,<br>Evaluating Python List, Amortized Cost, Evaluating Set ADT, Application<br>Searching and Sorting:<br>Searching-Linear Search, Binary Search,<br>Sorting-Bubble, Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List,<br>Maintaining sorted Lists. | 1. To understand data types, arrays, ADT, searching, and sorting concepts | 1) Learn about Data structures, its types and significance in computing<br>2) Explore about Abstract Data types and its implementation<br>3) Ability to program various applications using different data structure in Python |
| UNIT 2:<br>Linked Structures:<br>Introduction, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, Bag ADT-Linked List Implementation.<br>Comparing Implementations, Linked List Iterators, More Ways to Build Kinked Lists,<br>Applications-Polynomials<br>Stacks: Stack ADT, | 1. To learn various types of data structures like linked list, stack, queue, list, etc.<br>2. Also make student understand where these data structures can be implemented. | |

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| Implementing Stacks-Using Python List, Using Linked List, Stack Applications-Balanced Delimiters, Evaluating Postfix Expressions, Queues, Queue ADT, Implementing Queue-Using Python List, Circular Array, Using List, Priority Queues-Priority Queue ADT, Bounded and unbounded Priority Queues, Advanced Linked List: Doubly Linked Lists-Organization and Operation, Circular Linked List-Organization and Operation, Multi Lists | | |
| UNIT 3:<br>Recursion: Recursive Functions, Properties of Recursion, Its working, Recursive Applications<br>Hash Table: Introduction, Hashing-Linear Probing, Clustering, Rehashing, Separate Chaining, Hash Functions<br>Advanced Sorting: Merge Sort, Quick Sort, Radix Sort, Sorting Linked List<br>Binary Trees: Tree Structure, Binary Tree-Properties, Implementation and Traversals, Expression Trees, Heaps and Heapsort, Search Trees | 1. To discuss various technique to index data in data structure.<br>2. Illustrate tree data structure, hash function, searching trees, heap sort, traversal and recursive function. | |

**Course: Calculus**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| **UNIT 1:**<br>**DERIVATIVES AND ITS APPLICATIONS:**<br>**Review of Functions, limit** | 1) Understand the concept of limit, continuity, derivatives. | 1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions. |

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| of a function, continuity of a function, derivative function<br>Derivative In Graphing And Applications. Analysis of Functions: Increase, Decrease, Concavity, Relative Extrema, Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents, Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method. | 2) Problem solving on derivative in graphing and applications | 2) Ability to appreciate real world applications which use these concepts.<br>3) Skill to formulate a problem through Mathematical modeling and simulation. |
| UNIT 2<br>An Overview of the Area Problem, Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Area Between Two Curves, Length of a Plane Curve, Numerical Integration: Simpson's Rule, Modeling with Differential Equations, Separation of Variables, Slope Fields, Euler's Method, First-Order Differential Equations and Applications. | 1) Understand the concept of integration<br>2) Problem solving with different types of integration methods.<br>3) Problem solving on modeling with differential equation | |
| UNIT 3:<br>PARTIAL DERIVATIVES AND ITS APPLICATIONS: Functions of Two or More Variables Limits and Continuity Partial Derivatives, Differentiability, Differentials, and Local Linearity, Chain Rule, Directional Derivatives and Gradients, Tangent Planes and Normal, Vectors, Maxima and Minima of | 1) Understand the concept partial derivatives<br>2) Implement partial derivatives on different applications | |

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| Functions of Two Variables | | |

**Course: Statistical Methods and Testing of Hypothesis**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Learn about Random Variable, it's type discrete and continuous.<br><br>Different functions like pdf,pmf,cdf and reliability.<br><br>Introduction to basic distribution like Binomial, Normal, F, t and Chi-square with examples | To learn about discrete and Continuous data with its related functions like pdf and pmf.<br><br>To understand and use the distribution like Binomial for discrete data, Normal for continuous, F for comparison of variance. | Students should be able to learn about distribution and its application on the basis of example.<br><br>To Analyze and proof the hypothetical statements using test statistics.<br><br>Learn to read tabulated value of different functions.<br><br>Analysis or compare 2 and more samples together and conclude the outcome.<br><br>Learn to calculate and analyze the Non parametric distribution and CHi square association. |
| UNIT 2:<br>Learn about Hypothesis and steps to proof the Hypothesis.<br><br>Learn about Analysis of variance : one-way, two-way analysis of variance and Parametric tests. | Definition of Hypothesis and steps to conclude the hypothesis<br><br>Learn Methods of ANOVA and analyze more than 2 data simultaneously. | |
| UNIT 3:<br>Learn about Non Parametric test and different methods to analyze the qualitative data.<br><br>Chi Square test of association for 2 samples | Learn method of Non parametric tests like sign test, wilcoxon test, kruskal wallis test and Post hoc analysis | |

**Course: Green Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Green IT Overview: Introduction: Environmental Concerns and Sustainable Development. Environmental Impacts of IT. Green IT: Holistic Approach to Greening IT. Greening IT: Applying IT for Enhancing Environmental Sustainability. Green IT Standards and Eco-Labelling of IT. Enterprise Green IT Strategy. Green Washing. Green IT: Burden or Opportunity?<br>Green Devices and Hardware: Introduction, Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose.<br>Green Software: Introduction, Processor Power States, Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power. Sustainable Software Development: Introduction, Current Practices, Sustainable Software: Software Sustainability Attributes, Software Sustainability Metrics. Sustainable Software Methodology: Defining Actions. | 1) To explain Green Computing and Green IT infrastructure for making computing and information system environment sustainable<br>2) To explain the principles of Energy efficient technologies | 1) Learn about green IT can be achieved in and by hardware, software, network, communication and data center operations.<br>2) Understand the strategies, frameworks, processes and management of green IT. |
| UNIT 2<br>Green Data Centres: Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre | 1) To encourage optimized software and hardware designs for development of Green IT Storage. | |

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| Facility Infrastructure Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics Green Data Storage Introduction , Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management Green Networks and Communications: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards Enterprise Green IT Strategy: Introduction, Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy, Metrics and Measurements in Green Strategies. | Communication and Services<br>2) To impart knowledge on the methods of reducing CO2 levels in atmosphere | |
| UNIT 3:<br>Sustainable Information Systems and Green Metrics: Introduction, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Measuring the Maturity of Sustainable ICT Enterprise Green IT Readiness: Introduction, Readiness and Capability, | 1) To explores the use of approaches to embrace green IT initiatives<br>2) To gain knowledge of the importance of life cycle assessment | |

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| Development of the G-Readiness Framework. Measuring an Organization's G-Readiness<br>Sustainable IT Services: Creating a Framework for Service Innovation: Introduction.<br>Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework<br>Green Enterprises and the Role of IT: Introduction, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues | | |

9

Coordinator B.Sc.C.S.

**Course: Theory of Computation**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Automata Theory: Defining Automaton, Finite Automaton, Transitios and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines, Minimizing Automata, Formal Languges: Defining Grammar, Derivations, Languges generated by Grammar, Comsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata | 1) To understand Automata Theory<br>2) Identifying DFA and NDFA.<br>3) Defining Grammer and Languages<br>4) Distinguish different computing languages and classify their respective types | 1. Understand Grammar and Languages<br>2. Learn about Automata theory and its application in Language Design<br>3. Learn about Turing Machines and Pushdown Automata<br>4. Understand Linear Bound Automata and its applications |
| UNIT 2:<br><br>Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG Pushdown Automata: Definitions, Acceptance by PDA, PDA and CFG | 1) analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.<br>2) To Apply transformation between multiple representations of finite automata.<br>3) Problem solving based on Regular Sets and Regular Grammar | |
| UNIT 3: | 1) To state and explain | |

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| Linear Bound Automata The Linear Bound Automata Model, Linear Bound Automata and Languages. Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine, Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems | the Church-Turing thesis and its significance<br>2) Problem solving based on Linear Bound Automata | |

**Course: Core JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>The Java Language: Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays<br>OOPS: Introduction, Class, Object, Static Keywords, Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces<br>String Manipulations: String, String Buffer, String Tokenizer<br>Packages: Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java swing), User | 1) Understand the concept of OOPs as well as the purpose and usage principles of Inheritance, polymorphism, encapsulation etc.<br>2) Understand the basic concepts of classes and objects.<br>3) Understand JVM Concept , Data types and Operators, Strings.<br>4) To implement String methods<br>5) 2. 3. 4. Understand Internet Programming Using Java Applets & Graphic Programming & | 1. Object oriented programming concepts using Java.<br>2. Knowledge of input, its processing and getting suitable output.<br>3. Understand, design, implement and evaluate classes and applets.<br>4. Knowledge and implementation of AWT package. |

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| Defined Packages, Access specifiers | Make use of array, constructors, Inheritance, Packages and Interfaces. 5. | |
| UNIT 2:<br><br>Exception Handling: Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples<br>Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods<br>I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams, File, Random access File, Serialization<br>Networking: Introduction, Socket, Server socket, Client –Server Communication | 1) To recognise the exceptions<br>2) Understand the concept of Exceptional Handling<br>3) To model multithreading<br>4) To generate Client server code in Java | |
| UNIT 3:<br>Wrapper Classes: Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes<br>Collection Framework: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes<br><br>Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class<br>AWT: Introduction, Components, Event-Delegation-Model, | 1) To determine the Wrapper classes<br>2) To use the inbuilt util package.<br>3) To implement interface<br>4) To illustrate the use of AWT packages<br>5) To relate event driven programming.<br>6) Understand the concept of Exceptional Handling/Event Handling & Java I/O Handling. | |

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| Listeners, Layouts, Individual components: Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area | | |

**Course: Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction and Operating-Systems Structures: Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments, Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure<br>Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication<br><br>Threads: Overview, Multicore Programming, Multithreading Models | 1) To understand the services provided by and the design of an operating system.<br>2) To make aware of different types of Operating System and their services. | 1. To provide a understanding of operating system, its structures and functioning<br><br>2. Develop and master understanding of algorithms used by operating systems for various purposes. |
| UNIT 2:<br>Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, | 1) Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques. | |

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| Classic Problems of Synchronization, Monitors CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling<br>Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock | 2) Analyze important algorithms eg. Process scheduling and memory management algorithms<br>3) Students should understand the data structures and algorithms used to implement an OS.<br>4) To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.<br>5) Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems. | |
| UNIT 3:<br><br>Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table<br>Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing<br>Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management<br>File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System | 1) To understand the structure and organization of the file system.<br>2) To understand different approaches to memory management.<br>3) Describe the role of paging, segmentation and virtual memory in operating systems.<br>4) Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling | |

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| Mounting, File Sharing File-System Implementation File-System Structure, File-System Implementation: Directory Implementation, Allocation Methods, Free-Space Management | Algorithms | |

**Course: Database Management Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Stored Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures.<br>Triggers: Concept of triggers, Implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers.<br>Sequences: creating sequences, referencing, altering and dropping a sequence.<br>File Organization and Indexing: Cluster, Primary and secondary indexing, Index data structure: hash and Tree based indexing, Comparison of file organization: cost model, Heap files, sorted files, clustered files. Creating, dropping and maintaining indexes. | 1) To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage.<br>2) To understand concept of trigger, data integrity, sequence and file organization to further implement on projects. | 1. Master concepts of stored procedure and triggers and its use.<br>2. Learn about using PL/SQL for data management<br>3. Understand concepts and implementations of transaction management and crash recovery |
| UNIT 2: | 1) To understand | |

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| Fundamentals of PL/SQL Defining variables and constants. PL/SQL expressions and comparisons. Logical Operators. Boolean Expressions. CASE Expressions Handling. Null Values in Comparisons and Conditional Statements. PL/SQL Datatypes: Number Types, Character Types, Boolean Type, Datetime and Interval Types. Overview of PL/SQL Control Structures: Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IFTHEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements | basics of PL/SQL<br>2) Different operators in PL/SQL<br>3) To learn different data types in PL/SQL<br>4) To illustrate case statements and conditional statements | |
| UNIT 3:<br>Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.<br>DCL Statements: Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK<br>Crash Recovery: ARIES algorithm. The log based recovery, recovery related | 1) Understanding concept of tracsaction management and crash recovery. | |

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| structures like transaction and dirty page table Write-ahead log protocol. check points, recovery from a system crash, Redo and Undo phases | | |

**Course: Combinatorics and Graph Theory**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Describing Combinatorics and graph theory.<br>Understanding Strings, BInomial Coefficients and Multinomial Coefficients.<br>Solving Examples based on combinatorics using Induction method. | To provide knowledge about Enumeration method, sudoku puzzle.<br><br>TO provide learning about Strings and sets.<br><br>Solving Combinatorics using a recursive method.<br><br>Learning the method of induction to get the combinatorial results. | Students should be able to develop different methods of solving the example<br><br>Enhance the ability to think differently and solve the example with all possible outcomes.<br><br>Use Graph theory to identify best path from source to sink.<br><br>Student should able to identify path and cycles using different combinatorial methods.<br><br>Identify Network path in the given graph using Tree method, Ford Fulkerson method and augmenting methods. |
| UNIT 2:<br>Learning about Graph theory, Basic Notations.<br><br>Eulerian and Hamiltonian Graph, Types of graph.<br><br>Understanding labeling of trees, Applying probability to combinatorics.<br><br>Learn about Ramsey Numbers | Understand the graph and basic notations like vertices,edges.<br><br>To identify all possible paths and cycles in the given graph using Eulerian and Hamiltonian methods.<br><br>Applying Ramsey Number theory to Combinatorics | |
| UNIT 3:<br><br>Learning about NEtwork flows in Combinatorics.<br><br>Solving example based on Bipartite and Chain Partitioning. | Learn about basic Notations like path and node.<br><br>Learn Labeling algorithm using Ford Fulkerson method.<br><br>Augmenting the given path | |

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| Understand Polya's Enumeration | to identify the best possible route<br><br>Coloring of Vertices using polya's enumeration. | |

**Course: Physical Computing and IoT Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>SoC and Raspberry Pi<br>System on Chip: What is System on chip? Structure of System on Chip.<br>SoC products: FPGA, GPU, APU, Compute Units.<br>ARM 8 Architecture: SoC on ARM 8, ARM 8 Architecture Introduction<br>Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi.<br>Raspberry Pi Boot: Learn how this small SoC boots without BIOS.<br>Configuring boot sequences and hardware. | 1) To learn about SoC architectures; Learn how Raspberry Pi.<br>2) Learn to program Raspberry Pi.<br>3) Understanding basic architecture of SoC. | 1. Enable learners to understand System On Chip Architectures.<br>2. Introduction and preparing Raspberry Pi with hardware and installation.<br>3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's<br>4. Learn how to make consumer grade IoT safe and secure with proper use of protocols. |
| UNIT 2:<br>Programming Raspberry Pi<br>Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands<br>Programing interfaces: Introduction to Node.js, Python.<br>Raspberry Pi Interfaces: UART, GPIO, I2C, SPI<br>Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera. | 1) To learn linux commands which is used to operate Raspberry pi.<br>2) Understand nodejs<br>3) Raspberry Pi basic interfaces like UART, GPIO, I2C, SPI, etc.<br>4) To illustrate raspberry pi with camera module. | |
| UNIT 3: | 1) Implementation of | |

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|---|---|---|
| Introduction to IoT. What is IoT? IoT examples, Simple IoT LED Program<br>IoT and Protocols<br>IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP<br>IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED.<br>IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability. | internet of Things and Protocols.<br>2) Understanding IoT security protocols like HTTP, UPnp, CoAP, MQTT, and XMPP.<br>3) Students understand Node RED to implement IoT devices with an application. | |

**Course: Skill Enhancement: Web Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML,<br>Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML,<br>Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page<br>CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an<br>HTML Document, CSS properties to work with background of a Page, CSS<br>properties to work with Fonts and Text Styles, CSS properties for positioning an<br>element | 1) Understand basic concept of HTML<br>2) Understand types of CSS how to apply on website | 1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies.<br>2. Understand the various platforms, devices, display resolutions, viewports, and browsers that<br>render websites<br>3. To develop and implement client-side and server-side scripting language programs.<br>4. To develop and implement Database Driven Websites.<br>5. Design and apply XML to create a markup language for data and document centric applications. |
| UNIT 2: | 1) Student learn popup | |

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| JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions with Timer, JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model, Form Validation using JavaScript<br>XML: Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML Entity References, DTD, XSLT: XSLT Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set, xsl:value-of | boxes used in JavaScript<br>2) Understand JavaScript objects<br>3) Learn Form validation using JavaScript<br>4) Understand comparison XML and HTML<br>5) Student learn about XSLT | |
| UNIT 3:<br>AJAX: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX<br>PHP: Variables and Operators, Program Flow, Arrays, Working with Files and | 1) Understand concept AJAX, PHP and jQuery<br>2) Develop website using database concept with PHP | |

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| Directories, Working with Databases, Working with Cookies, Sessions and Headers<br>Introduction to jQuery Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects | | |

**S.Y.B.Sc. COMPUTER SCIENCE SEM 4**

**Course: Fundamentals of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction to algorithm, Why to analysis algorithm, Running time analysis, How to Compare Algorithms, Rate of Growth, Commonly Used Rates of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega-Ω Notation, Theta-Θ Notation, Asymptotic Analysis, Properties of Notations, Commonly used Logarithms and Summations, Performance characteristics of algorithms, Master Theorem for Divide and Conquer, Divide and Conquer Master Theorem: Problems & Solutions, Master Theorem for Subtract and Conquer Recurrences, Method of Guessing and Confirming | 1) To Define the basic concepts of algorithms and analyze the performance of algorithms.<br>2) To Discuss various algorithm design techniques for developing algorithms. | 1. To understand basic principles of algorithm design and why algorithm analysis is important<br>2. To understand how to implement algorithms in Python<br>3. To understand how to transform new problems into algorithmic problems with efficient solutions<br>4. To understand algorithm design techniques for solving different problems<br>5. Understand the concepts of algorithms for designing good program<br>6. Implement algorithms using Python |
| UNIT 2:<br><br>Tree algorithms: What is a Tree? Glossary, Binary Trees, Types of Binary Trees, Properties of Binary | 1) To Discuss various searching, sorting and graph traversal algorithms.<br>2) Analyze the asymptotic | |

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| Trees, Binary Tree, Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals, Expression Trees, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL (Adelson-Velskii and Landis) Trees<br>Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree<br><br>Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order | performance of algorithms.<br>3) Explain the major graph algorithms and their analyses<br>4) To implement Graph Traversal Techniques | |
| UNIT 3:<br><br>Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method<br>Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique<br>Divide and Conquer Algorithms: Introduction, What is Divide and Conquer Strategy? Divide | 1) Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming.<br>2) Demonstrate a familiarity with major algorithms and data structures.<br>3) Apply dynamic programming approach to solve suitable problems<br>4) Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this | |

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| and Conquer Visualization. Understanding Divide and Conquer. Advantages of Divide and Conquer. Disadvantages of Divide and Conquer. Master Theorem. Divide and Conquer Applications. Dynamic Programming: Introduction. What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy. Problems which can be solved using Dynamic Programming. Dynamic Programming Approaches. Examples of Dynamic Programming Algorithms. Understanding Dynamic Programming. Longest Common Subsequence | paradigm. Synthesize divideand-conquer algorithms. | |

**Course: Advanced JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br><br>Swing: Need for swing components, Difference between AWT and swing, Components hierarchy, Panes. Swing components: Jlabel, JTextField and JPasswordField, JTextAres, JButton, JCheckBox, JRadioButton, JComboBox and JList. JDBC: Introduction, JDBC Architecture, Types of Drivers, Statement, ResultSet, Read Only ResultSet, Updatable ResultSet, Forward Only ResultSet, Scrollable ResultSet, PreparedStatement. | 1) To learn the creation of pure Dynamic Web Application using JDBC.<br>2) To implement programs using Swing objects | 1) Understand the concepts related to Java Technology<br><br>2) Explore and understand use of Java Server Programming |

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| Connection Modes, SavePoint, Batch Updations, CallableStatement, BLOB & CLOB | | |
| UNIT 2<br>Servlets: Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, Servlet Communication, Session Tracking Mechanisms<br>JSP: Introduction, JSP LifeCycle, JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard actions and customized actions, | 1) To learn Server-Side Programming using Servlets and Java Server Pages.<br>2) To implements Servlets | |
| UNIT 3:<br><br>Java Beans: Introduction, JavaBeans Properties, Examples<br>Struts 2: Basic MVC Architecture, Struts 2 framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL<br>JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java | 1) To acquire knowledge on creation of software components using JAVA Beans.<br>2) Understand the concept of MVC<br>3) Craing applications using JSON | |

**Course: Computer Networks**

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br><br>Introduction Network Models.<br>Introduction to data communication, Components, Data Representation, Data Flow, Networks, Network Criteria, Physical Structures, Network types, Local Area Network, Wide Area Network, Switching, The Internet, Accessing the Internet, standards and administration Internet Standards.<br>Network Models, Protocol layering, Scenarios, Principles of Protocol Layering, Logical Connections, TCP/IP Protocol Suite, Layered Architecture, Layers in the TCP/IP Protocol Suite, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, Detailed introduction to Physical Layer, Detailed introduction to Data-Link Layer, Detailed introduction to Network Layer, Detailed introduction to Transport Layer, Detailed introduction to Application Layer.<br>Data and Signals, Analog and Digital Data, Analog and Digital Signals, Sine Wave Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signal, Bit Rate, Bit Length, Transmission of Digital Signals, Transmission Impairments, Attenuation, Distortion, Noise, Data Rate Limits, | Understanding about Netowrk Modesl and OSI Model.<br><br>To provide knowledge about different terminology used in computer networks.<br><br>Rules in Networking and TCP/IP Protocol suite.<br><br>Encapsulation and Decapsulation methods.<br><br>Multiplexing and demultiplexing methods.<br><br>Learn about Computer signals. | 1. Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'.<br>2. Useful to proceed with industrial requirements and International vendor certifications. |

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| Performance, Bandwidth, Throughput, Latency (Delay) | | |
| UNIT 2<br>Introduction to Physical Layer and Data-Link Layer<br>Digital Transmission<br>digital-to-digital conversion, Line Coding, Line Coding Schemes, analog-to-digital conversion, Pulse Code Modulation (PCM), Transmission Modes, Parallel Transmission, Serial Transmission, Analog Transmission, digital-to-analog Conversion, Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, analog-to-analog Conversion, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), Multiplexing, Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing, Transmission Media, Guided Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable, Switching, Three Methods of Switching , Circuit Switched Networks, Packet Switching, Introduction to Data-Link Layer, Nodes and Links, Services, Two Sub-layers, Three Types of addresses, Address Resolution Protocol (ARP), Error Detection and Correction, introduction, Types of Errors, Redundancy, Detection versus Correction, | Learning about different Modulation techniques PCM.<br><br>Conversion of Signal as per the transmission medium.<br><br>Learn about types of cables and transmission medium.<br><br>Types of Shift key, Amplitude and Phase.<br><br>Learning about Switching methods. | |

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| UNIT 3<br><br>Network layer Transport Layer<br>Media Access Control (MAC) random access CSMA CSMA/CD CSMA/CA controlled access Reservation Polling Token Passing channelization FDMA TDMA CDMA Connecting Devices and Virtual LANs connecting devices Hubs Link-Layer Switches Routers Introduction to Network Layer network layer services Packetizing Routing and Forwarding Other Services IPv4 addresses Address Space Classful Addressing Unicast Routing General Idea Least-Cost Routing Routing Algorithms Distance-Vector Routing Link-State Routing Path-Vector Routing Introduction to Transport Layer Transport-Layer Services Connectionless and Connection-Oriented Protocols Transport-Layer Protocols Service Port Numbers User Datagram Protocol User Datagram UDP Services UDP Applications Transmission Control Protocol TCP Services TCP Features Segment | Learning about Network layer working and major functions<br><br>Error detection and Channelization<br><br>IP addressing learning of IPV4 and IPV6<br><br>Learn about Network device Like Router and Switches<br><br>Difference between TCP and UDP | |

**Course: Software Engineering**

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1<br>Introduction: The Nature of Software: Software Engineering: The Software Process, Generic Process Model: The Waterfall Model: Incremental Process Models, Evolutionary Process Models: Concurrent Models: Component-Based Development: The Unified Process Phases: Agile Development- Agility: Agile Process: Extreme Programming<br>Requirement Analysis and System Modeling<br>Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS , Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram | 1) Understand the fundamental concepts of Software Engineering Lifecycle models.<br>2) Summarize the software requirement specifications and the SRS documents.<br>3) Understanding of different software architectural styles. | 1. Understand the process to be followed in SDLC.<br>2. Define formulate and analyze a problem.<br>3. Apply design and testing principles to software project development & Design Methodologies<br>4. Apply the project management and analysis principles to software project development.<br>5. Knowledge about software development life cycle<br>and problem articulation |
| UNIT 2:<br>System Design:<br>System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design<br>Software Measurement and Metrics: Product | 1) Describe software engineering layered technology and Process frame work.<br>2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the Requirements.<br>3) Perform various life | |

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| Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation-Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for Software Quality<br>Software Project Management: Estimation in Project Planning Process –Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision, Project Scheduling - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts | cycle activities like Analysis, Design, Implementation, Testing and Maintenance | |
| UNIT 3<br>Risk Management - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan<br>Software Quality Assurance: Elements of SQA, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Six Sigma, Software Reliability, The ISO 9000 Quality Standards, Capability Maturity Model<br>Software Testing : Verification and Validation, | 1) Demonstrate the software project management skills through case studies.<br>2) Understanding of software testing approaches.<br>3) Describe software measurement and software risks<br>4) Understanding on quality control and how to ensure good quality software. | |

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| Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design | | |

**Course: Linear Algebra using Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Field: Introduction to complex numbers, numbers in Python , Abstracting over fields, Playing with GF(2), Vector Space: Vectors are functions, Vector addition, Scalar-vector multiplication, Combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations, Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and otherwise | 1) To offer the learner the relevant linear algebra concepts through computer science applications.<br>2) Understanding concepts of vector, complex number, span and also how to implement them practically in python. | 1. Appreciate the relevance of linear algebra in the field of computer science.<br>2. Understand the concepts through program implementation<br>3. Instill a computational thinking while learning linear algebra. |
| UNIT 2:<br>Matrix: Matrices as vectors, Transpose, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication | 1) Understand concepts of matrix, basis, and dimension to implement in computer applications. | |

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| in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix multiplication, Inner product and outer product<br>From function inverse to matrix inverse<br>Basis: Coordinate systems, Two greedy algorithms for finding a set of generators, Minimum Spanning Forest and GF(2), Linear dependence, Basis , Unique representation, Change of basis, first look, Computational problems involving finding a basis<br>Dimension: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator | | |
| UNIT 3:<br><br>Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination, Finding a basis for the null space, Factoring integers,<br>Inner Product: The inner product for vectors over the reals, Orthogonality, Orthogonalization: Projection orthogonal to multiple vectors, Projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, Orthogonal complement,<br>Eigenvector: Modeling discrete dynamic processes, Diagonalization of the Fibonacci matrix, Eigenvalues and eigenvectors, Coordinate | Understand concepts of Guass Elimination, orthogonalization, eigen vector. | |

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| representation in terms of eigenvectors. The Internet worm. Existence of eigenvalues. Markov chains. Modeling a web surfer. PageRank. | | |

**Course: .NET Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>The .NET Framework: .NET Languages, Common Language Runtime, .NET Class Library<br>C# Language Basics: Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial Classes<br>ASP.NET: Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders, HTML Server Controls - View State, HTML Control Classes, HTML Control Events, HtmlControl Base Class, HtmlContainerControl Class, HtmlInputControl Class, Page Class, global.asax | 1) Understand the .NET framework<br>2) Acquire knowledge of C# language<br>3) Implement programs on C# programming language<br>4) Understand concept and HTML Server Controls of ASP.NET | 1. Understand the .NET framework<br>2. Develop a proficiency in the C# programming language<br>3. Proficiently develop ASP.NET web applications using C#<br>4. Use ADO.NET for data persistence in a web application |

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| File, web.config File | | |
| UNIT 2:<br>Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events and AutoPostBack, Page Life Cycle<br>State Management: ViewState, Cross-Page Posting, Query String, Cookies, Session State, Configuring Session State, Application State<br>Validation: Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions<br>Rich Controls: Calendar Control, AdRotator Control, MultiView Control<br>Themes and Master Pages: How Themes Work, Applying a Simple Theme, Handling Theme Conflicts, Simple Master Page and Content Page, Connecting Master pages and Content Pages, Master Page with Multiple Content Regions, Master Pages and Relative Paths<br>Website Navigation: Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control | 1) Understand Web Controls in ASP.NET<br>2) Acquire knowledge on working of validators, master pages<br>3) Implement programs on website navigation | |
| UNIT 3:<br><br>ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, | 1) Understand concept of ADO.NET<br>2) Understand working with XML<br>3) Acquire knowledge | |

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| Select Command, DataReader, Disconnected Data Access<br>Data Binding: Introduction, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls – SqlDataSource Data Controls: GridView, DetailsView, FormView<br>Working with XML: XML Classes – XMLTextWriter, XMLTextReader<br>Caching: When to Use Caching, Output Caching, Data Caching<br>LINQ: Understanding LINQ, LINQ Basics,<br>ASP.NET AJAX: ScriptManager, Partial Refreshes, Progress Notification,<br>Timed Refreshes | of LINQ basics<br>4) Understand how AJAX used in ASP.NET<br>5) Develop web application in ASP.NET using C# programming language. | |

**Course:Skill Enhancement: Android Developer Fundamentals**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>What is Android? Obtaining the required tools, creating first android app, understanding the components of screen, adapting display orientation, action bar, Activities and Intents, Activity Lifecycle and Saving State, Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View | 1) Demonstrate their understanding of the fundamentals of Android operating systems<br>2) To implement Basic Views | 1) Understand the requirements of Mobile programming environment.<br>2) Learn about basic methods, tools and techniques for developing Apps<br>3) Explore and practice App development on Android Platform<br>4) Develop working prototypes of working systems for various uses in daily lives. |
| UNIT 2:<br>User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently | 1) To program various Input controls<br>2) To design simple Andriod App | |
| UNIT 3:<br>Data - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite | 1) To understand the daata connectivity in Andriod<br>2) To understand the implementation of | |

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| primer, store data using SQLite database, ContentProviders, loaders to load and display data, Permissions, performance and security, Firebase and AdMob, Publish your app | SQLite | |

Coordinator B.Sc.CS

**T.Y.B.Sc. COMPUTER SCIENCE SEM 5**

**Course: Artificial Intelligence**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>What Is AI: Foundations, History and State of the Art of AI<br>Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents.<br>Problem Solving by searching:<br>Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. | 1) Identify problems where artificial intelligence techniques are applicable<br>2) compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems<br>3) Toclassify the different types of agents | 1) After completion of this course, learner should get a clear understanding of AI<br>2) Different search algorithms used for solving problems.<br>3) The learner should also get acquainted with different learning algorithms and models used in machine learning. |
| UNIT 2:<br><br>Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning | 1) To formulate and choose best hypothesis<br>2) To understand and the architecture of Artificial Neural Networks<br>3) To understand the working of SVM<br>4) To Justify the use of ensemble learning | |
| UNIT 3:<br><br>Learning probabilistic models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The | 1) Demonstrate proficiency in applying scientific method to models of probabilistic learning<br>2) To describe | |

ANJUMAN-I-ISLAM'S COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

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| EM Algorithm. Reinforcement learning Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning. | Reinforcement Learning and its type. | |

**Course: Linux Server Administration**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction:<br>Technical Summary of Linux Distributions, Managing Software<br>Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems,<br>Core System Services, Process of configuring, compiling, Linux Kernel<br>Networking and Security: TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security | 1) Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. | 1) Learner will be able to develop Linux based systems and maintain.<br>2) Learner will be able to install appropriate service on Linux server as per requirement.<br>3) Learner will have proficiency in Linux server administration. |
| UNIT 2:<br>Internet Services: Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server,<br>Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail<br>Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, | 1) Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.<br>2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS. | |

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| OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security | | |
| UNIT 3<br>Intranet Services<br>Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications<br>File Servers, Email Services, Chat Applications, Virtual Private Networking. | 1) Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.<br>2) To illustrate various intranet services in Linux and there configuration steps. | |

**Course: Architecting of IoT**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to IOT, Design Principle and Standards.<br><br>IOT reference model and architecture, ITs deployment and operational view.<br><br>Learning about device domain | To provide the learning about IOT domain and its architectural view.<br><br>To Learn about Reference Model and Architectural view<br><br>Learning about Function of device domain and gateway domain. | Students should have a complete understanding of IOT Networks and its deployment.<br><br>Learn the different layer protocol to apply in applications for better security.<br><br>Learn the need of IPv4 and IPv6 along with all layer protocols. |
| UNIT 2:<br>Protocols involved in Data link and Network layer<br><br>PHY/MAC - 3GPP, Wireless HART, BLE.<br><br>IPV4 and IPV6 requirements, 6LowPAN, CORPL and other protocols | Learning f Data link layer like 3GPP and Wireless HART.<br><br>Understanding the difference between protocols.<br><br>Requirement of IPv4 and IPv6 and its differences | |



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| | Learn the working about network layer protocol. | |
| UNIT 3<br><br>Transport layer Protocol TCP, MPTCP etc.<br><br>Session LAyer Protocol - HTTP, CoAP etc.<br><br>Service Layer Protocol oneM2M, ETSI, M2M etc. | Learn the functions of transport layer protocol like connection oriented, multipath TCP etc.<br><br>Understand the session layer protocol HTTP and CoAP to exchange the packets.<br><br>Machine to Machine Services. | |

**Course: Web Services**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Web services basics : What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform | 1) To implement a basic RESTful or SOAP web service using the JAX-WS framework in Java.<br>2) By learning about XML and SOAP, students will be able to implement data exchange between different systems in a standardized way, which can improve interoperability and simplify integration.<br>3) Understanding the Web Services Development Life Cycle (WSDLC) can help illustrate the process of developing, testing, and deploying web services in a structured and methodical way. | Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services |
| UNIT 2:<br>The REST Architectural style : Introducing HTTP, The core architectural elements of a RESTful system, | 1) Understanding REST architecture.<br>2) Create Web services Application using REST API's<br>3) Apply JASON and REST programming | |

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| Description and discovery of RESTful web services. Java tools and frameworks for building RESTful web services. JSON message format and tools and frameworks around JSON. Build RESTful web services with JAX-RS APIs. The Description and Discovery of RESTful Web Services. Design guidelines for building RESTful web services. Secure RESTful web services | fundamentals | |
| UNIT 3: Developing Service-Oriented Applications with WCF : What Is Windows Communication Foundation. Fundamental Windows Communication Foundation Concepts. Windows Communication Foundation Architecture. WCF and .NET Framework Client Profile. Basic WCF Programming. WCF Feature Details. Web Service QoS | 1) Understanding Windows Communication foundation.<br>2) Analyze Windows Communication Foundation Architecture<br>3) Create .NET framework based WCF. | |

**Course: Game Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Mathematics for Computer Graphics, DirectX Kickstart: Cartesian Coordinate system: The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of | 1) Understand basic concept of mathematics used in computer graphics<br>2) Acquire knowledge on different types of transformations<br>3) Understand difference of CPU and GPU | Learner should study Graphics and gaming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn. |

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| Pythagoras in 2D. Coordinates, Theorem of Pythagoras in 3D, 3D Polygons. Euler's Rule<br>Vectors: Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas<br>Transformations: 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis. Transforming Vectors, Determinants, Perspective Projection, Interpolation<br>DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU? | | |
| UNIT 2<br>DirectX Pipeline and Programming:<br>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, | 1) Understand DIrectX Pipeline<br>2) Understand trigonometry formulas and types of curves<br>3) Acquire knowledge of types of interpolation | |

ARCHITECT ASSTT. MUMBAI

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| Multisampling Theory and MS in Direct3D, Feature Levels<br>Direct3D 11 Rendering Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM)<br>Understanding Meshes or Objects, Texturing, Lighting, Blending, Interpolation and Character Animation:<br>Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratics, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships<br>Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions<br>Curves: Circle, Bezier, B-Splines<br>Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line. | 4) Understand analytical geometry concept | |
| UNIT 3:<br>Introduction to Rendering Engines: Understanding the current market Rendering Engines, Understanding AR, VR and MR.Depth Mappers, Mobile | 1) Understand rendering engines concept<br>2) Understand difference between AR, VR and MR<br>3) Understand working in Unity | |

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| Phones: Smart Glasses, HMD's<br>Unity Engine<br>Multi-platform publishing, VR + AR: Introduction and working in Unity: 2D, Graphics, Physics, Scripting, Animation, Timeline,<br>Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing,<br>Scripting: Scripting Overview, Scripting Tools and Event Overview<br>XR: VR, AR, MR, Conceptual Differences, SDK, Devices | 4) Develop games using Unity concepts | |

**T.Y.B.Sc. COMPUTER SCIENCE SEM 6**

**Course: Wireless Sensor Networks and Mobile Communication**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks. Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.<br>Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.<br>Network architecture. Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts. | Learn the Introduction to WSN and its need in todays world.<br><br>Understand Deployment architecture, Topology used in deployment.<br><br>Different components of WSN<br><br>Hardware and Software requirements of WSN.<br><br>Learn about MANETS and efficient use of battery. | 1) After completion of this course, learner should be able to list various applications of wireless sensor networks,<br>2) Describe the concepts, protocols, design,<br>3) implementation and use of wireless sensor networks.<br>4) Also implement and evaluate new ideas for solving wireless sensor network design issues. |

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| UNIT 2<br>Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study, Routing Protocols : Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks, Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. | To PRovide knowledge of MAC Protocols used for WSN and ROuting protocols for route updates.<br><br>Protocols used for Transport layer like conversion of existing TCP to suite the environment of WSN for efficient use of power | |
| UNIT 3<br><br>Introduction, Wireless Transmission and Medium Access Control, Applications, A short history of wireless communication, Wireless Transmission, Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems, Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, | To provide knowledge about history of WSN and its application,<br><br>Learn about Cellular system in telecom<br><br>How does the HAndover and Takeover of call works<br><br>Satellite functioning and different architecture.<br><br>Learn ts application in GEO,LEO and MEO. | |

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| Localization And Calling, Handover, security, New data services, DECT System architecture, Protocol architecture, ETRA, UMTS and IMT-2000.<br>Satellite Systems: History, Applications, Basics, GEO, LEO, MEO, Routing, Localization, Handover. | | |

**Course: Cloud Computing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing. Elements of Parallel Computing. Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds. | 1) Explain the core concepts of the cloud computing paradigm<br>2) Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies. | 1) After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing<br>2) The possible applications for state-of-the-art cloud computing using open source technology.<br>3) Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.<br>4) They should explain the core issues of cloud computing such as security, privacy, and interoperability. |
| UNIT 2:<br><br>Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM. Creating virtual | 1) Implement different types of Virtualization technologies and Service Oriented Architecture systems | |

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| machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing | | |
| UNIT 3:<br>Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat | 1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges<br>2) Illustrate the fundamental concepts of cloud storage | |

**Course: Information Retrieval**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction to Information Retrieval: Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval. | 1) Describe the objectives of information retrieval Systems.<br><br>2) To discuss the issues related to IR | 1) After completion of this course, learner should get an understanding of the field of information retrieval<br>2) its relationship to search engines.<br>3) It will give the learner an understanding to apply information retrieval models. |
| UNIT 2:<br>Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, | 1) To understand the working of specialised search techniques<br>2) Describe Map-Reduce. | |

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| Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval. | 3) Analyze working of QA systems | |
| UNIT 3:<br><br>Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures. XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval. | 1) To understand the acrchitectutre of web search engine<br>2) To demonstrate XML retrieval. | |

**Course: Digital Image Processing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing<br>2D Signals and Systems : | 1) Review the fundamental concepts of a digital image processing system.<br>2) Understand the Human Visual Systems<br>3) Explain the fundamentals of digital image and its | 1) Learner should review the fundamental concepts of a digital image processing system.<br>2) Analyze the images in the frequency domain using various transforms.<br>3) Evaluate the |

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| 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation<br>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform | processing<br>4) Descibe the 2D Signals<br>5) Problem solvig in Image Convolution | techniques for image enhancement and image segmentation<br>4) Apply various compression techniques.<br>5) They will be familiar with basic image processing techniques for solving real problems. |
| UNIT 2:<br>Image Enhancement :Image Enhancement in spatial domain, Enhancement trough Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic<br><br>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image | 1) understand the need for image transforms different types of image transforms and their properties.<br>2) learn different techniques employed for the enhancement of images.<br>3) To identify different colour models and color image processing | |

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| processing Logical operations Morphological operations Dilation and Erosion Distance Transform Colour Image processing Colour images Colour Model Colour image quantization Histogram of a colour image | | |
| UNIT 3 Image Segmentation Image segmentation techniques Region approach Clustering techniques Thresholding Edge-based segmentation Edge detection Edge Linking Hough Transform Image Compression Need for image compression Redundancy in images Image-compression scheme Fundamentals of Information Theory Run-length coding Shannon-Fano coding Huffman Coding Arithmetic Coding Transform-based compression Image-compression standard | 1) Understand the need for image compression<br>2) To learn the spatial and frequency domain techniques of image compression<br>3) To implement image segmentation techniques | |

**Course: Ethical Hacking**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Information Security : Attacks and Vulnerabilities<br>Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle<br>Types of malware :Worms, viruses, Trojans, Spyware, Rootkits<br>Types of vulnerabilities : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database<br>Types of attacks and their common prevention mechanisms : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs | 1) Understand concept of information security<br>2) Understand types of malware and vulnerabilities<br>3) Acquire knowledge on types of attacks and their prevention mechanisms<br>4) Discuss recent attacks | Learner will know to identify security vulnerabilities and weaknesses in the target applications.<br>They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines. |

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| Case-studies : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit | | |
| UNIT 2:<br>Ethical Hacking – I (Introduction and pre-attack)<br>Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing.<br>Approach : Planning - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, | 1) Discuss types of ethical hacking<br>2) Understand how penetration testing is important<br>3) Acquire knowledge of different phases of ethical hacking | |

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| Preparing report Fixing security gaps following the report Enterprise strategy Repeated PT approval by security testing team Continuous Application Security Testing Phases Reconnaissance/foot printing/Enumeration Phases Scanning, Sniffing | | |
| UNIT 3<br>Ethical Hacking Enterprise Security Phases Gaining and Maintaining Access Systems hacking – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking – ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPSpoofing, SYN Flooding, Smurf attack, Applications hacking – SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, Malware analysis – Netcat Trojan, wrapping definition, reverse engineering Phases – Covering your tracks – Steganography, Event Logs alteration Additional Security Mechanisms – IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines) | Acquire knowledge to test and exploit systems using various tools and understand the impact of hacking in real time machines | |

Coordinator B.Sc. CS.

**COURSE OUTCOME**
**F. Y. B. Sc. COMPUTER SCIENCE SEM 1**
**2019-2020 Syllabus**

**Course: Computer Organization and Design**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Computer Abstractions and Technology: Basic structure and operation of a computer, functional units and their interaction. Representation of numbers and characters. Logic circuits and functions: Combinational circuits and functions: Basic logic gates and functions, truth tables; logic circuits and functions. Minimization with Karnaugh maps. Synthesis of logic functions with and-or-not gates, nand gates, nor gates. Fan-in and fan-out requirements; tristate buffers. Half adder, full adder, ripple carry adder.<br>(Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers.<br>Sequential circuits and functions: State diagram and state table; finite state machines and their synthesis. | 1) Students are able to understand basic functions of computers.<br>2) To learn about how computer systems work and underlying principles<br>3) To understand the basics of digital electronics needed for computers | 1) To learn about how computer systems work and underlying principles<br>2) To understand the basics of digital electronics needed for computers<br>3) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>4) To understand the basics of processor structure and operation<br>5) To understand how data is transferred between the processor and I/O devices |
| UNIT 2:<br>Instruction set architectures: Memory organization, addressing and operations; word size, big-endian and little-endian arrangements. Instructions, sequencing. Instruction sets for RISC and CISC (examples Altera NIOS II and Freescale ColdFire). Operand addressing modes; pointers; indexing for arrays. Machine language, assembly language, assembler directives. Function calls, | 1) To understand the basics of instruction set architecture for reduced and complex instruction sets<br>2) Understand types of machine instructions<br>3) Understand difference between RISC and CISC | |

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| processor runtime stack, stack frame. Types of machine instructions: arithmetic, logic, shift, etc. Instruction sets, RISC and CISC examples. | | |
| UNIT 3:<br>Basic Processor Unit:<br>Main components of a processor: registers and register files, ALU, control unit, instruction fetch unit, interfaces to instruction and data memories. Datapath. Instruction fetch and execute; executing arithmetic/logic, memory access and branch instructions; hardwired and microprogrammed control for RISC and CISC.<br>Basic I/O: Accessing I/O devices, data transfers between processor and I/O devices. Interrupts and exceptions: interrupt requests and processing. | 1) To understand the basics of processor structure and operation<br>2) To understand how data is transferred between the processor and I/O devices | |

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**Course: Programming with Python- I**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Reasons for Python as the learner's first programming language. Introduction to the IDLE interpreter (shell) and its documentation. Expression evaluation: similarities and differences compared to a calculator; expressions and operators of types int, float, boolean. Built-in function type. Operator precedence.<br>Enumeration of simple and compound statements. The expression statement. The assert statement, whose operand is a boolean expression (values true or false). The assignment statement, dynamic binding of names to values, (type is associated with data and not with names); automatic and implicit declaration of variable names with the assignment statement; assigning the value None to a name. The del (delete) statement. Input/output with print and input functions. A statement list (semicolon separated list of simple statements on a single line) as a single interpreter command.<br>The import statement for already-defined functions and constants. The augmented assignment statement. The built-inhelp() function.<br>Interactive and script modes of IDLE, running a script, restarting the shell.<br>The compound statement def to define functions; the role of indentation for delimiting the body of a compound statement, | 1) To understand why Python is a useful scripting language for developers<br>2) Understand the process of designing programs<br>3) Acquire knowledge about programming<br>4) To implement inbuilt functions of Python | 1) Students should be able to understand the concepts of programming before actually starting to write programs.<br>2) Students should be able to develop logic for Problem Solving.<br>3) Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.<br>4) Students should be able to apply the problem solving skills using syntactically simple language i.e. |

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| calling a previously defined function. Compound data types str, tuple and list (enclosed in quotes, parentheses and brackets, respectively). Indexing individual elements within these types. Strings and tuples are immutable, lists are mutable. Built-in functions min, max, sum. Interactive solution of model problems, (e.g., finding the square root of a number or zero of a function), by repeatedly executing the body of a loop (where the body is a statement list). | | |
| UNIT 2:<br>Advantages of functions, function parameters, formal parameters, actual parameters, global and local variables. The range function, the iterative for statement. The conditional statements if, if-else, if-elif-else. The iterative statements while, while-else, for-else. The continue statement to skip over one iteration of a loop, the break statement to exit the loop.<br>Nested compound statements. Dictionaries: concept of key-value pairs, techniques to create, update and delete dictionary items. Problem-solving using compound types and statements. | 1. Describe functions in Python<br>2. Demonstrate conditional statements<br>3. Discuss the compound statements<br>4. Construct programs to solve problems using functions, dictionary | |
| UNIT 3:<br>Anonymous functions. List comprehensions. Gentle introduction to object-oriented programming; using the built-in dir() function, enumerate the methods of strings, tuples, lists, dictionaries. Using these methods for problem-solving with compound types | 1. Understand the working of anonymous functions<br>2. Cursory explanation of OOPS concepts<br>3. Illustrate Tuples and List<br>4. Programming using Tuples and List. | |

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**Course: Free and Open Source Software**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction<br>Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project. Methodologies Open Source History, Initiatives, Principle and methodologies. Philosophy: Software Freedom, Open Source Development Model Licenses and Patents: What Is A License, Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copy lefts, Patents Economics of FOSS : Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization Social Impact Open source vs. closed source, Open source government, Open source ethics. Social and Financial impacts of open source technology, Shared software, Shared source, Open Source in Government. | 1) To understand the meaning of the open source.<br>2) To learn about various terms in open source software like FOSS, GNU, license, patents, copyrights, etc.<br>3) To learn and understand about various open source software. | 1) Upon completion of this course, students should have a good working knowledge of Open Source ecosystem, its use, impact and importance.<br>2) This course shall help student to learn Open Source methodologies, case studies with real life examples. |
| UNIT 2:<br>Case Studies<br>Example Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Open Office. Study: Understanding the developmental models, licensings, mode of funding, commercial/non-commercial use. Open Source Hardware, Open Source Design, Open source Teaching. Open source media. Collaboration, Community and Communication Contributing to Open Source Projects Introduction to github, interacting with the community on | 1) Discuss various examples of open source software like Android, Linux, etc.<br>2) To illustrate how to use various open source software. | |

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| github, Communication and etiquette, testing open source code, reporting issues, contributing code.<br>Introduction to wikipedia, contributing to Wikipedia Or contributing to any prominent open source project of student's choice. Starting and Maintaining own Open Source Project. | | |
| UNIT 3:<br>Understanding Open Source Ecosystem<br>Open Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris.<br>Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies | 1) To learn various technologies like docker, programming languages, etc.<br>2) To understand Linux and other FOSS technologies like hardware, virtualization, etc. | |

**Course: Database Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to DBMS – Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture Data models - Client/Server Architecture, Object Based Logical Model, Record Based Logical Model ( relational, hierarchical, network) Entity Relationship Model - Entities, attributes, entity sets, relations, relationship sets, Additional constraints ( key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER ( entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER) Relational data model– Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint<br>ER to Table- Entity to Table, Relationship to tables with and without key constraints. | 1) To understand the basic use of database.<br>2) Various models like RDBMS, Network model, etc.<br>3) To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc.<br>4) Constraints used in database management system.<br>5) To understand how to convert ER to table so that we can implement these tables in database application.<br>6) Describe fundamental elements of RDBMS.<br>7) Design E-R diagram to represent simple database applications scenarios. | 1) Students should be able to evaluate business information problem and find the requirements of a problem in terms of data.<br>2) Students should be able to design the database schema with the use of appropriate data types for storage of data in database.<br>3) Students should be able to create, manipulate, query and back up the databases. |
| UNIT 2:<br>Schema refinement and Normal forms: Functional dependencies, first, second, third,and BCNF normal forms based on primary keys, lossless join decomposition.<br>Relational Algebra operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins,<br>division)<br>DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary | 1) To understand Functional dependencies, schema so that the table relationship is can be understood which will further help to create tables in database.<br>2) To illustrate DDL statements, DML statements, Joins to update, alter or delete any record from the database without changing other records of tables. | |

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| key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables, Backing Up and Restoring databases<br>DML Statements – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause | 3) Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL.<br>4) Criticize a database and improve the design by normalization. | |
| UNIT 3:<br>Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse)<br>Joining Tables – inner join, outer join (left outer, right outer, full outer)<br>Subqueries – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries<br>Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control Views (creating, altering dropping, renaming and manipulating views)<br>DCL Statements (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges) | 1) To understand types of in built functions so that they can manipulate database records easily.<br>2) String functions, math functions, date function.<br>3) To understand about the DBA, permissions and security<br>4) Basic of Database protection & Distributed databases | |

**Course: Discrete Mathematics**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Recurrence Relations<br>(a) Functions: Definition of function. Domain, co domain and the range of a function.<br>Direct and inverse images. Injective, surjective and bijective functions. Composite<br>and inverse functions.<br>(b) Relations: Definition and examples. Properties of relations , Partial Ordering sets,<br>Linear Ordering Hasse Diagrams , Maximum and Minimum elements, Lattices<br>(c) Recurrence Relations: Definition of recurrence relations, Formulating recurrence<br>relations, solving recurrence relations- Backtracking method, Linear homogeneous recurrence relations with constant coefficients. Solving linear homogeneous<br>recurrence relations with constant coefficients of degree two when characteristic<br>equation has distinct roots and only one root, Particular solutions of non linear<br>homogeneous recurrence relation, Solution of recurrence relation by the method<br>of generation functions, Applications- Formulate and solve recurrence relation for<br>Fibonacci numbers, Tower | 1) Students are able to understand the concept of functions.<br>2) Understand types of relation<br>3) Acquire concept of partially ordered set<br>4) Implement recurrence relation concepts | 1) To provide an overview of the theory of discrete objects, starting with relations and partially ordered sets.<br>2) Study about recurrence relations, generating functions and operations on them.<br>3) Give an understanding of graphs and trees, which are widely used in software.<br>4) Provide basic knowledge about models of automata theory and the corresponding formal languages. |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| of Hanoi, Intersection of lines in a plane, Sorting Algorithms. | | |
| UNIT 2:<br>Counting Principles , Languages and Finite State Machine<br>(a) Permutations and Combinations: Partition and Distribution of objects, Permutation with distinct and indistinct objects, Binomial numbers, Combination with identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem, Combination with indistinct objects.<br>(b) Counting Principles: Sum and Product Rules, Two-way counting, Tree diagram for solving counting problems, Pigeonhole Principle (without proof); Simple examples, Inclusion Exclusion Principle (Sieve formula) (Without proof).<br>(c) Languages, Grammars and Machines: Languages , regular Expression and Regular languages, Finite state Automata, grammars, Finite state machines, Gödel numbers, Turing machines. | 1) Problem solving based on Permutation and combination<br>2) Understand concept of counting principle<br>3) Acquire basic knowledge about models of automata theory and the corresponding formal languages. | |
| UNIT 3:<br>Graphs and Trees<br>(a) Graphs : Definition and elementary results, Adjacency matrix, path matrix, Representing relations using diagraphs, Warshall's algorithm- | 1) Understand the concept of graphs and trees, which are widely used in software.<br>2) Explain algorithms of operation on Graph<br>3) Implement Graph | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| shortest path ,<br>Linked representation of a graph, Operations on graph with algorithms - searching<br><br>in a graph; Insertion in a graph, Deleting from a graph, Traversing a graph- Breadth-First search and Depth-First search.<br><br>(b) Trees: Definition and elementary results. Ordered rooted tree, Binary trees, Complete and extended binary trees, representing binary trees in memory, traversing binary trees, binary search tree, Algorithms for searching and inserting in binary search trees, Algorithms for deleting in a binary search tree | traversal techniques<br>4) Implement tree traversal techniques | |

**Course: Descriptive Statistics and Introduction to Probability**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Different types of Data required for analysis.<br>Presentation of Data using different tools<br>Calculating the centered value on the basis of observation.<br>To Learn about Variance in the given data. | Provide basic learning about different types of data and presenting tools.<br><br>To understand different centered values like mean, median and mode.<br><br>Learn about different Methods to calculate variation in the data | To provide complete learning about statistical data and its representation methods.<br><br>TO make students familiar with Central tendency and dispersion methods.<br><br>To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance.<br><br>To provide detailed learning about Probability and related examples and ensure students learn about Bayes theorem and conditional probabilities. |
| UNIT 2:<br><br>To Understand Spreadness of data in the given set of observations.<br><br>To check the symmetricity of data using skewness and kurtosis.<br><br>To analyze the regression analysis using Karl Pearson's methods.<br><br>Learn the scatterness of data using slope of line and least square method. | Provide learning of Raw and Central Moments.<br><br>Students should understand the symmetry in data using skewness value and kurtosis graph.<br><br>Learn about scatter plot and Karl pearson's coefficient<br><br>Provide learning about least square method and regression coefficient. | |
| UNIT 3:<br><br>To Learn the different terms used in probability like random sample, event, experiment, types of events.<br><br>Definition of Probability and examples based on probability.<br><br>Addition and Multiplication statements, Bayes theorem and conditional probability | Provide information about Probability ensure basic learning of terminology and definition of probability.<br><br>Students should be able to solve the example based on probability.<br><br>Learning about Statements and Conditional probability | |

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**Course: Soft Skills Development**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to Softskill and Hard Skill.<br>Personality Development, Emotional Intelligence, Etiquette and Mannerism, Communication Today. | Student should understand about knowing self and Johari's Window.<br><br>Difference between Emotional and Intelligence Quotient.<br><br>To provide learning about Professional and Personal etiquette.<br><br>Learn about 3M Model of communication, Verbal and Non Verbal Communicaiton. | 1) To know about various aspects of soft skills and learn ways to develop personality<br>2) Understand the importance and type of communication in personal and professional environment.<br>3) To provide insight into much needed technical and non-technical qualities in career planning<br>4) Learn about Leadership, team building, decision making and stress management |
| UNIT 2:<br>Employment Communication: Like Introduction to Organization process<br>Professional Presentation: Presenting self for different prospects of presentation<br>Job Interviews: TO appear for Interview<br>Group Discussion: Importance and requirement | Introduction to JOb Interview, Resume and CV.<br><br>To make the cover letter and Job Application.<br><br>Learn to Present in professional life.<br><br>Understand the steps of Interview and FAQ.<br>Group discussion process and arrangement , topics involved in group discussions | |
| UNIT 3:<br>Creativity at Workplace: Create the Work enviornment<br>Ethical Values: Values and SOciety Ethics<br>Capacity Building: Learn, Unlearn and Relearn: To build the capacity of learning<br>Leadership and Team Building: Qualities required to be leader.<br>Decision Making and Negotiation: Quick and right decision makings<br>Stress and Time Management:To learn time and stress management | To understand the workplace creativity and get the work completed in innovative ways.<br><br>Develop ethical values.<br><br>Build the capacity of learning right point and unlearn not required or wrong points.<br><br>Increase the decision making capabilities.<br><br>Learn to understand stress and method to overcome by proper time management. | |

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**COURSE OUTCOME**
**F. Y. B. Sc. COMPUTER SCIENCE SEM 2**
**2019-2020 Syllabus**

**Course: Programming with C**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Structure of C program: Header and body. Use of comments. Interpreters vs compilers,<br>Python vs C. Compilation of a program. Formatted I/O: printf(), scanf().<br>Data: Variables, Constants, data types like: int, float char, double and void, short and long size qualifiers, signed and unsigned qualifiers.<br>Compare with datatypes in Python.<br>Compare static typing in C vs dynamic typing in Python<br>Variables: Declaring variables, scope of the variables according to block, hierarchy of data types. Compare explicit declarations in C with implicit declarations in Python.<br>Types of operators: Arithmetic, relational, logical, compound assignment, increment and decrement, conditional or ternary, bitwise and comma operators.<br>Precedence and order of evaluation, statements and Expressions.<br>Automatic and explicit type conversion.<br>Iterations: Control statements for decision making: (i) Branching: if statement, else.. if statement, (does the writer | 1) Students understand the difference between Python and C.<br>2) Students should be able to use different data types in a computer program.<br>3) Students should be able to design programs involving decision structures, loops and functions. | 1) Students should be able to write, compile and debug programs in C language.<br>2) Students should be able to use different data types in a computer program.<br>3) Students should be able to design programs involving decision structures, loops and functions.<br>4) Students should be able to explain the difference between call by value and call by reference<br>5) Students should be able to understand the dynamics of memory by the use of pointers.<br>6) Students should be able to use different data structures and create/update basic data files. |

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| mean if-else or nested ifs)switch statement. (ii) Looping: while loop, do.. while, for loop. (iii) Jump statements: break, continue and goto. | | |
| UNIT 2:<br>Arrays: (One and two dimensional), declaring array variables, initialization of arrays, accessing array elements. Compare array types of C with list and tuple types of Python.<br>Data Input and Output functions: Character I/O format: getch(), getche(), getchar(), getc(), gets(), putchar(), putc(), puts().<br>Manipulating Strings: Declaring and initializing String variables, Character and string handling functions. Compare with Python strings.<br>Functions: Function declaration, function definition, Global and local variables, return statement, Calling a function by passing values. Recursion: Definition, Recursive functions. | 1) Understand concept and use of array<br>2) Able to understand data input and output functions<br>3) Students should be able to explain the difference between call by value and call by reference | |
| UNIT 3:<br>Pointer: Fundamentals, Pointer variables, Referencing and de-referencing, Pointer Arithmetic, Using Pointers with Arrays, Using Pointers with Strings, Array of Pointers, Pointers as function arguments, Functions returning pointers. Dynamic Memory Allocation: malloc(), calloc(), realloc(), free() | 1) Understand concept of pointers<br>2) Students should be able to understand the dynamics of memory by the use of pointers<br>3) Students should be able to use different data structures and create/update basic data files. | |

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| and sizeof operator. Compare with automatic garbage collection in Python.<br>Structure: Declaration of structure, reading and assignment of structure variables, Array of structures, arrays within structures, structures within structures. Compare C structures with Python tuples.<br>Unions: Defining and working with unions.<br>File handling: Different types of files like text and binary, Different types of functions: fopen(), fclose(), fgetc(), fputc(), fgets(), fputs(), fscanf(), fprintf(), getw(), putw(), fread(), fwrite(), fseek(). | | |

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**Course: Programming with Python – II**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Python File Input-Output: Opening and closing files, various types of file modes, reading and writing to files, manipulating directories. Iterables, iterators and their problemsolving applications.<br>Exception handling: What is an exception, various keywords to handle exceptions<br>such try, catch, except, else, finally, raise.<br>Regular Expressions: Concept of regular expression, various types of regular<br>expressions, using match function. | 1) To understand concept of File I/O, Exception Handling and Regullar expression.<br>2) To implement programs based on File I/O, Exception Handling and Regullar expression.<br>3) Evaluate pupils by designing regular expressions. | 1) Students should be able to understand how to read/write to files using python.<br>2) Students should be able to catch their own errors that happen during execution of programs.<br>3) Students should get an introduction to the concept of pattern matching.<br>4) Students should be made familiar with the concepts of GUI controls and designing GUI applications.<br>5) Students should be able to connect to the database to move the data to/from the application.<br>6) 6)Students should know how to connect to computers, read from URL and send email. |
| UNIT 2:<br>What is GUI, Advantages of GUI, Introduction to GUI library. Layout management,<br>events and bindings, fonts, colours, drawing on canvas (line, oval, rectangle, etc.)<br>Widgets such as : frame, label, button, checkbutton, entry, listbox, message, radiobutton, text, spinbox etc | 1) To Analyse the use of GUI in real world application.<br>2) To implement tkinter widgets | |
| UNIT 3:<br>Database connectivity in Python: Installing mysql connector, accessing | 1) To differentiate between the front end and back-end<br>2) To implement | |

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| connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity. Network connectivity: Socket module, creating server-client programs, sending email, reading from URL | database commands and connectivity<br>3) To create simple database application.<br>4) Applying networking concepts using python | |

**Course: Linux**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction<br>History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution<br>Why learn Linux?<br>Importance of Linux in software ecosystem: web servers, supercomputers, mobile, servers.<br>Installation<br>Installation methods, Hands on Installation using CD/DVD or USB drive.<br>Linux Structure<br>Linux Architecture, Filesystem basics, The boot process, init scripts, runlevels, shutdown process, Very basic introductions to Linux processes, Packaging methods: rpm/deb, Graphical Vs Command line. | 1. Gives a basic introduction to Linux<br>2. To understand importance of Linux in the real world.<br>3. Demonstrated various methods to install Linux.<br>4. Difference between CLI vs GUI. | 1) Upon completion of this course, students should have a good working knowledge of Linux, from both<br>a graphical and command line perspective, allowing them to easily use any Linux distribution.<br>2) This course shall help students to learn advanced subjects in computer science practically.<br>3) Student shall be able to progress as a Developer or Linux System Administrator using the acquired<br>skill set. |
| UNIT 2:<br>Graphical Desktop Session Management, Basic Desktop Operations, Network Management, Installing<br>and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors, Multimedia applications.<br>Command Line<br>Command line mode options, Shells, Basic Commands, General Purpose Utilities, Installing Software, User management, Environment variables, Command | 1. Discussed various text editors in Linux.<br>2. To learn general purpose commands to start with Linux.<br>3. File system used in Linux. | |

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| aliases.<br>Linux Documentation<br>man pages, GNU info, help command, More documentation sources<br>File Operations<br>Filesystem, Filesystem architecture, File types, File attributes, Working with files,<br>Backup, compression | | |
| UNIT 3:<br>Security<br>Understanding Linux Security, Uses of root, sudo command, working with<br>passwords, Bypassing user authentication, Understanding ssh<br>Networking<br>Basic introduction to Networking, Network protocols: http, ftp etc., IP address, DNS, Browsers, Transferring files.<br>ssh, telnet, ping, traceroute, route, hostname, networking GUI.<br>Basic Shell Scripting<br>Features and capabilities, Syntax, Constructs, Modifying files, Sed, awk command,<br>File manipulation utilities, Dealing with large files and Text, String manipulation, Boolean expressions, File tests, Case, Debugging, Regular expressions | 1. Students have been explained about security in Linux.<br>2. Discussed networking commands to check network-related tasks in Linux.<br>3. Basic commands to work with file manipulation. | |

**Course: Data Structures**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators.<br>Application<br>Arrays: Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Data Type, Application<br>Sets and Maps: Sets-Set ADT, Selecting Data Structure, List based Implementation,<br>Maps-Map ADT, List Based Implementation,<br>Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarrays, Application<br>Algorithm Analysis: Complexity Analysis-Big-O Notation, Evaluating Python Code,<br>Evaluating Python List, Amortized Cost, Evaluating Set ADT, Application<br>Searching and Sorting: Searching-Linear Search, Binary Search, Sorting-Bubble,<br>Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List,<br>Maintaining sorted Lists. | 1. To understand data types, arrays, ADT, searching, and sorting concepts | 1) Learn about Data structures, its types and significance in computing<br>2) Explore about Abstract Data types and its implementation<br>3) Ability to program various applications using different data structure in Python |
| UNIT 2:<br>Linked Structures: Introduction, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, Bag ADT-Linked List Implementation.<br>Comparing Implementations, Linked List Iterators, More Ways | 1. To learn various types of data structures like linked list, stack, queue, list, etc.<br>2. Also make student understand where these data structures can be implemented. | |

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| to Build Kinked Lists, Applications-Polynomials Stacks: Stack ADT, Implementing Stacks- Using Python List, Using Linked List, Stack Applications-Balanced Delimiters, Evaluating Postfix Expressions Queues: Queue ADT, Implementing Queue- Using Python List, Circular Array, Using List, Priority Queues- Priority Queue ADT, Bounded and unbounded Priority Queues Advanced Linked List: Doubly Linked Lists- Organization and Operation, Circular Linked List-Organization and Operation, Multi Lists | | |
| UNIT 3: Recursion: Recursive Functions, Properties of Recursion, Its working, Recursive Applications Hash Table: Introduction, Hashing-Linear Probing, Clustering, Rehashing, Separate Chaining, Hash Functions Advanced Sorting: Merge Sort, Quick Sort, Radix Sort, Sorting Linked List Binary Trees: Tree Structure, Binary Tree- Properties, Implementation and Traversals, Expression Trees, Heaps and Heapsort,Search Trees | 1. To discuss various technique to index data in data structure.<br>2. Illustrate tree data structure, hash function, searching trees, heap sort, traversal and recursive function. | |

**Course: Calculus**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>DERIVATIVES AND ITS APPLICATIONS:<br>Review of Functions, limit of a function, continuity of a function, derivative function.<br>Derivative In Graphing And Applications: Analysis of Functions: Increase, Decrease, Concavity, Relative Extrema; Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents. Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method. | 1) Understand the concept of limit, continuity, derivatives.<br>2) Problem solving on derivative in graphing and applications | 1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions.<br>2) Ability to appreciate real world applications which use these concepts.<br>3) Skill to formulate a problem through Mathematical modeling and simulation. |
| UNIT 2:<br>An Overview of the Area Problem, Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Area Between Two Curves, Length of a Plane Curve. Numerical Integration: Simpson's Rule. Modeling with Differential Equations, Separation of Variables, Slope Fields, Euler's Method, First-Order Differential Equations and Applications. | 1) Understand the concept of integration<br>2) Problem solving with different types of integration methods.<br>3) Problem solving on modeling with differential equation | |
| UNIT 3:<br>PARTIAL DERIVATIVES AND ITS APPLICATIONS:<br>Functions of Two or More Variables Limits and | 1) Understand the concept partial derivatives<br>2) Implement partial derivatives on | |

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| Continuity Partial Derivatives, Differentiability, Differentials, and Local Linearity, Chain Rule, Directional Derivatives and Gradients, Tangent Planes and Normal, Vectors, Maxima and Minima of Functions of Two Variables. | different applications | |

**Course: Statistical Methods and Testing of Hypothesis**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Learn about Random Variable, it's type discrete and continuous.<br><br>Different functions like pdf, pmf, cdf and reliability.<br><br>Introduction to basic distribution like Binomial, Normal, F, t and Chi-square with examples | To learn about discrete and Continuous data with its related functions like pdf and pmf.<br><br>To understand and use the distribution like BInomial for discrete data, Normal for continuous, F for comparison of variance. | Students should be able to learn about distribution and its application on the basis of example.<br><br>To Analyze and proof the hypothetical statements using test statistics.<br><br>Learn to read tabulated value of different functions.<br><br>Analysis or compare 2 and more samples together and conclude the outcome.<br><br>Learn to calculate and analyze the Non parametric distribution and CHi square association. |
| UNIT 2:<br>Learn about Hypothesis and steps to proof the Hypothesis.<br><br>Learn about Analysis of variance : one-way, two-way analysis of variance and Parametric tests. | Definition of Hypothesis and steps to conclude the hypothesis<br><br>Learn Methods of ANOVA and analyze more than 2 data simultaneously. | |
| UNIT 3:<br>Learn about Non Parametric test and different methods to analyze the qualitative data.<br><br>Chi Square test of association for 2 samples | Learn method of Non parametric tests like sign test, wilcoxon test, kruskal wallis test and Post hoc analysis | |

**Course: Green Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Green IT Overview: Introduction , Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green I , Holistic Approach to Greening IT, Greening IT, Applying IT for Enhancing Environmental Sustainability, Green IT Standards and Eco-Labelling of IT , Enterprise Green IT Strategy, Green Washing, Green IT: Burden or Opportunity?<br>Green Devices and Hardware: Introduction , Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose<br>Green Software: Introduction , Processor Power States , Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power<br>Sustainable Software Development: Introduction, Current Practices, Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software Methodology, Defining Actions | 1. To explain Green Computing and Green IT infrastructure for making computing and information system environment sustainable<br>2. To explain the principles of Energy efficient technologies | 1) Learn about green IT can be achieved in and by hardware, software, network communication and data center operations.<br>2) Understand the strategies, frameworks, processes and management of green IT |
| UNIT 2:<br>Green Data Centres: Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics<br>Green Data Storage: Introduction , Storage Media Power Characteristics, Energy | 1. To encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services<br>2. To impart knowledge on the methods of reducing CO2 levels in atmosphere | |

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|---|---|---|
| Management Techniques for Hard Disks, System-Level Energy Management<br>Green Networks and Communications: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards<br>Enterprise Green IT Strategy: Introduction, Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy, Metrics and Measurements in Green Strategies. | | |
| UNIT 3:<br>Sustainable Information Systems and Green Metrics: Introduction, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Measuring the Maturity of Sustainable ICT<br>Enterprise Green IT Readiness: Introduction, Readiness and Capability, Development of the G-Readiness Framework, Measuring an Organization's G-Readiness<br>Sustainable IT Services: Creating a Framework for Service Innovation: Introduction, Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework<br>Green Enterprises and the Role of IT: Introduction, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues | 1. To explores the use of approaches to embrace green IT initiatives<br>2. To gain knowledge of the importance of life cycle assessment | |

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**COURSE OUTCOME**
**S. Y. B. Sc. COMPUTER SCIENCE SEM 3**
**2019-2020 Syllabus**

**Course: Theory of Computation**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Automata Theory: Defining Automaton, Finite Automaton, Transitios and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines, Minimizing Automata.<br>Formal Languges: Defining Grammar, Derivations, Languges generated by Grammar, Comsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata | 1) To understand Automata Theory<br>2) Identifying DFA and NDFA.<br>3) Defining Grammer and Languages<br>4) Distinguish different computing languages and classify their respective types | 1. Understand Grammar and Languages<br>2. Learn about Automata theory and its application in Language Design<br>3. Learn about Turing Machines and Pushdown Automata<br>4. Understand Linear Bound Automata and its applications |
| UNIT 2:<br><br>Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar<br>Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG Pushdown Automata. Definitions, Acceptance by PDA, PDA and CFG | 1) analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.<br>2) To Apply transformation between multiple representations of finite automata.<br>3) Problem solving based on Regular Sets and Regular Grammar | |

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| UNIT 3:<br><br>Linear Bound Automata: The Linear Bound Automata Model, Linear Bound Automata and Languages.<br>Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine, Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems | 1) To state and explain the Church-Turing thesis and its significance.<br>2) Problem solving based on Linear Bound Automata | |

**Course: Core JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>The Java Language: Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays<br>OOPS: Introduction, Class, Object, Static Keywords, Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces<br>String Manipulations: String, String Buffer, String Tokenizer<br>Packages: Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java.swing), User Defined Packages, Access specifiers | 1) Understand the concept of OOPs as well as the purpose and usage principles of Inheritance, polymorphism, encapsulation etc.<br>2) Understand the basic concepts of classes and objects.<br>3) Understand JVM Concept , Data types and Operators, Strings.<br>4) To implement String methods<br>5) 2. 3. 4. Understand Internet Programming Using Java Applets & Graphic Programming & Make use of array, constructors, Inheritance, Packages and Interfaces. 5. | 1. Object oriented programming concepts using Java.<br>2. Knowledge of input, its processing and getting suitable output.<br>3. Understand, design, implement and evaluate classes and applets.<br>4. Knowledge and implementation of AWT package. |
| UNIT 2:<br><br>Exception Handling: Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples<br>Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods<br>I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams, File, Random | 1) To recognise the exceptions<br>2) Understand the concept of Exceptional Handling<br>3) To model multithreading<br>4) To generate Client server code in Java | |

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| access File, Serialization Networking: Introduction, Socket, Server socket, Client –Server Communication | | |
| UNIT 3:<br>Wrapper Classes: Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes<br>Collection Framework: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes<br><br>Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class<br>AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area | 1) To determine the Wrapper classes<br>2) To use the inbuilt util package.<br>3) To implement interface<br>4) To illustrate the use of AWT packages<br>5) To relate event driven programming.<br>6) Understand the concept of Exceptional Handling/Event Handling & Java I/O Handling. | |

**Course: Operating System**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction and Operating-Systems Structures: Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure<br>Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication<br><br>Threads: Overview, Multicore Programming, Multithreading Models | 1) To understand the services provided by and the design of an operating system.<br>2) To make aware of different types of Operating System and their services. | 1. To provide a understanding of operating system, its structures and functioning<br><br>2. Develop and master understanding of algorithms used by operating systems for various purposes. |
| UNIT 2:<br>Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors<br>CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel | 1) Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.<br>2) Analyze important algorithms eg. Process scheduling and memory management algorithms<br>3) Students should understand the data structures and | |

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| Feedback Queue Scheduling), Thread Scheduling<br>Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock | algorithms used to implement an OS.<br>4) To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.<br>5) Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems. | |
| UNIT 3:<br><br>Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table<br>Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing<br>Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management<br>File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing<br>File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management | 1) To understand the structure and organization of the file system.<br>2) To understand different approaches to memory management.<br>3) Describe the role of paging, segmentation and virtual memory in operating systems.<br>4) Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms. | |

**Course: Database Management Systems**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Stored Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures.<br>Triggers: Concept of triggers, Implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers.<br>Sequences: creating sequences, referencing, altering and dropping a sequence.<br>File Organization and Indexing: Cluster, Primary and secondary indexing, Index data structure: hash and Tree based indexing, Comparison of file organization: cost model, Heap files, sorted files, clustered files. Creating, dropping and maintaining indexes. | 1) To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage.<br>2) To understand concept of trigger, data integrity, sequence and file organization to further implement on projects. | 1. Master concepts of stored procedure and triggers and its use.<br>2. Learn about using PL/SQL for data management<br>3. Understand concepts and implementations of transaction management and crash recovery |
| UNIT 2:<br>Fundamentals of PL/SQL: Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements, PL/SQL Datatypes: Number Types, Character Types, Boolean | 1) To understand basics of PL/SQL.<br>2) Different operators in PL/SQL.<br>3) To learn different data types in PL/SQL.<br>4) To illustrate case statements and conditional statements. | |

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| Type, Datetime and Interval Types<br>Overview of PL/SQL Control Structures: Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IFTHEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements | | |
| UNIT 3:<br>Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling,<br>Two Phase Locking protocol.<br>DCL Statements: Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK<br>Crash Recovery: ARIES algorithm. The log based recovery, recovery related structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash, Redo and Undo phases. | 1) Understanding concept of tracsaction management and crash recovery. | |

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**Course: Combinatorics and Graph Theory**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Describing Combinatorics and graph theory.<br>Understanding Strings, BInomial Coefficients and Multinomial Coefficients.<br>Solving Examples based on combinatorics using Induction method. | To provide knowledge about Enumeration method, sudoku puzzle.<br><br>TO provide learning about Strings and sets.<br><br>Solving Combinatorics using a recursive method.<br><br>Learning the method of induction to get the combinatorial results. | Students should be able to develop different methods of solving the example.<br><br>Enhance the ability to think differently and solve the example with all possible outcomes.<br><br>Use Graph theory to identify best path from source to sink.<br><br>Student should able to identify path and cycles using different combinatorial methods.<br><br>Identify Network path in the given graph using Tree method, Ford Fulkerson method and augmenting methods. |
| UNIT 2:<br>Learning about Graph theory, Basic Notations.<br><br>Eulerian and Hamiltonian Graph, Types of graph.<br><br>Understanding labeling of trees, Applying probability to combinatorics.<br><br>Learn about Ramsey Numbers | Understand the graph and basic notations like vertices,edges.<br><br>To identify all possible paths and cycles in the given graph using Eulerian and Hamiltonian methods.<br><br>Applying Ramsey Number theory to Combinatorics | |
| UNIT 3:<br><br>Learning about NEtwork flows in Combinatorics.<br><br>Solving example based on Bipartite and Chain Partitioning.<br><br>Understand Polya's Enumeration. | Learn about basic Notations like path and node.<br><br>Learn Labeling algorithm using Ford Fulkerson method.<br><br>Augmenting the given path to identify the best possible route.<br><br>Coloring of Vertices using polya's enumeration. | |

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**Course: Physical Computing and IoT Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>SoC and Raspberry Pi<br>System on Chip: What is System on chip? Structure of System on Chip. SoC products: FPGA, GPU, APU, Compute Units.<br>ARM 8 Architecture: SoC on ARM 8. ARM 8 Architecture Introduction<br>Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi<br>Hardware, Preparing your raspberry Pi.<br>Raspberry Pi Boot: Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware. | 1) To learn about SoC architectures; Learn how Raspberry Pi.<br>2) Learn to program Raspberry Pi.<br>3) Understanding basic architecture of SoC. | 1. Enable learners to understand System On Chip Architectures.<br>2. Introduction and preparing Raspberry Pi with hardware and installation.<br>3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's<br>4. Learn how to make consumer grade IoT safe and secure with proper use of protocols. |
| UNIT 2:<br>Programming Raspberry Pi<br>Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring<br>Raspberry Pi with Linux Commands<br>Programing interfaces: Introduction to Node.js, Python.<br>Raspberry Pi Interfaces: UART, GPIO, I2C, SPI<br>Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI<br>for Camera. | 1) To learn linux commands which is used to operate Raspberry pi.<br>2) Understand nodejs<br>3) Raspberry Pi basic interfaces like UART, GPIO, I2C, SPI, etc.<br>4) To illustrate raspberry pi with camera module. | |
| UNIT 3:<br>Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program.<br>IoT and Protocols<br>IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP.<br>IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED.<br>IoT Security and Interoperability: Risks, Modes of Attacks. Tools for Security and Interoperability. | 1) Implementation of internet of Things and Protocols.<br>2) Understanding IoT security protocols like HTTP, UPnp, CoAP, MQTT, and XMPP.<br>3) Students understand Node RED to implement IoT devices with an application. | |

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**Course: Skill Enhancement: Web Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page<br>CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element | 1) Understand basic concept of HTML<br>2) Understand types of CSS how to apply on website | 1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies.<br>2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites<br>3. To develop and implement client-side and server-side scripting language programs.<br>4. To develop and implement Database Driven Websites.<br>5. Design and apply XML to create a markup language for data and document centric applications. |
| UNIT 2:<br>JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions with Timer, | 1) Student learn popup boxes used in JavaScript<br>2) Understand JavaScript objects<br>3) Learn Form validation using JavaScript<br>4) Understand comparison XML and HTML<br>5) Student learn about XSLT | |

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| JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model,<br>Form Validation using JavaScript<br>XML: Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML Entity References, DTD, XSLT: XSLT<br>Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set,<br>xsl:value-of | | |
| UNIT 3:<br>AJAX: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX<br>PHP: Variables and Operators, Program Flow, Arrays, Working with Files and<br>Directories, Working with Databases, Working with Cookies, Sessions and Headers<br>Introduction to jQuery: Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects | 1) Understand concept AJAX, PHP and jQuery<br>2) Develop website using database concept with PHP | |

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**COURSE OUTCOME**
**S. Y. B. Sc. COMPUTER SCIENCE SEM 4**
**2019-2020 Syllabus**

**Course: Fundamentals of Algorithms**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1:<br>Introduction to algorithm, Why to analysis algorithm, Running time analysis, How to Compare Algorithms, Rate of Growth, Commonly Used Rates of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega-Ω Notation, Theta-Θ Notation, Asymptotic Analysis, Properties of Notations, Commonly used Logarithms and Summations, Performance characteristics of algorithms, Master Theorem for Divide and Conquer, Divide and Conquer Master Theorem: Problems & Solutions, Master Theorem for Subtract and Conquer Recurrences, Method of Guessing and Confirming | 1) To Define the basic concepts of algorithms and analyze the performance of algorithms.<br>2) To Discuss various algorithm design techniques for developing algorithms. | 1. To understand basic principles of algorithm design and why algorithm analysis is important<br>2. To understand how to implement algorithms in Python<br>3. To understand how to transform new problems into algorithmic problems with efficient solutions<br>4. To understand algorithm design techniques for solving different problems<br>5. Understand the concepts of algorithms for designing good program<br>6. Implement algorithms using Python |
| UNIT 2:<br>Tree algorithms: What is a Tree? Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals, Expression Trees, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL (Adelson-Velskii and Landis) Trees<br>Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree<br>Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest | 1) To Discuss various searching, sorting and graph traversal algorithms.<br>2) Analyze the asymptotic performance of algorithms.<br>3) Explain the major graph algorithms and their analyses<br>4) To implement Graph Traversal Techniques | |

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| Elements in Sorted Order | | |
| UNIT 3:<br>Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method<br>Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique<br>Divide and Conquer Algorithms: Introduction, What is Divide and Conquer Strategy? Divide and Conquer Visualization, Understanding Divide and Conquer, Advantages of Divide and Conquer, Disadvantages of Divide and Conquer, Master Theorem, Divide and Conquer Applications<br>Dynamic Programming: Introduction, What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy, Problems which can be solved using Dynamic Programming, Dynamic Programming Approaches, Examples of Dynamic Programming Algorithms, Understanding Dynamic Programming, Longest Common Subsequence | 1) Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming,<br>2) Demonstrate a familiarity with major algorithms and data structures.<br>3) Apply dynamic programming approach to solve suitable problems,<br>4) Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divideand-conquer algorithms. | |

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**Course: Advanced JAVA**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Swing: Need for swing components, Difference between AWT and swing, Components hierarchy, Panes, Swing components: Jlabel, JTextField and JPasswordField, JTextAres, JButton, JCheckBox, JRadioButton, JComboBox and JList<br>JDBC: Introduction, JDBC Architecture, Types of Drivers, Statement, ResultSet, Read Only ResultSet, Updatable ResultSet, Forward Only ResultSet, Scrollable ResultSet, PreparedStatement, Connection Modes, SavePoint, Batch Updations, CallableStatement, BLOB & CLOB | 1) To learn the creation of pure Dynamic Web Application using JDBC.<br>2) To implement programs using Swing objects | 1) Understand the concepts related to Java Technology<br><br>2) Explore and understand use of Java Server Programming |
| UNIT 2:<br>Servlets: Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, Servlet Communication, Session Tracking Mechanisms<br>JSP: Introduction, JSP LifeCycle, JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard actions and customized actions, | 1) To learn Server-Side Programming using Servlets and Java Server Pages.<br>2) To implements Servlets | |

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| UNIT 3<br><br>Java Beans: Introduction, JavaBeans Properties, Examples<br>Struts 2: Basic MVC Architecture, Struts 2 framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL<br>JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java | 1) To acquire knowledge on creation of software components using JAVA Beans<br>2) Understand the concept of MVC<br>3) Craing applications using JSON | |

**Course: Computer Networks**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction Network Models:<br>Introduction to data communication, Components, Data Representation, Data Flow, Networks, Network Criteria, Physical Structures, Network types, Local Area Network, Wide Area Network, Switching,, The Internet, Accessing the Internet, standards and administration Internet Standards.<br>Network Models, Protocol layering, Scenarios, Principles of Protocol Layering, Logical Connections, TCP/IP Protocol Suite, Layered Architecture, Layers in the TCP/IP Protocol Suite, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing.<br>Detailed introduction to Physical Layer, Detailed introduction to Data-Link Layer, Detailed introduction to Network Layer, Detailed introduction to Transport Layer, Detailed introduction to Application Layer.<br>Data and Signals, Analog and Digital Data, Analog and Digital Signals, Sine Wave Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signal, Bit Rate, Bit | Understanding about Netowrk Modesl and OSI Model.<br><br>To provide knowledge about different terminology used in computer networks.<br><br>Rules in Networking and TCP/IP Protocol suite.<br><br>Encapsulation and Decapsulation methods.<br><br>Multiplexing and demultiplexing methods.<br><br>Learn about Computer signals. | 1. Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'.<br>2. Useful to proceed with industrial requirements and International vendor certifications. |

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| Length, Transmission of Digital Signals, Transmission Impairments, Attenuation, Distortion, Noise, Data Rate Limits, Performance, Bandwidth, Throughput, Latency (Delay) | | |
| UNIT 2:<br>Introduction to Physical Layer and Data-Link Layer: Digital Transmission digital-to-digital conversion, Line Coding, Line Coding Schemes, analog-to-digital conversion, Pulse Code Modulation (PCM), Transmission Modes, Parallel Transmission, Serial Transmission. Analog Transmission, digital-to-analog Conversion, Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, analog-to-analog Conversion, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), Multiplexing, Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing. Transmission Media, Guided Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. Switching, Three Methods of Switching , Circuit Switched Networks, Packet Switching, Introduction to Data-Link Layer, Nodes and Links, Services, Two Sub-layers, Three Types of addresses, Address Resolution Protocol (ARP). Error | Learning about different Modulation techniques PCM.<br><br>Conversion of Signal as per the transmission medium.<br><br>Learn about types of cables and transmission medium.<br><br>Types of Shift key, Amplitude and Phase.<br><br>Learning about Switching methods. | |

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| Detection and Correction, introduction, Types of Errors, Redundancy, Detection versus Correction. | | |
| UNIT 3:<br><br>Network layer, Transport Layer<br>Media Access Control (MAC), random access, CSMA, CSMA/CD, CSMA/CA, controlled access, Reservation, Polling, Token Passing, channelization, FDMA, TDMA, CDMA.<br>Connecting Devices and Virtual LANs, connecting devices, Hubs, Link-Layer Switches, Routers, Introduction to Network Layer, network layer services, Packetizing, Routing and Forwarding, Other Services, IPv4 addresses, Address Space, Classful Addressing.<br>Unicast Routing, General Idea, Least-Cost Routing, Routing Algorithms, Distance-Vector Routing, Link-State Routing, Path-Vector Routing,<br>Introduction to Transport Layer, Transport-Layer Services, Connectionless and Connection-Oriented Protocols.<br>Transport-Layer Protocols, Service, Port Numbers, User Datagram Protocol, User Datagram, UDP Services, UDP Applications, Transmission Control Protocol, TCP Services, TCP Features, Segment. | Learning about Network layer working and major functions.<br><br>Error detection and Channelization.<br><br>IP addressing learning of IPV4 and IPV6.<br><br>Learn about Network device Like Router and Switches.<br><br>Difference between TCP and UDP | |

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**Course: Software Engineering**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Component-Based Development, The Unified Process Phases, Agile Development- Agility, Agile Process, Extreme Programming<br>Requirement Analysis and System Modeling: Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS , Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram | 1) Understand the fundamental concepts of Software Engineering Lifecycle models.<br>2) Summarize the software requirement specifications and the SRS documents.<br>3) Understanding of different software architectural styles. | 1. Understand the process to be followed in SDLC.<br>2. Define formulate and analyze a problem.<br>3. Apply design and testing principles to software project development & Design Methodologies.<br>4. Apply the project management and analysis principles to software project development.<br>5. Knowledge about software development life cycle and problem articulation |
| UNIT 2:<br>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for | 1) Describe software engineering layered technology and Process frame work.<br>2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of | |

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| Design<br>Software Measurement and Metrics: Product Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation-Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for ,Software Quality<br>Software Project Management: Estimation in Project Planning Process – Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision, Project Scheduling - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts | software as per the Requirements.<br>3) Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance | |
| UNIT 3:<br>Risk Management - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan<br>Software Quality Assurance: Elements of SQA, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Six Sigma, Software Reliability, The ISO 9000 Quality Standards, Capability Maturity Model | 1) Demonstrate the software project management skills through case studies.<br>2) Understanding of software testing approaches.<br>3) Describe software measurement and software risks<br>4) Understanding on quality control and how to ensure good | |

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| Software Testing : Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design | quality software. | |

**Course: Linear Algebra using Python**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Field: Introduction to complex numbers, numbers in Python , Abstracting over fields, Playing with GF(2), Vector Space: Vectors are functions, Vector addition, Scalar-vector multiplication, Combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations. Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and otherwise | 1) To offer the learner the relevant linear algebra concepts through computer science applications.<br>2) Understanding concepts of vector, complex number, span and also how to implement them practically in python. | 1. Appreciate the relevance of linear algebra in the field of computer science.<br>2. Understand the concepts through program implementation<br>3. Instill a computational thinking while learning linear algebra. |
| UNIT 2:<br>Matrix: Matrices as vectors, Transpose, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix multiplication, Inner product and outer product<br>From function inverse to matrix inverse<br>Basis: Coordinate systems, Two greedy algorithms for finding a set of generators, Minimum Spanning Forest and GF(2), Linear dependence, Basis , | 1) Understand concepts of matrix, basis, and dimension to implement in computer applications. | |

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| Unique representation, Change of basis, first look, Computational problems involving finding a basis Dimension: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator | | |
| UNIT 3:<br><br>Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination, Finding a basis for the null space, Factoring integers, Inner Product: The inner product for vectors over the reals, Orthogonality, Orthogonalization: Projection orthogonal to multiple vectors, Projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, Orthogonal complement, Eigenvector: Modeling discrete dynamic processes, Diagonalization of the Fibonacci matrix, Eigenvalues and eigenvectors, Coordinate representation in terms of eigenvectors, The Internet worm, Existence of eigenvalues, Markov chains, Modeling a web surfer: PageRank. | Understand concepts of Guass Elimination, orthogonalization, eigen vector. | |

**Course: .NET Technologies**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>The .NET Framework: .NET Languages, Common Language Runtime, .NET Class Library<br>C# Language Basics: Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial Classes<br>ASP.NET: Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders, HTML Server Controls - View State, HTML Control Classes, HTML Control Events, HtmlControl Base Class, HtmlContainerControl Class, HtmlInputControl Class, Page Class, global.asax File, web.config File | 1) Understand the .NET framework<br>2) Acquire knowledge of C# language<br>3) Implement programs on C# programming language<br>4) Understand concept and HTML Server Controls of ASP.NET | 1. Understand the .NET framework<br>2. Develop a proficiency in the C# programming language<br>3. Proficiently develop ASP.NET web applications using C#<br>4. Use ADO.NET for data persistence in a web application |
| UNIT 2:<br>Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events and | 1) Understand Web Controls in ASP.NET<br>2) Acquire knowledge on working of validators, master pages | |

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| AutoPostBack, Page Life Cycle<br>State Management: ViewState, Cross-Page Posting, Query String, Cookies,<br>Session State, Configuring Session State, Application State<br>Validation: Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions<br>Rich Controls: Calendar Control, AdRotator Control, MultiView Control<br>Themes and Master Pages: How Themes Work, Applying a Simple Theme,Handling Theme Conflicts, Simple Master Page and Content Page, Connecting<br>Master pages and Content Pages, Master Page with Multiple Content Regions, Master Pages and Relative Paths<br>Website Navigation: Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control | 3) Implement programs on website navigation | |
| UNIT 3:<br><br>ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access<br>Data Binding: Introduction, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls – SqlDataSource Data Controls: GridView, | 1) Understand concept of ADO.NET<br>2) Understand working with XML<br>3) Acquire knowledge of LINQ basics<br>4) Understand how AJAX used in ASP.NET<br>5) Develop web application in ASP.NET using C# programming language. | |

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| DetailsView, FormView<br>Working with XML: XML Classes – XMLTextWriter, XMLTextReader<br>Caching: When to Use Caching, Output Caching, Data Caching<br>LINQ: Understanding LINQ, LINQ Basics,<br>ASP.NET AJAX: ScriptManager, Partial Refreshes, Progress Notification,<br>Timed Refreshes | | |

**Course:Skill Enhancement: Android Developer Fundamentals**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>What is Android? Obtaining the required tools, creating first android app, understanding the components of screen, adapting display orientation, action bar, Activities and Intents, Activity Lifecycle and Saving State, Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View | 1. Demonstrate their understanding of the fundamentals of Android operating systems<br>2. To implement Basic Views | 1) Understand the requirements of Mobile programming environment.<br>2) Learn about basic methods, tools and techniques for developing Apps<br>3) Explore and practice App development on Android Platform<br>4) Develop working prototypes of working systems for various uses in daily lives. |
| UNIT 2:<br>User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently | 1. To program various Input controls<br>2. To design simple Andriod App | |
| UNIT 3:<br>Data - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite primer, store data using SQLite database, ContentProviders, loaders to load and display data, Permissions, performance and security, Firebase and AdMob, Publish your app | 1. To understand the daata connectivity in Andriod<br>2. To understand the implementation of SQLite | |

Coordinator B.Sc. CS.

**COURSE OUTCOME**
**T. Y. B. Sc. COMPUTER SCIENCE SEM 5**
**2019-2020 Syllabus**

**Course: Artificial Intelligence**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>What Is AI: Foundations, History and State of the Art of AI.<br>Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents.<br>Problem Solving by searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. | 1) Identify problems where artificial intelligence techniques are applicable<br>2) compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centred problems<br>3) Toclassify the different types of agents | 1) After completion of this course, learner should get a clear understanding of AI<br>2) Different search algorithms used for solving problems.<br>3) The learner should also get acquainted with different learning algorithms and models used in machine learning. |
| UNIT 2:<br><br>Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning | 1) To formulate and choose best hypothesis<br>2) To understand and the architecture of Artificial Neural Networks<br>3) To understand the working of SVM<br>4) To Justify the use of ensemble learning | |
| UNIT 3: | 1) Demonstrate | |

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| Learning probabilistic models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm. Reinforcement learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning. | proficiency in applying scientific method to models of probabilistic learning<br>2) To describe Reinforcement Learning and its type. | |

**Course: Linux Server Administration**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: Technical Summary of Linux Distributions, Managing Software<br>Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems,<br>Core System Services, Process of configuring, compiling, Linux Kernel<br>Networking and Security: TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security | 1) Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions | 1) Learner will be able to develop Linux based systems and maintain<br>2) Learner will be able to install appropriate service on Linux server as per requirement<br>3) Learner will have proficiency in Linux server administration |
| UNIT 2:<br>Internet Services: Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security | 1) Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.<br>2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS. | |
| UNIT 3:<br>Intranet Services: Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP),<br>Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications File Servers, Email Services, Chat Applications, Virtual Private Networking. | 1) Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.<br>2) To illustrate various intranet services in Linux and there configuration steps. | |

**Course: Architecting of IoT**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to IOT, Design Principle and Standards.<br><br>IOT reference model and architecture, ITs deployment and operational view.<br><br>Learning about device domain | To provide the learning about IOT domain and its architectural view.<br><br>To Learn about Reference Model and Architectural view<br><br>Learning about Function of device domain and gateway domain. | Students should have a complete understanding of IOT Networks and its deployment.<br><br>Learn the different layer protocol to apply in applications for better security.<br><br>Learn the need of IPv4 and IPv6 along with all layer protocols. |
| UNIT 2:<br>Protocols involved in Data link and Network layer<br><br>PHY/MAC - 3GPP, Wireless HART, BLE.<br><br>IPV4 and IPV6 requirements, 6LowPAN, CORPL and other protocols | Learning f Data link layer like 3GPP and Wireless HART.<br><br>Understanding the difference between protocols.<br><br>Requirement of IPv4 and IPv6 and its differences<br><br>Learn the working about network layer protocol. | |
| UNIT 3:<br><br>Transport layer Protocol TCP, MPTCP etc.<br><br>Session LAyer Protocol - HTTP, CoAP etc.<br><br>Service Layer Protocol oneM2M, ETSI, M2M etc. | Learn the functions of transport layer protocol like connection oriented, multipath TCP etc.<br><br>Understand the session layer protocol HTTP and CoAP to exchange the packets.<br><br>Machine to Machine Services. | |

**Course: Web Services**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Web services basics :<br>What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform | 1) To implement a basic RESTful or SOAP web service using the JAX-WS framework in Java.<br>2) By learning about XML and SOAP, students will be able to implement data exchange between different systems in a standardized way, which can improve interoperability and simplify integration.<br>3) Understanding the Web Services Development Life Cycle (WSDLC) can help illustrate the process of developing, testing, and deploying web services in a structured and methodical way. | Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services |
| UNIT 2:<br>The REST Architectural style :<br>Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web | 1) Understanding REST architecture.<br>2) Create Web services Application using REST API's<br>3) Apply JASON and REST programming fundamentals | |

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| UNIT 3<br>Developing Service-Oriented Applications with WCF :<br>What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming, WCF Feature Details, Web Service QoS | 1) Understanding Windows Communication foundation<br>2) Analyze Windows Communication Foundation Architecture<br>3) Create .NET framework based WCF. | |

**Course: Game Programming**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1<br>Mathematics for Computer Graphics, DirectX Kickstart<br>Cartesian Coordinate system. The Cartesian XY-plane. Function Graphs. Geometric Shapes. Polygonal Shapes. Areas of Shapes. Theorem of Pythagoras<br>in 2D. Coordinates. Theorem of Pythagoras in 3D. 3D Polygons. Euler's Rule<br>Vectors. Vector Manipulation. multiplying a Vector by a Scalar. Vector Addition and Subtraction. Position Vectors. Unit Vectors. Cartesian Vectors.<br>Vector Multiplication. Scalar Product. Example of the Dot Product. The Dot Product in Lighting Calculations. The Dot Product in Back-Face Detection. The<br>Vector Product. The Right-Hand Rule. deriving a Unit Normal Vector for a Triangle Areas. Calculating 2D Areas<br>Transformations 2D Transformations. Matrices. Homogeneous Coordinates<br>3D Transformations. Change of Axes. Direction Cosines. rotating a Point about<br>an Arbitrary Axis. Transforming Vectors. Determinants. Perspective Projection.<br>Interpolation<br>DirectX. Understanding | 1) Understand basic concept of mathematics used in computer graphics<br>2) Acquire knowledge on different types of transformations<br>3) Understand difference of CPU and GPU | Learner should study Graphics and gaming concepts with present working style of developers where<br>everything remains on internet and they need to review it, understand it, be a part of community and learn |

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| GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU? | | |
| UNIT 2:<br>DirectX Pipeline and Programming:<br>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels<br>Direct3D 11 Rendering Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM)<br>Understanding Meshes or Objects, Texturing, Lighting, Blending.<br>Interpolation and Character Animation:<br>Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships<br>Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions<br>Curves: Circle, Bezier, B- | 1) Understand DIrectX Pipeline<br>2) Understand trigonometry formulas and types of curves<br>3) Acquire knowledge of types of interpolation<br>4) Understand analytical geometry concept | |

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| Splines<br>Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line. | | |
| UNIT 3<br>Introduction to Rendering Engines: Understanding the current market Rendering Engines. Understanding AR, VR and MR.Depth Mappers, Mobile Phones, Smart Glasses, HMD's<br>Unity Engine: Multi-platform publishing, VR + AR: Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing.<br>Scripting: Scripting Overview, Scripting Tools and Event Overview<br>XR: VR, AR, MR, Conceptual Differences. SDK, Devices | 1) Understand rendering engines concept<br>2) Understand difference between AR, VR and MR<br>3) Understand working in Unity<br>4) Develop games using Unity concepts | |

**COURSE OUTCOME**
**T. Y. B. Sc. COMPUTER SCIENCE SEM 6**
**2019-2020 Syllabus**

**Course: Wireless Sensor Networks and Mobile Communication**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.<br>Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.<br>Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts. | Learn the Introduction to WSN and its need in todays world.<br><br>Understand Deployment architecture, Topology used in deployment.<br><br>Different components of WSN<br><br>Hardware and Software requirements of WSN.<br><br>Learn about MANETS and efficient use of battery. | 1) After completion of this course, learner should be able to list various applications of wireless sensor networks,<br>2) Describe the concepts, protocols, design,<br>3) implementation and use of wireless sensor networks.<br>4) Also implement and evaluate new ideas for solving wireless sensor network design issues. |
| UNIT 2:<br>Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study. Routing Protocols : Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks. | To PRovide knowledge of MAC Protocols used for WSN and ROuting protocols for route updates.<br><br>Protocols used for Transport layer like conversion of existing TCP to suite the environment of WSN for efficient use of power. | |

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| Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. | | |
| UNIT 3:<br><br>Introduction, Wireless Transmission and Medium Access Control: Applications, A short history of wireless communication. Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT-2000. Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover. | To provide knowledge about history of WSN and its application,<br><br>Learn about Cellular system in telecom<br><br>How does the HAndover and Takeover of call works<br><br>Satellite functioning and different architecture.<br><br>Learn ts application in GEO,LEO and MEO. | |

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**Course: Cloud Computing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing. Elements of Parallel Computing. Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds. | 1) Explain the core concepts of the cloud computing paradigm<br>2) Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies. | 1) After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing<br>2) The possible applications for state-of-the-art cloud computing using open source technology.<br>3) Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.<br>4) They should explain the core issues of cloud computing such as security, privacy, and interoperability. |
| UNIT 2:<br>Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing | 1) Implement different types of Virtualization technologies and Service Oriented Architecture systems | |
| UNIT 3:<br>Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat | 1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges<br>2) Illustrate the fundamental concepts of cloud storage | |

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**Course: Information Retrieval**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br><br>Introduction to Information Retrieval: Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval. | 1) Describe the objectives of information retrieval Systems.<br><br>2) To discuss the issues related to IR | 1) After completion of this course, learner should get an understanding of the field of information retrieval<br>2) its relationship to search engines.<br>3) It will give the learner an understanding to apply information retrieval models. |
| UNIT 2:<br>Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval. | 1) To understand the working of specialised search techniques<br>2) Describe Map-Reduce.<br>3) Analyze working of QA systems | |
| UNIT 3:<br>Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures.<br>XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval. | 1) To understand the acrchitectutre of web search engine<br>2) To demonstrate XML retrieval. | |

**Course: Digital Image Processing**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing<br>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter<br>Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation<br>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform | 1) Review the fundamental concepts of a digital image processing system.<br>2) Understand the Human Visual Systems<br>3) Explain the fundamentals of digital image and its processing<br>4) Descibe the 2D Signals<br>5) Problem solvig in Image Convolution | 1) Learner should review the fundamental concepts of a digital image processing system.<br>2) Analyze the images in the frequency domain using various transforms.<br>3) Evaluate the techniques for image enhancement and image segmentation.<br>4) Apply various compression techniques.<br>5) They will be familiar with basic image processing techniques for solving real problems. |
| UNIT 2:<br>Image Enhancement :Image Enhancement in spatial domain, Enhancement trough Point | 1) understand the need for image transforms different types of image transforms and their | |

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| operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic<br><br>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing, Logical operations, Morphological operations, Dilation and Erosion, Distance Transform<br>Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image | properties.<br>2) learn different techniques employed for the enhancement of images.<br>3) To identify different colour models and color image processing | |
| UNIT 3:Image Segmentation: Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform<br>Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard | 1) Understand the need for image compression<br>2) To learn the spatial and frequency domain techniques of image compression.<br>3) To implement image segmentation techniques | |

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**Course: Ethical Hacking**

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1:<br>Information Security : Attacks and Vulnerabilities<br>Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle<br>Types of malware :Worms, viruses, Trojans, Spyware, Rootkits<br>Types of vulnerabilities : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database<br>Types of attacks and their common prevention mechanisms : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs<br>Case-studies : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, | 1. Understand concept of information security<br>2. Understand types of malware and vulnerabilities<br>3. Acquire knowledge on types of attacks and their prevention mechanisms<br>4. Discuss recent attacks | Learner will know to identify security vulnerabilities and weaknesses in the target applications. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines. |

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| WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit | | |
| UNIT 2:<br>Ethical Hacking – I (Introduction and pre-attack)<br>Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing.<br>Approach : Planning - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, Preparing report, Fixing security gaps following the report<br>Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing,<br>Phases: Reconnaissance/foot-printing/Enumeration, Phases: Scanning, Sniffing | 1. Discuss types of ethical hacking<br>2. Understand how penetration testing is important<br>3. Acquire knowledge of different phases of ethical hacking | |
| UNIT 3:<br>Ethical Hacking :Enterprise Security | Acquire knowledge to test and exploit systems using various tools and understand the impact of hacking in real time machines. | |

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| Phases : Gaining and Maintaining Access : Systems hacking – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPSpoofing, SYN Flooding, Smurf attack, Applications hacking : SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, Malware analysis : Netcat Trojan, wrapping definition, reverse engineering Phases : Covering your tracks : Steganography, Event Logs alteration Additional Security Mechanisms : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines) | | |

Coordinator B.Sc.CS.

Program: Bachelors of Science in (Information Technology)

## Program Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.

**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

## Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.

**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.

**PSO5:** Identify, design, and analyze complex computer software systems and implement and interpret the results from those systems.

**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

# Course Outcomes
## FYBSC IT – SEM 1

Course: USIT101 Programming Principles with C

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:** | U1-01 - Understand Fundamentals of Programming<br>U1-02 - Exploring C Programming<br>U1-03 - Classifying Data using Data types in C Programming | **CO1** - To develop the programming skills using fundamentals of basic c language.<br>**CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable.<br>**CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling.<br>**CO4** - To teach the basics of pre-processors available with C compiler.<br>**CO5** - To understand the procedural oriented programming concept.<br>**CO6** - To enable Learners to develop the logic of the program. |
| **UNIT II** | U2 - 01 - Managing Input and Output Operations<br>U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions<br>U3 - Understanding the conditional statements | |
| **UNIT III** | U3 - 01 - Controlling the Program Order: Decision Making<br>U3 - 02 - Repeating Sequence of Instructions: Loops<br>U3 - 03 - Understand Group of Statements: Functions | |
| **UNIT IV** | U4 - 01 - Implementing Pointers.<br>U4 -02 - Learn Characters Arrays | |
| **UNIT V** | U5 - 01- Implementing Structures using C<br>U5 - 02 - Learning File operations. | |

Course: USIT102 Digital Logic and Applications

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:** | U1-01 Students learned the difference between Analog System and Digital System<br>U1-02 Understanding different number system and their conversions.<br>U1-03 Understanding weighted codes and non-weighted codes<br>U1-04 Students learnt different codes with examples and performed binary arithmetic.<br>U1-05 Students understood basic gates, universal gates and other gates concepts. | **CO1** - Course Outcomes: concepts and techniques used in digital electronics.<br>**CO2** - Have a detailed understanding of the fundamentals<br>**CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system.<br>**CO4** - Analyze different typs of digital electronic circuit using various mapping and logical tools and know the techniques to prepare simplified circuit using various mapping and mathematical methods.<br>**CO5** - Understand different types of logic gates and the relationship between logic gates.<br>**CO6** - Develop a digital logic and apply it to solve real life problems.<br>**CO7** - Understand, Analyze, design and implement combinational and sequential logic circuits.<br>**CO8** - Enable students to develop skill to build digital circuits. |
| **UNIT II:** | U2-01 Understanding and Solving Boolean Algebra problems.<br>U2-02 Understood the concept of principle of Duality.<br>U2-03 Understanding Minterms and Maxtrems<br>U2-04 Understanding and solving reduction techniques using Karnaugh maps. | |
| **UNIT III:** | U3-01 Designing and implementing Combinational Logic Circuits<br>U3-02 Understood difference between combinational and sequential circuits.<br>U3-03 Learning different Arithmetic Circuits | |
| **UNIT IV:** | U4-01 Designing and implementing S-R Latch. U4-02 Designing and learning various Flipflops<br>U4-03 Learnt Master - Slave Flipflop.<br>U4-04 Designing and learning various Shift Registers. | |
| **UNIT V:** | U5-01 Designing and implementing Bit Arithmetic and Logic Unit.<br>U5-02 Learning functioning of Carry Look ahead Counter.<br>U5-03 Understood Binary multiplication.<br>U5-04 Understood Division Algorithm. | |

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## Course: USIT103 Fundamentals of Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:** | U1 - 01 - Understanding & learning the introduction of database<br>U1 - 02 - Understanding the basic concept of Relational Database model & algebra. | **CO1** Define and describe the fundamental elements of relational database management systems.<br>**CO2** To relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.<br>**CO3** Design ER-models to represent simple database application scenarios.<br>**CO4** Transform the ER-model to relational tables, populate relational databases and formulate SQL queries on data.<br>**CO5** Improve the database design by normalization. |
| **UNIT – II:** | U2 - 01 - Learning about ER diagrams.<br>U2 - 02 - Understand the concepts on ER model<br>U2 - 03 - Learning about UML diagrams. | |
| **UNIT– III** | U3 - 01 - Understanding & learning functional dependency.<br>U3 - 02 - Understanding normalization. | |
| **UNIT– IV** | U4 - 01 - Learning applications of constraints.<br>U4 - 02 - Learning applications of views and SQL.<br>U4 - 03 - Learning file structures & indexing in files. | |
| **UNIT – V** | U5 - 01 - Learning about Transaction Management and Concurrency Control.<br>U5 - 02 - Learning and understanding of different methods of recovery management. | |

## Course: USIT104 Discrete Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:** | U1 - 01 - Understands the various set operations.<br>U1 - 02 - Remembering the different types of sets.<br>U1 -03 - Applying and analyzing the relation operations. | **CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures.<br>**CO2** Be able to apply basic counting techniques to solve combinatorial problems.<br>**CO3** Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.<br>**CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.<br>**CO5** Have substantial experience to comprehend formal logical arguments. |
| **UNIT II:** | U2 - 01 - Understands the Logarithmic and mathematical function<br>U2 - 02- Learning different types of functions on sets.<br>U2 - 03 - Understand the applications of algorithms. | |
| **UNIT III:** | U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion.<br>U3 -02- Interpreting Counting principle and<br>U3 - 03 - Understanding working of recursion | |
| **UNIT IV:** | U4 - 01 - Implementing Different searching algorithms.<br>U4 -02 - Analyzing the Graphs & trees. | |
| **UNIT V:** | U5 - 01 - leaning the concept of binary tree.<br>U5 - 02 - Implementing Search tree.<br>U5 -03 - Understand the working of Priority Queue. | |

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Course: USIT105 Technical Communication Skills

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:** | U1 - 01 - Understanding the fundamentals of Communication skills.<br>U1-02- Analyzing and Applying Communication skills. | CO1. Analyze, synthesize and utilize the process and strategies from delivery to solving communication problem.<br>CO2. Learn the communication methodologies at workplace and learning about importance of team collaboration.<br>CO3. Learn about different technical communication such as presentations and interviews.<br>CO4. Understand and apply the art of written communication in writing reports, proposals.<br>CO5. Ground rules of ethical communication and MIS.<br>CO6. Understand the functions of graphs, maps, charts. |
| **UNIT II:** | U2 - 01 - Understanding the 7Cs of Communication skills.<br>U2 - 02 - Understanding and remembering the development of Oral communication skills for business through conversations and group discussion.<br>U2 - 01 - Applying and learning the writing of Business messages such as email and its etiquettes. | |
| **UNIT III:** | U3 - 01 - Analyzing and Evaluating the importance of Active listening skills.<br>U3 - 02 - Understanding and Remembering specific communication needs<br>U3-03 Applying the skills of presentation through strategies and analyzing how to face a job interview. | |
| **UNIT IV:** | U2 - 01 - Applying and learning the writing of Business correspondence, messages and documents.<br>U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs | |
| **UNIT V:** | U5 - 01 - Learning and Understanding the different ways of financial communication.<br>U5 - 02 - Creating and applying the business communication ethics.<br>U5 -03 Understanding the importance of visual aids in presentation. | |

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# Course Outcomes

## FYBSC IT – SEM 2

Course: USIT201 Object oriented Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT - I** | U1 -01- Learning Object oriented programming.<br>U1 -02- Understands the principles and features of C++.<br>U1 - 03 - Implementing programs using perators and pointers. | CO1: Students will understand the need of object-oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment.<br>CO2: Student will understand how to model the real-world scenario using class diagram and be able to exhibit communication between objects using sequence diagram.<br>CO3: Students will be able to implement relationships between classes.<br>CO4: Students will be able to demonstrate various collection classes.<br>CO5: Students will be able to create and user interfaces and packages<br>CO6: The students will be able to demonstrate programs on exceptions, multithreading and applets. |
| **UNIT - II** | U2 -01- Understands the classes and Objects in OOPs.<br>U2 -02- Remembering the Constructors and Destructors.<br>U2 - 03 - Understands the concept of overloading. | |
| **UNIT- III** | U3 -01- Understand the concept of formatting.<br>U3 -02- Analyze the Virtual functions.<br>U3 - 03 - Analyze the different types of inheritance. | |
| **UNIT- IV** | U4 -01- Understand the concept of file handling.<br>U4 -02- Learning the concept of Exception handling. | |
| **UNIT - V** | U5 -01- Understand the concept of Templates.<br>U5 -02- Working and creating programs on string manipulation.<br>U5 - 03 - Summarize the new features of Ansi c++ | |

Course: USIT202 Fundamentals of Micro Processor and Microcontrollers

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT - I** | U1-O1 Understanding Microprocessor Concepts, Microcomputers.<br>U1-O2 Learning large computers to small chip microcontrollers.<br>U1-O3 Understanding microprocessor internal Architecture and pin configuration.<br>U1-O4 Learnt different types of memory and input and output devices.<br>U1-O5 Learning 8155 memory segment, memory interfacing.<br>U1-O6 Illustration of 8085 based microcomputer. | **CO1:** Describe the architecture & organization of 8085 Microprocessor.<br>**CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.<br>**CO3:** Relate the addressing modes used in the instructions.<br>**CO4**. Realize the Interfacing of memory & various I/O devices with 8085 microprocessors.<br>**CO5**. Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. **CO6**. Learning different programming techniques of 8085.<br>**CO7** Understanding the concepts of Subroutines.<br>**CO8** Learning embedded systems and general purpose computers.<br>**CO9** Understanding 8051 microcintroller, internal architecture, coding of 8051 programming in C and various applicatio codes.<br>**CO10** Studying design and development of embedded systems and IDE. |
| **UNIT - II** | U2-01 Learning interfacing of IO Devices Concepts.<br>U2-02 Distinguishing memory mapped IO and peripheral mapped IO.<br>U2-03 Programming using 8085 assembly language.<br>U2-4 Learning Programming model and 8085 Instruction Set.<br>U2-05 Understanding various debugging techniques. | |
| **UNIT -III** | U3-01 Laerning Instruction Classifications<br>U3-02Learning various assembly language programs and coding techniques.<br>U3-03 Illustartion of counters and time dalys<br>U3-04 Demonstation of stacks and subroutines.<br>U3-05 Learning advanced subroutine concepts.<br>U3-06 Learnt various software and hardware interrupts. | |
| **UNIT-IV** | U4-01 Learning embedded systems and general purpose computers.<br>U4-02 Understaning Memory map, I/O map & Interrupt map Concepts.<br>U4-03 Learning applications of different types of memories.<br>U4-04 Understanding 8051 microcintrollers and its internal architecture.<br>U4-05 Learnt coding of 8051 programming in C and applications of 8051. | |
| **UNIT - V** | U5-01 Designing different applications of 8051 microcontrollers.<br>U5-02 Learning various factors required to select a microcontroller.<br>U5-03 Understanding structure of embedded program.<br>U5-04 Understanding design and development of embedded systems and IDE.<br>U5-05 Learning cross compilation concept, embedded product development life cycle. | |

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Course: USIT203 Web Applications Development

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Understanding and introduction of the internet and its application.<br>U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators .<br>U1 - 03 - Learning and application of HTML5, LINKS, TAGS, CSS and FORMATTING. | • Analyze working of the Internet.<br>• Gain an insight into designing web pages.<br>• Use different ways of styling web pages using CSS.<br>• Implement basic and complex functionalities of JavaScript in a web page.<br>• Employ PHP Scripts to execute dynamic tasks in a web page.<br>• Perform various database tasks using PHP. |
| UNIT - II | U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning .<br>U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more .<br>U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML . | |
| UNIT -III | U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values .<br>U3 - 02 - Understanding and learning statements and various functions .<br>U3 - 03 - Learning and application of documents and its objects . | |
| UNIT – IV | U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling . | |
| UNIT – V | U5 - 01 - Understanding and learning of advanced PHP .<br>U5-02- Analyzing and implementing connection between PHP with MYSQL to work with database. | |

Course: USIT204 Numerical Methods

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models<br>U1 - 02 -Learning different types of errors that take place in problem solving . | CO1 Understand numerical techniques to find the roots of nonlinear equations and solution of systems of linear equations.<br>CO2 Understand the difference operators and the use of interpolation<br>CO3 Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations. |
| UNIT – II | U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method<br>U2 - 02 - Learning of different Interpolation . | |
| UNIT -III | U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration<br>U3 - 02 - Learning Taylor's series and Simpson's rule . | |
| UNIT – IV | U4 - 01 - Understanding and learning of many types of regressions<br>U4-02- Understanding and learning squares , non linear regression | |
| UNIT – V | U5 - 01- Detailed study of linear programming problems & graphical solutions.<br>U5 - 02 - Understanding of Partial differential equations.<br>U5 - 03 - Understanding and learning Laplace, Bender-Schmidt's equations.<br>U5 - 04 - Understanding of hyperbolic equations. | |

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Course: USIT205 Green IT

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT - I | U1-01: To learn various toxins present in electronic products.<br>U1-02: Detailed study of Company's Carbon Footprint.<br>U1-03: To study Initiatives taken by UN, Implementation of Basel Conventions.<br>U1-04: To know the significance of WEEE Directives.<br>U1-05: To learn the non-regulatory government initiatives. | CO1 :To learn overview and issues addressed in Green Computing.<br>CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing.<br>CO3: To illustrate steps taken to increase power efficiency by reducing power consumption.<br>CO4: Explanation of methods to reduce cooling costs.<br>CO5: Addressing the power usage problems, storage problems and virtualization<br>CO6: Implementation of Steps to measure the cooling costs.<br>CO7: To improve the way of work culture in offices in order to use energy efficiently.<br>CO8: To understand cooling demands and steps taken to minimze the cooling costs.<br>CO9: To learn how to green IT infrastructure in our surroundings<br>CO10: To know the role of Chief Green Officer in an organisation and fulfilment of SMART goals by set by him. |
| UNIT - II | U2-01: To illustrate power problems and issues to overcome these problems.<br>U2-02: To Study virtualization and managing power issues with low cost.<br>U2-03: To explain Usage of energy efficient drives.<br>U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same<br>U2-05: Designing centralised cooling system and its impact on cooling system. | |
| UNIT -III | U3 -01- Learning and analyzing the Global Impact of local actions.<br>U3-02 - Understanding green data storage, green software and green networking and communications.<br>U3 -02- Learning to use electronic device instead of paper and going paperless. | |
| UNIT - IV | U4-01- Understanding the concept of why recycling and refurbishing is important.<br><br>U4 -02- Analyze the use of hardware products.<br><br>U4 -03- Learning hard drive, CD and DVD recycling and disposal.<br>U$ -04 Understanding energy star programs and Remote Desktops. | |
| UNIT - V | U5 -01- Learning about the use of IS to achieve environmental objectives.<br>U5 -02- Analyzing the green supply chain concepts.<br>U5 -03- Understanding the role of Chief Green Officer and CEO.<br>U5 -04 - Understanding various things about data such as tracking, Analysing and conducting audits. | |

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# Course Outcomes

## SYBSC IT – SEM 3

### Course: USIT301 Python Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understand the concept of Python Programming.<br>U1 -02- Learning to install the python.<br>U1 -03- Understanding the error which occurs while executing.<br>U1 -04- Learning about various keywords and variables in python. | CO1 Comprehend the basics of python programming<br>CO2 Ability to implement modular approach using python<br>CO3 Efficiently implement various data structures provided by python<br>CO4 Develop applications based on object oriented concept<br>CO5 Develop application using GUI and databases |
| UNIT – II | U2 -01- Understand the concept of functions and type conversion.<br>U2 -02- Learning and understanding the concept of looping and counting. | |
| UNIT – III | U3 -01- Understand how to work with list<br>U3 -02- Learning how to access the value in tuple<br>U3 -03- Learning basic tuple operations<br>U3 -04- Analyze the Text Files, The File Object Attributes, Directories | |
| UNIT – IV | U4 -01- Understanding the concept of Regular Expressions.<br>U4 -02- Learning the overview of OOP<br>U4 -03- Learning and creating a thread and synchronizing thread.<br>U4 -04- Creating Modules and understand the different type of module. | |
| UNIT -V | U5 -01- Creating the GUI Form and Adding Widgets<br>U5 -02- Analyzing the Widgets such as buttons, menu, radio button.<br>U5 -03- Learning how to design GUI applications with proper layout management features. | |

### Course: USIT302 Data Structures

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understand the concept of Data Structure and classification of data structure.<br>U1 -02- Learning about data types, algorithms and arrays.<br>U1 -03- Learning about various type of notations. | CO1 Ability to analyze algorithms and algorithm correctness.<br>CO2 Ability to summarize searching and sorting techniques.<br>CO3 Ability to describe stack, queue and linked list operation.<br>CO4 Ability to gain knowledge of tree and graph concepts.<br>CO5 Ability to analyze and choose appropriate data structure and algorithm for program development.<br>CO6 Efficiently use sorting and searching algorithm and know their complexities.<br>CO7 Improve coding skills by applying most suitable data structure for storage and access.<br>CO8 Ability to use trees and graph structures for representing and using complex and non-line data organization.<br>CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures.<br>CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts.<br>CO11 Determine and demonstrate bugs in progrsm, recognize neededbasic operation with data structures.<br>CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.<br>CO13 To use appropriate algorithmic strategy for better efficiency. |
| UNIT – II | U2 -01- Understand types of linked lists.<br>U2 -02- Learning about the concept of linked list. | |
| UNIT – III | U3 -01- Understand the concepts of Stack Memory Representation<br>U3 - 02- Learning about what exactly Queue is. | |
| UNIT – IV | U4 -01- Understanding about binary trees like property, algorithms and representation.<br>U4 -02- Learning about Advanced Tree Structures. | |
| UNIT -V | U5 -01- Understand about hashing techniques.<br>U5 -02- Learning about the introduction of graph and representation of graph. | |

Course: USIT303 Computer Networks

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Learning about Data communications.<br>U1 -02- Understanding Physical Layers.<br>U1 -03- Learning about Digital and Analog transmission. | CO1 Understand the importance of computer network and communications.<br>CO2 Learn about transmission media and their characteristics<br>CO3 Learn about role of various layers of ISO OSI Model in communications<br>CO4 Analyze data flow between TCP/IP model using Application, Transport and Network<br>Layer Protocols.<br>CO5 Demonstrate design issues, flow control and error control.<br>CO6 Illustrate applications of Computer Network capabilities, selection and usage for various<br>sectors of user community.<br>CO7 Knowledge about various protocols used in computer network.<br>CO8 Demonstrate different routing and switching algorithms. |
| UNIT – II | U2 -01- Understanding about Bandwidth Utilization<br>U2 -02- Learning about Switching.<br>U2 -03- Learning about Data Link Layer | |
| UNIT – III | U3 -01- Understand the concept of Data Link Control.<br>U3 -02- Learning about what media access control is.<br>U3 -03- Get to know about wireless LANs. | |
| UNIT – IV | U4 -01- Understand the basic concept of Network Layer.<br>U4 -02- Get to know about Unicast Routing.<br>U4 -03- Learning about Next generation IP. | |
| UNIT -V | U5 -01- Understanding the basic concepts of Transport layer.<br>U5 -02- Learning Standard Client0Server Protocols | |

Course: USIT304 Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Understanding and learning the Introduction of Database and transaction .<br>U1 - 02 - Understanding and application of Data Models . .<br>U1 - 03 - Learning about ER diagram. | CO1 Understand the need of modelling data and then storing the data in organized manner<br>CO2 Ability to create appropriate structure to map with specific type of data.<br>CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and<br>retrieval of data.<br>CO4 Use latest methods of storage and retrieval of data as desired by the user.<br>CO5 Develop models and management information systems as per requirements of clients. |
| UNIT – II | U2 -01- Understanding the basic concept of Relational database model.<br>U2 - 02 - Understanding the basic concept of Relational database design.<br>U2 - 03 - Learning and understanding calculus . | |
| UNIT – III | U3 - 01 - Learning the application of constraints , views and sql .<br>U3 - 02 - Understanding the concept of functions and values . | |
| UNIT – IV | U4 - 01 - Learning about Transaction management and Concurrency Control.<br>U4 -02 - Learning and Application of different methods and database recovery management | |
| UNIT -V | U5 - 01 - Learning and Understanding the basic concept of PL-SQL<br>U5 - 02 - Application of different data types , procedures and clauses . | |

Course: USIT305 Applied Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Get to know about Inverse of a matrix, Properties of matrices.<br>U1 -02- Learning and Understanding about complex numbers and its different application . | CO1 Enhancing the Logic building capability.<br>CO2 Compute a given integral using the most efficient method.<br>CO3 Use integrals to formulate and solve application problems in science and engineering.<br>CO4 Matrices will help them better understand computer graphics.<br>CO5 Laplace will be helpful in understanding Digital Signal systems. |
| UNIT – II | U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods .<br>U2 - 02 - Understanding and application of Linear Differential Equations with Constant<br>Coefficients.<br>U2 - 03 - Understanding and application of Particular integral | |
| UNIT – III | U3 - 01 - Introduction to The Laplace Transform and its different theories and methods<br>U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations . | |
| UNIT – IV | U4 - 01 - Application and learning of Multiple Integrals with its different types and properties . | |
| UNIT -V | U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions | |

## SYBSC IT – SEM 4

Course: USIT401 Core Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Introduction to History, architecture and its components,Java Class<br>U1 - 02 - Understanding and Learning of Data Types and its different operators and properties . | CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>CO2 Understand fundamentals of object-oriented programming in Java, including defining<br>classes, invoking methods, using class libraries, etc.<br>CO3 Be aware of the important topics and principles of software development.<br>CO4 Have the ability to write a computer program to solve specified problems.<br>CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs<br>CO6 Identify classes, objects, members of a class and relationships among them needed for a specific<br>problem<br>CO7 Write Java application programs using OOP principles and proper program structuring<br>CO8 Demonstrate the concepts of polymorphism and inheritance<br>CO9 Write Java programs to implement error handling techniques using exception handling |
| UNIT – II | U2 - 01 - Understanding and Learning of Control Flow Statements .<br>U2 - 02 - Learning and application of Iterations i.e loops and statements .<br>U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values . | |
| UNIT – III | U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces .<br>U3 - 02 - Learning and understanding the concept of creating packages and importing it . | |
| UNIT – IV | U4 - 01 - Detailed study of arrays and introduction and understanding its types .<br>U4 - 02 - Understanding and learning of multi threading and its various properties ,<br>U4 - 03 - Application and Understanding of exception handling . | |
| UNIT -V | U5 - 01 - Understanding and learning of event handling and its models .<br>U5 -02 - Learning of Abstract Window Toolkit in detail .<br>U5 - 03 - Detailed study of layouts . | |

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Course: USIT402 Introduction to Embedded Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 02 - Understanding and introduction to Embedded system and its application .<br>U1 - 02 - Learning of the concept of Core of embedded systems.<br>U1 - 03 - Detailed study of Characteristics and quality attributes of embedded systems. | CO1 To have knowledge about the basic working of a microcontroller system and its programming in assembly language.<br>CO2 To provide experience to integrate hardware and software for microcontroller applications systems.<br>CO3 Understand what is microcontroller, microcomputer and embedded system.<br>CO4 Become familier with programming environment used to develop embedded systems.<br>CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices.<br>CO6 Learn debugging techniques for an embedded systems<br>CO7 Ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.<br>CO8 Ability to write the programs for microcontroller.<br>CO9 Ability to understand the role of embedded systems in industry.<br>CO10 Ability to understand the design concept of embedded systems. |
| UNIT – II | U2 - 01 - Study of Embedded systems and its application .<br>U2 - 02 - Understanding the concept of Embedded Hardware and types of memory .<br>U2 - 03 - Detailed study of the concept called peripherals . | |
| UNIT – III | U3 - 01 - Studying and Understanding the The 8051 Microcontrollers.<br>U3 - 02 - Learning and application of 8051 Programming in C and its logic. | |
| UNIT – IV | U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller .<br>U4 - 02 - Learning the concept of Programming embedded systems and the structure . | |
| UNIT -V | U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic .<br>U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files | |

Course: USIT403 Computer Oriented Statistical Techniques

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Learning the concept of tendencies and its different types of notation .<br>U1 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion .<br>U1 - 03 - Learning and understanding the concept of deviation and studying the same in dtail. | CO1 Recognize the error in the number generated by the solution.<br>CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.<br>CO3 Apply method of interpolation and extrapolation for prediction.<br>CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.<br>CO5 Calculate mean, median and mode for individual series.<br>CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation.<br>CO7 How to apply discrete and continuous probability distributions to various businessproblems.<br>CO8 Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.<br>CO9 Learn non-parametric test such as the Chi-Square |
| UNIT – II | U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis .<br>U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis.<br>U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory | |
| UNIT – III | U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.<br>U3 - 02 - Remembering and Learning and the theory of Statistical Decision . | |

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| | | |
|---|---|---|
| | U3 - 03 - Detailed study of Statistics in R and its distribution . | test for Independence as well as Goodness of Fit. |
| UNIT – IV | U4 - 01 - Understanding and Analyzing the Small Sampling Theory .<br>U4 - 02 - Remembering the concept of The Chi-Square Test and its properties . | CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software. |
| UNIT -V | U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares .<br>U5 - 02 - The detailed study of correlation and its concept of theories and regression . | |

Course: USIT404 Software Engineering

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - The learning and Introduction to Software engineering .<br>U1 - 02 - Analyzing and creating the software requirements and its requirements .<br>U1 - 03 - Learning and understanding different types of Software Development Process Models.<br>U1 - 04 - Understanding the Agile software development . | CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application.<br>CO2 Describe software engineering layered technology and Process frame work.<br>CO3 A general understanding of software process models such as the waterfall and evolutionary models.<br>CO4 Understanding of software requirements and the SRS documents.<br>CO5 Understanding of the role of project management including planning, scheduling, risk management, etc.<br>CO6 Describe data models, object models, context models and behavioural models.<br>CO7 Understanding of different software architectural styles. |
| UNIT – II | U2 - 01 - Learning in detailed of the concept Socio-technical system and its Essential characteristics of socio technical systems and more<br>U2 - 02 - Introduction and Learning of critical system and types of it .<br>U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models . | |
| UNIT – III | U3 - 01 - Introduction to Architectural Design and its system and styles .<br>U3 - 02 - Learning and Understanding of User Interface Design .<br>U3 - 03 - Analyzing and creating Quality Management . | |
| UNIT – IV | U4 - 01 - Understanding and learning about the Verification and Validation.<br>U4 - 02 - Analyze and creating testing components and its functions . | |
| UNIT -V | U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc . | |

Course: USIT405 Computer Graphics and Animation

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Introduction to Computer graphics and its application and software description .<br>U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping . | CO1 To familiarize students with basic principles and techniques for computer graphics.<br>CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional transformations.<br>CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry.<br>CO4 This course will introduce students to all aspects of computer graphics including hardware,<br>software and applications.<br>CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional<br>transformations. |
| UNIT – II | U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices .<br>U2 - 02 - Learning and creating Three-Dimensional Transformations and many of its working and objectives .<br>U2 - 03 - Understanding the concepts of Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections etc . | |
| UNIT – III | U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective .<br>U3 - 02 - Remembering and learning light and color and its various components . | |
| UNIT – IV | U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques .<br>U4 - 02 - Creating and Learning the planes and curves and surfaces along with its different working and drawings . | |
| UNIT -V | U5 - 01 - Learning and understanding the concept of Computer Animation in detail .<br>U5 - 02 - Creating and analyzing Image Manipulation and Storage in detail . | |

# FYBSC IT – SEM 5

Course: USIT501 Software Project Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understanding Why is Software Project Management Important.<br>U1 -02- Learning the basic concept of project.<br>U1 -03- Understanding and learning about what is management.<br>U1 -04- Learning about Overview of Project Planning. | CO1 Professional terminologies of software industry.<br>CO2 Problem solving algorithms and techniques.<br>CO3 Understand the development work environment<br>CO4 To make students realize software project management is not just theory subject to pass, instead it<br>will help them live their professional life with ease.<br>CO5 This subject makes a student realize that whether a student becomes a project manager in future<br>or not, still even as an employee he/she should learn to be an efficient team player. |
| UNIT – II | U2 -01- Analyzing the Appropriate Project Approach.<br>U2 -02- How to choose proper methods and technologies for software development<br>U2 -03- Analyzing the most Appropriate Process Model.<br>U2 -04- Understanding about Software Effort Estimation Techniques. | |
| UNIT – III | U3 -01- Learning about how to plan, when to plan and proper project schedules.<br>U3 -02- Understanding about risk management.<br>U3 -03- Analyzing the Resource Allocation.<br>U3 -04- Analyzing the Cost Schedules | |
| UNIT – IV | U4 -01- Understanding Monitoring and Control.<br>U4 -02- Learning about how to manage contracts.<br>U4 -03- Understanding Behaviour, Organizational Behaviour | |
| UNIT – V | U5 - Learning about how to work in teams.<br>U5 -02- Analyzing how good the software quality should be.<br>U5 -03- Learning about how the project closure should be. | |

Course: USIT502 Internet of Things

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understanding what is Internet Of Things.<br>U1 -02- Learning Flavour of the Internet of Things.<br>U1 -03- Understanding the principles of internet.<br>U1 -04- Understanding different types of IP addresses. | CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping.<br>CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors.<br>CO3 The Internet of Things (IOT) is the next wave, world is going to witness.<br>CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and everything which you use in day-to-day life).<br>CO5 Internet of Things is a term given to the attempt of connecting objects to the internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion. |
| UNIT – II | U2 -01- Learning about Costs versus Ease of Prototyping.<br>U2 -02- Understanding what is open and closed source.<br>U3 -03- learning about Arduino and Raspberry Pi. | |
| UNIT – III | U3 -01- Understanding how to prototype the physical design.<br>U3 -02- Learning the basic concept of Laser cutting.<br>U3 -03- Understanding the concept of Scrapping, comet, polling and other protocols. | |
| UNIT – IV | U4 -01- Understanding what is memory management.<br>U4 -02- Learning the basic concept of Business Model.<br>U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups. | |
| UNIT – V | U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards.<br>U5 -02- Learning about Ethics.<br>U5 -03- Analyzing the Correctness and Maintainability, Security, Performance | |

Course: USIT503 Advanced Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understanding .NET framework .<br>U1 -02- Learning about Types, Objects, and Namespaces.<br>U3 - 03- Learning about values types and reference type. | CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.<br>CO2 Enable learners to use Visual Studio -an advanced design tool<br>CO3 To gain in-depth learning of various concepts and features of NET coding and developing of web applications.<br>CO4 To Provide knowledge of different State management techniques<br>CO5 To explore ADO.NET- a model for interacting with databases.<br>CO6 Using XML various security fundamentals will be explored |
| UNIT – II | U2 -01- Understanding the basic concept of Web form fundamentals.<br>U2 -02- Learning about Form controls.<br>U2 -03- Understanding Validation and how to Use Validation Controls. | |
| UNIT – III | U3 -01- Learning and understanding about the basic concept of Error Handling, Logging, and Tracing.<br>U3 -02- Learning State Management.<br>U3 -03- Learning about how to apply Themes and master pages. | |
| UNIT – IV | U4 -01- Understanding the fundamentals of ADO.NET.<br>U4 -02- Learning about Data Binding.<br>U4 -03- Learning about the basic concept of Data controls. | |
| UNIT – V | U5 -01- Understanding what is XML.<br>U5 -02- Learning about what is Security Fundamentals.<br>U5 -03- Understanding Ajax, Using Partial Refreshes. | |

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Course: USIT505 Linux System Administration

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understanding about Red Hat Enterprise Linux.<br>U1 -02- Analyzing and Working with the Bash Shell.<br>U1 -03- Learning about System Administration Tasks | CO1 To familiarize students with Linux Installation.<br>CO2 Enable Students to Install RPM and use Red hat Package Management<br>CO3 To Make Students Install Samba Server and the use of Samba Server<br>CO4 To make Students Install Apache, Send Mail.<br>CO5 Write Shell Scripts in Linux. |
| UNIT – II | U2 -01- Learning about how to configure and manage storage.<br>U2 -02- Understanding NetworkManager,<br>Working with Services and Runlevels.<br>U2 -03- Learning about how to troubleshoot the network.<br>U2 -04- Learning the basic concept of SSH.<br>U2 -05- Learning about Permissions. | |
| UNIT – III | U3 -01- Learning about Securing Server with iptables<br>U3 -02- Learning how to set up a firewall. | |
| UNIT – IV | U4 -01- Understanding how to configure DNS and DHCP.<br>U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd. | |
| UNIT – V | U5 -01- Learning about Bash Shell Scripting.<br>U5 -02- Understanding Variables, Variables, Subshells, and Sourcing.<br>U5 -03- Learning High-Availability Clustering. | |

Course: USIT506 Enterprise Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 -01- Understanding what is Java EE.<br>U1 -02- Learning about the basic concept of Java servlets.<br>U2 -03- Understanding how to work with database. | CO1 Identify advance concepts of java programming with database connectivity.<br>CO2 Design and develop platform independent applications using a variety of component based frameworks.<br>CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.<br>CO4 The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network.<br>CO5 The major objective of this course is to provide a sound foundation to the students on the concepts,<br>precepts and practices, in a field that is of immense concern to the industry and business. |
| UNIT – II | U2 -01- learning the concept of Request Dispatcher.<br>U2 -02- Learning about cooking.<br>U2 -03- Learning how to work with files. | |
| UNIT – III | U3 -01- Understand about Java Server pages.<br>U3 -02- Learning about LifeCycle of a JSP Page.<br>U3 -03- Understanding about Action Element. | |
| UNIT – IV | U4 -01- Understanding Enterprise java Bean.<br>U4 -02- Learning about types of Java bean<br>U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail . | |
| UNIT – V | U5 - 01 -Introduction and learning about Persistence, Object/Relational Mapping And JPA in detail with its meaning .<br>U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications .<br>U5 - 03 - Creating and learning of JSPS,<br>The JPA ApplicationStructure, along with this learning how to run the program .<br>U5 - 04 - Learning how to write and hiber net application in details with all the information required . | |

# TYBSC IT – SEM 6

## Course: USIT601 Software Quality Assurance

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Describe fundamental concepts of software quality assurance.<br>U1 - 02 - Explore test planning and its management. | CO1 Ability to identify and apply modern software testing methods in software development<br>CO2 Understand testing strategies and defect management<br>CO3 Recognise the importance of software quality assurance<br>CO4 Know about quality improvement, cost control and contribute toward efficient delivery of software solutions |
| UNIT – II | U2 - 01 - To learn the basic testing techniques.<br>U2 - 02 - Develop knowledge of testing process and features. | |
| UNIT – III | U3 - 01 - To learn Boundary value analysis.<br>U3 - 02 - Develop knowledge of the Testing techniques. | |
| UNIT – IV | U4 - 01 - Analyze Verfication and Validation.<br>U4 - 02 - Introduce V - Model and Testing during test | |
| UNIT – V | U5 - 01 - understanding the levels of testing's. | |

## Course: USIT602 Security in Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - simplify Information Security Overview<br>U1 - 02 - determine Secure Design Principles | CO1 Insight into secure design principles and defense models.<br>CO2 Knowledge about storage and database security.<br>CO3 Implement IDS, Firewalls and wireless security.<br>CO4 Skills to implement secure cloud environment for web and application security<br>CO5 Ability to implement physical security for implementing secure information environment. |
| UNIT – II | U2 - 01 - classify Authentication and Authorization<br>U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure. | |
| UNIT – III | U3 - 01 - Learn Firewall Capabilities, Firewall Design.<br>U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and<br>Prevention, Wireless Network Positioning and Secure Gateways. | |
| UNIT – IV | U4 - 01 - Learn Operating System Security Models.<br>U4 - 02 - Learn Intrusion Detection and Prevention Systems | |
| UNIT – V | U5 - 01 - Introduce Cloud computing.<br>U5 - 02 - Analyze application Security, Remote Administration Security. | |

## Course: USIT603 Business Intelligence

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - Describe the concepts and components of Business Intelligence (BI).<br>U1 - 02 -Critically evaluate use of BI for supporting decision making in an organization.<br>U1 - 03 - Understand and use the technologies and tools that make up BI. | CO1 Ability to use decision support system for BI Applications<br>CO2 Ability to develop and use mathematical models for data mining and data preparations |
| UNIT – II | U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction<br>U2 - 02 - To develop knowledge of data mining. | |

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| | U2 - 03 - Analyze Data Validation and data preparation. | CO3 Know how and when to apply classification and clustering techniques for solving BI problems<br>CO4 Explore insights into important emerging applications of BI<br>CO5 Developing skills to design expert system solutions for business applications |
| UNIT – III | U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods<br>U3 - 02 - Explain Clustering and classification model. | |
| UNIT – IV | U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model<br>U4 - 02 - Identify marketing models and production models. | |
| UNIT – V | U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems.<br>U5 - 02 - generate knowledge of AI and other Automation techniques.<br>U5 - 03 - Develop Knowledge of expert system. | |

Course: USIT604 Principles of Geographic Information Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).<br>U1 - 02 -Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | CO1 Explore mapped data, Spatial Data Types, Data Creation, Georeferencing, Spatial Analysis<br>CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis<br>CO3 Analyze spatial data, using QGIS analysis tools<br>CO4 Develop and Manage Geodatabases for real world data<br>CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others |
| UNIT – II | U2 - 01 -Demonstrate organizational skills in file and database management.<br>U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology. | |
| UNIT – III | U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions.<br>U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. | |
| UNIT – IV | U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms.<br>U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems. | |
| UNIT – V | U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.<br>U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS). | |

Course: USIT605 IT Service Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I | U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM<br>U1 - 02 - understand how ITSM can operate in an organisation to improve processes<br>U1 - 03 - understand best management practice from a technical and non-technical perspective | CO1 Ability to deal with the convergence, interoperability and design of heterogeneous networks with local, access and core networks, as well as with service |
| UNIT – II | U2 - 01 - communicate management theories and ideas in writing<br>U1 - 02 - problem solve through the lens of management theories<br>U1 - 03 - critically evaluate information from a variety of sources | |

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| UNIT – III | U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions<br>U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms and businesses.<br>U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems. | integration.<br>CO2 Ability to model, design, implement, manage, operate, administrate and maintain networks, services and contents<br>CO3 Ability to plan networks and decision-making about services.<br>CO4 Learn about service transition and service operations.<br>CO5 Ability to apply Continual Service Improvement in an organization. |
| UNIT – IV | U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector.<br>U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in general.<br>U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance. | |
| UNIT – V | U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets.<br><br>U5 - 02 -Locate and access appropriate sources of information in order to be able to make informed decisions about effective services delivery.<br>U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios. | |

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Academic Year-2022-23

Program: Bachelors of Science in (Information Technology)

## Program Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.

**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.

**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Academic Year: 2022-23

# Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.

**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.

**PSO5:** Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.

**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

# Course Outcomes

## FYBSC IT – SEM 1
## 2022-2023

Course: USIT101 Programming Principles with C

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:**<br>Algorithms, History of C, Structure of C Program, Program Characteristics, Compiler, Linker and preprocessor, pseudo code statements and flowchart symbols, Desirable program characteristics. Program structure. Compilation and Execution of a Program, C Character Set, identifiers and keywords, data types and sizes , constants and its types, variables, Character and character strings, typedef, typecasting | U1-01 - Understand Fundamentals of Programming<br>U1-02 - Exploring C Programming<br>U1-03 - Classifying Data using Data types in C Programming | **CO1** - To develop the programming skills using fundamentals of basic c language.<br>**CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable.<br>**CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling.<br>**CO4** - To teach the basics of pre-processors available with C compiler.<br>**CO5** - To understand the procedural oriented programming concept.<br>**CO6** - To enable Learners to develop the logic of the program. |
| **UNIT II**<br><br>**Type of operators:**<br>Arithmetic operators, relational and logical operators, Increment and Decrement operators, assignment operators, the conditional operator, Assignment operators and expression, Precedence and order of Evaluation Block Structure, Initialization, C Preprocessor<br>**Control Flow:**<br>Statements and Blocks, If-Else, Else-If, Switch, Loops- While and For LoopsDo-while, Break and Continue, Goto and Labels | U2 - 01 - Managing Input and Output Operations<br>U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions<br>U3 - Understanding the conditional statements | |

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| **UNIT III**<br><br>**Functions and Program Structure:** Basics of functions, User defined and Library functions, Function parameters, Return values, Recursion External variables, Scope Rules, Standard Input and Output, Formatted Output-printf() and Formatted Input- scanf(), Line Input and Output, Error Handling- StdErr and Exit, Header Files | U3 - 01 - Controlling the Program Order: Decision Making<br>U3 - 02 - Repeating Sequence of Instructions: Loops<br>U3 - 03 - Understand Group of Statements: Functions | |
| **UNIT IV**<br><br>**Pointer and Arrays** Pointer and Addresses, Pointer and Function Arguments, Pointer and Arrays, Address Arithmetic, Character Pointers and Functions, Pointer Arrays: Pointers and Functions, Multidimensional Array, Command-line Arguments, Pointers to Functions, Dynamic memory allocation | U4 - 01 - Implementing Pointers.<br>U4 -02 - Learn Characters Arrays | |
| **UNIT V**<br><br>**Structures:** Basics of structures, Structures and Functions, Arrays of Structures, Pointers to Structures, Unions, Bit-fields,<br>**File management in C:** Defining and Opening file, Closing a file, Input / Output operations on file, Error handling in C, Random access to files, Command line arguments. | U5 - 01- Implementing Structures using C<br>U5 - 02 - Learning File operations. | |

Course: USIT102 Digital Logic and Applications

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**Digital Systems and Binary numbers** Digital Systems and Binary numbers Introduction to Number systems, Positional Number systems, Conversions (converting between bases), Non positional number systems, Unsigned and Signed binary numbers, Binary Codes, Number representation and storage in computer system.<br><br>**Logic gates and Logic Circuits** Basic and Universal Gates. | U1-01 Students learned the difference between Analog System and Digital System<br>U1-02 Understanding different number system and their conversions.<br>U1-03 Understanding weighted codes and non-weighted codes<br>U1-04 Students learnt different codes with examples and performed binary arithmetic.<br>U1-05 Students understood basic gates, universal gates and other gates concepts. | **CO1** - Course Outcomes: concepts and techniques used in digital electronics.<br>**CO2** - Have a detailed understanding of the fundamentals<br>**CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system.<br>**CO4** - Analyze different typs of digital electronic circuit using various mapping and logical tools and know the techniques to prepare simplified circuit using various mapping and mathematical |

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| | | methods.<br>**CO5** - Understand different types of logic gates and the relationship between logic gates.<br>**CO6** - Develop a digital logic and apply it to solve real life problems.<br>**CO7** - Understand, Analyze, design and implement combinational and sequential logic circuits.<br>**CO8** - Enable students to develop skill to build digital circuits. |
| **UNIT II:**<br><br>**Boolean algebra and Gate level minimization**<br>Introduction, Postulates of Boolean Algebra, Two Valued Boolean Algebra, Principle of Duality, Basic Theorems of Boolean Algebra, Boolean Functions and their Representation, Gate-Level Minimization (Simplification of Boolean Function), QuineMcCluskey Method, Review questions | U2-01 Understanding and Solving Boolean Algebra problems.<br>U2-02 Understood the concept of principle of Duality.<br>U2-03 Understanding Minterms and Maxtrems<br>U2-04 Understanding and solving reduction techniques using Karnaugh maps.<br>U2-05 Understanding and solving reduction techniques using Quine Mc Cluskey Method. | |
| **UNIT III:**<br><br>**Combinational Logic:** Introduction, Analysis and Design Procedure for Combinational Logic Circuits, Types of Combinational Circuit, Review Questions<br>. | U3-01 Designing and implementing Combinational Logic Circuits<br>U3-02 Understood difference between combinational and sequential circuits.<br>U3-03 Learning different Arithmetic Circuits | |
| **UNIT IV:**<br>**Sequential circuit:** Introduction, Latch, Flip-Flops, Registers, Counters, Review Questions<br>**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:**<br>Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.<br>**Sequential Circuits:**<br>Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flipflop, Race-around condition, Master – slave JK flip-flop, T flip-flop, conversion from one type of flip-flop to another, Application of flipflops. | U4-01 Designing and implementing S-R Latch, U4-02 Designing and learning various Flipflops<br>U4-03 Learnt Master - Slave Flipflop.<br>U4-04 Designing and learning various Shift Registers.<br>U4-05 Learnt various Up-Counters and Down-Counters. | |

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| **UNIT V:**<br><br>**Applications:**<br>Bit Arithmetic and Logic unit, Carry lookahead generator, Binary Multiplication and Division algorithm, Booth's multiplication algorithm counter. | U5-01 Designing and implementing Bit Arithmetic and Logic Unit.<br>U5-02 Learning functioning of Carry Look ahead Counter.<br>U5-03 Understood Binary multiplication.<br>U5-04 Understood Division Algorithm.<br>U5-05 Learnt Booth's multiplication algorithm. | |

Course: USIT103 Fundamentals of Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>Database system- concept and Architecture. Relational model and Relational database constraints. Relational Algebra. | U1 - 01 - Understanding & learning the introduction of database<br>U1 - 02 - Understanding the basic concept of Relational Database model & algebra. | **CO1** Define and describe the fundamental elements of relational database management systems.<br>**CO2** To relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.<br>**CO3** Design ER-models to represent simple database application scenarios.<br>**CO4** Transform the ER-model to relational tables, populate relational databases and formulate SQL queries on data.<br>**CO5** Improve the database design by normalization. |
| **UNIT – II:**<br><br>Conceptual modelling and database design: Data modelling using the Entity Relationship model (ER).The enhanced entity relationship model. Relational database design by ER and EER model. Practical database design methodology and use of UML diagrams. | U2 - 01 - Learning about ER diagrams.<br>U2 - 02 - Understand the concepts on ER model<br>U2 - 03 - Learning about UML diagrams. | |
| **UNIT – III**<br>Database Design theory and normalization: Basics of functional dependencies and normalization for | U3 - 01 - Understanding & learning functional dependency.<br>U3 - 02 - Understanding normalization. | |

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| relational databases. Relational database design and further dependencies. | | |
| **UNIT – IV**<br><br>Introduction to SQL . Complex queries, triggers, views, joining database tables and schema modification. Query Processing and optimization. File structure, hashing and indexing | U4 - 01 - Learning applications of constraints.<br>U4 - 02 - Learning applications of views and SQL.<br>U4 - 03 - Learning file structures & indexing in files. | |
| **UNIT – V**<br><br>Transaction management and concurrency control and recovery: Introduction to transaction processing concepts and theory. Concurrency control technique. Database recovery technique. | U5 - 01 - Learning about Transaction Management and Concurrency Control.<br>U5 - 02 - Learning and understanding of different methods of recovery management. | |

Course: USIT104 Discrete Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Set Theory**<br>Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction<br>**Relations**<br>Introduction, Product Sets, Relations, Pictorial Representatives of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations | U1 - 01 - Understands the various set operations.<br>U1 - 02 - Remembering the different types of sets.<br>U1 -03 - Applying and analyzing the relation operations. | **CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures.<br>**CO2** Be able to apply basic counting techniques to solve combinatorial problems.<br>**CO3** Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.<br>**CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.<br>**CO5** Have substantial experience to comprehend formal logical arguments. |

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| **UNIT II:**<br>**Functions and Algorithms**<br>Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions, Sequences, Indexed Classes of Sets, Recursively Defined Functions, Cardinality, Algorithms and Functions, Complexity of Algorithms<br>**Probability**<br>Introduction, Sample Space and Events, Finite Probability Spaces, Conditional Probability, Independent Events, Independent Repeated Trials, Binomial Distribution, Random Variables, Chebyshev's Inequality, Law of Large Numbers | U2 - 01 - Understands the Logarithmic and mathematical function<br>U2 - 02- Learning different types of functions on sets.<br>U2 - 03 - Understand the applications of algorithms. | |
| **UNIT III:**<br>**Techniques of Counting**<br>Introduction, Basic Counting Principles, Mathematical Functions, Permutations, Combinations, the Pigeonhole Principle, The Inclusion–Exclusion Principle, Tree Diagrams<br>**Advanced Counting Techniques, Recursion**<br>Introduction, Combinations with Repetitions, Ordered and Unordered Partitions, Inclusion–Exclusion Principle Revisited, Pigeonhole Principle Revisited, Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Solving SecondOrder Homogeneous Linear Recurrence, Relations, Solving General Homogeneous Linear Recurrence Relations | U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion.<br>U3 -02- Interpreting Counting principle and<br>U3 - 03 - Understanding working of recursion | |
| **UNIT IV:**<br>**Graph Theory**<br>Introduction, Data Structures,,Graphs and Multigraphs, Subgraphs, Isomorphic and Homeomorphic Graphs, Paths, Connectivity, Traversable and Eulerian Graphs, Bridges of Königsberg, Labeled and Weighted Graphs, Complete, Regular, and Bipartite Graphs, Tree Graphs, Planar Graphs, Graph Colorings, Representing Graphs in | U4 - 01 - Implementing Different searching algorithms..<br>U4 -02 - Analyzing the Graphs & trees. | |

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| Computer Memory, Graph Algorithms, Traveling-Salesman Problem, Solved Problems<br>**Directed Graphs**<br>Introduction, Directed Graphs, Basic Definitions, Rooted Trees, Sequential Representation of Directed Graphs, Warshall's Algorithm, Shortest Paths, Linked Representation of Directed Graphs, Graph Algorithms: Depth-First and Breadth-First Searches, Directed Cycle-Free Graphs, Topological Sort, Pruning Algorithm for Shortest Path | | |
| **UNIT V:**<br>**Binary Trees**<br>Introduction, Binary Trees,, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees, Priority Queues, Heaps, Path Lengths, Huffman's Algorithm, General (Ordered Rooted) Trees Revisited<br>**Ordered Sets and Lattices**<br>Introduction, Ordered Sets, Hasse Diagrams of Partially Ordered Sets, Consistent Enumeration, Supremum and Infimum, Isomorphic (Similar) Ordered Sets, Well Ordered Sets, Lattices 346 Bounded Lattices, Distributive Lattices, Complements, Complemented Lattices | U5 - 01 - leaning the concept of binary tree.<br>U5 - 02 - Implementing Search tree.<br>U5 -03 - Understand the working of Priority Queue. | |

Course: USIT105 Technical Communication Skills

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**Fundamentals of Technical Communication**<br>Introduction. The process of communication, Language as tool of communication, levels of communication. The flow of communication, Communication Networks, The importance of technical communication<br><br>**Barriers to communication**<br>Definition of Noise, classification of | U1 - 01 - Understanding the fundamentals of Communication skills .<br><br>U1-02- Analyzing and Applying Communication skills. | CO1. Analyze, synthesize and utilize the process and strategies from delivery to solving communication problem.<br>CO2. Learn the communication methodologies at workplace and learning about importance of team collaboration.<br>CO3. Learn about |

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| Barriers<br><br>**Non-verbal Communication**<br>**Introduction**<br>Definition, significance of nonverbal, forms of non -verbal communication, types of non-verbal communication | | different technical communication such as presentations and interviews.<br>CO4. Understand and apply the art of written communication in writing reports, proposals.<br>CO5. Ground rules of ethical communication and MIS.<br>CO6. Understand the functions of graphs, maps, charts. |
| **UNIT II:**<br><br>**The Seven Cs of Effective Communication**: Completeness, Conciseness, Consideration,Concreteness, Clarity, Courtesy, Correctness<br>**Conversations**<br>Introduction, Importance of Business conversion, Essential of Business conversion,Conversation Management<br>**Meeting and conferences**<br>Introduction, Purpose of Meeting, planning a meeting, Meeting Process, Leading effective meeting, Evaluating meeting, planning conference, teleconferencing<br>**Group Discussion and team presentation**<br>Introduction, Benefits of GD, Workplace GD guidelines, Functional and non functional roles in GD, Improving group performance, Assessment of group discussion ,Team presentation<br>**Email communication**<br>Introduction, Advantages of email, problems in email communication, Email etiquettes,Techniques of writing Effective Email | U2 - 01 - Understanding the 7Cs of Communication skills .<br><br>U2 - 02 - Understanding and remembering the development of Oral communication skills for business through conversations and group discussion.<br><br>U2 - 01 - Applying and learning the writing of Business messages such as email and its etiquettes. | |

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| **UNIT III:**<br>**Active Listening**<br>Introduction, Type of listening, **Traits of** good listener, Active **vs Passive listening**, Implication of effective **listening**<br>**Effective presentation Strategies**<br>Introduction, Defining purpose, Analyzing audience and Locale, Organizing contents,preparing outline, Visual Aids, Understanding Nuances of delivery, Kinesics<br>**Interview**<br>Introduction, objectives, types of interview, job interviews | U3 - 01 - Analyzing and Evaluating the importance of Active listening skills.<br><br>U3 - 02 - Understanding and Remembering specific communication needs<br><br>U3-03 Applying the skills of presentation through strategies and Analyzing how to face a job interview. | |
| **UNIT IV:**<br><br>**Business writing**<br>Introduction, Importance of written Business, Five main strategies of writing **business** messages<br>**Business correspondence**<br>Business letter writing, common component of Business letter, Strategies for writing body of a letter, Types of Business letter, writing memos<br>**Business reports and proposal**<br>What is report? Steps in writing routine Business report, parts of report, corporate reports and Business proposals<br>**Careers and Resume**<br>Introduction to career building, resume format, traditional, electronic and video resumes,sending resume, follow up letters and online recruitment process | U2 - 01 - Applying and learning the writing of Business correspondence, messages and documents.<br><br>U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs | |
| **UNIT V:**<br><br>**Communication across Functional areas**<br>Financial communication, MIS<br>**Ethics in Business Communication**<br>Ethical communication, Values, ethics and communication, ethical dilemmas facing manager,strategic approaches to corporate ethics<br>**Creating and Using Visual Aids**<br>Object, Models, Handouts, Charts and Graphs, Text Visuals , Formatting Computer generated charts, graphs and visuals | U5 - 01 - Learning and Understanding the different ways of Financial communication .<br><br>U5 - 02 - Creating and applying the business communication ethics.<br><br>U5 -03 Understanding the importance of visual aids in presentation. | |

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# Course Outcomes

## FYBSC IT – SEM 2-2022-23

Course: USIT201 Object oriented Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| **UNIT - I**<br>**INTRODUCTION OF OBJECT-ORIENTED DESIGN :**<br>Introduction,<br>Objects, Class and Instance, Polymorphism, Inheritance, Object-Oriented Analysis ,<br>Finding the Objects ,Conceptual Modeling Requirements Model , Analysis<br>Model, The Design Model, The Implementation Model , Test Model, ObjectOriented Analysis and Design, The Evolution of Object Model, Object-Oriented<br>Programming, Object-Oriented Design, Object-Oriented Analysis, Elements of<br>Object Model ,The Role of OOAD in the Software Life Cycle, OOAD<br>Methodologies, Grady Booch Approach,<br>**STARTING WITH C++:**<br>C++ Overview, C++ Character Set, C++ Tokens,<br>Variables, Counting Tokens, Data Types, Qualifiers, Range of Data Types, Your First<br>C++ Program, Structure of a C++ Program, Styles of, Writing C++ Programs,<br>Programming Examples<br>**FEATURES OF C++:**<br>Introduction, Operators and Expressions, Declaring Constants,<br>Type Conversion, Decision Making: An Introduction, Unconditional Branching Using<br>Goto , Introduction to Looping<br>**OPERATORS AND REFERENCES IN C++:**<br>Introduction, Scope Resolution<br>Operator, Reference Variables, The Bool Data Type, The Operator New and Delete,<br>Malloc Vs. New ,Pointer Member Operators | U1 -01- Learning Object oriented programming.<br><br>U1 -02- Understands the principles and features of C++.<br>U1 - 03 - Implementing programs using perators and pointers. | CO1: Students will understand the need of object oriented programming, fundamental concepts<br>and will be able to solve computational problems using basic constructs like if-else,<br>control structures, array, strings in Java environment.<br>CO2: Student will understand how to model the real world scenario using class diagram and be able to exhibit communication between objects using sequence diagram.<br>CO3: Students will be able to implement relationships between classes.<br>CO4: Students will be able to demonstrate various collection classes.<br>CO5: Students will be able to create and user interfaces and packages<br>CO6: The students will be able to demonstrate programs on exceptions, multithreading and applets. |
| **UNIT - II**<br>**FUNCTION IN C++:**<br>Introduction ,Function Declaration/Prototyping ,,The Main Function in C++,Recursion ,Call by Reference ,Call by Reference Vs Call by Address , Return by Reference ,,Inline Function ,Function Overloading ,Function with Default Arguments CLASS AND OBJECTS IN C++ :<br>Working with Class, Structure in C++ ,Accessing Private Data Passing and Returning Object ,Array of Object ,Friend | U2 -01- Understands the classes and Objects in OOPs.<br>U2 -02- Remembering the Constructors and Destructors.<br>U2 - 03 - Understands the concept of | |

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| Function ,Static Class Members ,Constant Member Function<br>**WORKING WITH CONSTRUCTOR AND DESTRUCTOR:**<br>Introduction, Constructor with Parameters, Implicit and Explicit Call to Constructor, Copy Constructor, Dynamic Initialization of Objects, Dynamic Constructor, Destructor<br>**WORKING WITH OPERATOR OVERLOADING:**<br>Introduction, Operator Overloading with Binary Operator Overloading Assignment (=) Operator, Overloading 12 Annexure I Unary Operators, Overloading Using Friend Function, Rules of Operator Overloading, Type Conversion | overloading. | |
| UNIT - III<br>**WORKING WITH INHERITANCE IN C++:**<br>Introduction, Types of Inheritance, Public, Private and Protected Inheritance, Multiple Inheritance, Hierarchical Inheritance, Virtual Base Class, Constructor and Destructor in Inheritance, Containership<br>**POINTERS TO OBJECTS AND VIRTUAL FUNCTIONS:**<br>Pointer to Objects, The This Pointer, What is Binding in C++? ,Virtual Functions ,Working of a Virtual Function ,Rules for Virtual Function ,Pure Virtual Function and Abstract Class ,Object Slicing ,Some Facts about Virtual Function ,Virtual Destructor<br>**INPUT-OUTPUT AND MANIPULATORS IN C++:**<br>Introduction, C++ Stream Classes, Unformatted Input/Output, Formatted Input /Output Operations, Manipulators | U3 -01- Understand the concept of formatting.<br>U3 -02- Analyze the Virtual functions.<br>U3 - 03 - Analyze the different types of inheritance. | |
| UNIT IV:<br>**FILE HANDLING IN C++:**<br>Introduction, File Streams, Opening and Closing a File, File Opening Modes Checking End of File, Random Access in File, Command Line Arguments, Working with Binary Mode Error Handling<br>**TEMPLATE PROGRAMMING:**<br>Introduction , Function Template , Class Template<br>**EXCEPTION HANDLING IN C++ :**<br>Introduction , Basics of Exception Handling , Exception Handling Mechanism , Programming Examples ,Exception Handling with Class Catching all Exceptions , Specifying Exception for a Function | U4 -01- Understand the concept of file handling.<br>U4 -02- Learning the concept of Exception handling. | |
| UNIT V:<br>**INTRODUCTION TO THE STANDARD TEMPLATE LIBRARY :**<br>Introduction , Components of STL , Containers , Algorithms , Iterators ,Application of Container Classes Function Objects<br>**MANIPULATING STRINGS :**<br>Introduction , Creating (string) Objects , Manipulating String Objects , Relational Operations, String Characteristics , Accessing Characters in Strings , Comparing and Swapping<br>**NEW FEATURES OF ANSI C++ STANDARD :**<br>Introduction ,New Data Types , New Operators , Class Implementation , Namespace Scope , Operator Keywords , New Keywords , New Headers | U5 -01- Understand the concept of Templates.<br>U5 -02- Working and creating programs on string manipulation.<br>U5 - 03 - Summerize the new features of ansi c++ | |

SHETHLUL S.M.V. COLLEGE OF SCIENCE & COMMERCE

Course: USIT202 Fundamentals of Micro Processor and Microcontrollers

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| **Microprocessor, microcomputers, and Assembly Language:** Microprocessor,Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications.<br>**Microprocessor Architecture and Microcomputer System:** Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing, Microprocessor-Based System Application.<br>**8085 Microprocessor Architecture and Memory Interface:** Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer, Memory Interfacing,Interfacing the8085 Memory Segment. | U1-O1 Understanding Microprocessor Concepts, Microcomputers.<br>U1-O2 Learning large computers to small chip microcontrollers.<br>U1-O3 Understanding microprocessor internal Architecture and pin configuration.<br>U1-O4 Learnt different types of memory and input and output devices.<br>U1-O5 Learning 8155 memory segment, memory interfacing.<br>U1-O6 Illustration of 8085 based microcomputer. | **CO1:**Describe the architecture & organization of 8085 Microprocessor.<br>**CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.<br>**CO3:** Relate the addressing modes used in the instructions.<br>**CO4.** Realize the Interfacing of memory & various I/O devices with 8085 microprocessor.<br>**CO5.** Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. **CO6.** Learning different programming techniques of 8085.<br>**CO7** Understanding the concepts of Subroutines.<br>**CO8** Learning embedded systems and general purpose computers.<br>**CO9** Understanding 8051 microcintroller. internal architecture, coding of 8051 programming in C and various applicatio codes.<br>**CO10** Studying design and development of embedded systems and IDE. |
| UNIT 2 :**Interfacing of I/O Devices**<br>Basic Interfacing concepts, Interfacing Output Displays, Interfacing-Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.<br>**Introduction to 8085 Assembly Language Programming:** The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program.<br>**Introduction to 8085 Instructions:** Data Transfer Operations, Arithmetic Operations, Logic | U2-01 Learning interfacing of IO Devices Concepts,<br>U2-02 Distinguishing memory mapped IO and peripheral mapped IO.<br>U2-03 Programming using 8085 assembly language.<br>U2-4 Learning Programming model and 8085 Instruction | |

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| Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program. | Set.<br>U2-05 Understanding various debugging techniques. | |
| **UNIT-3:Programming Techniques With Additional Instructions:**<br>Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Instruction Related to Memory, Logic Operations: Rotate, Logics Operations: Compare, Dynamic Debugging.<br>**Counters and Time Delays:**<br>Counters and Time Delays, Illustrative Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.<br>**Stacks and Sub-Routines:**<br>Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts<br>**Interrupts:** The 8085 Interrupt, 8085 Vectored and Non vectored Interrupts, Restart as S/W Instructions. | U3-01 Laerning Instruction Classifications<br>U3-02Learning various assembly language programs and coding techniques.<br>U3-03 Illustartion of counters and time dalys<br>U3-04 Demonstation of stacks and subroutines.<br>U3-05 Learning advanced subroutine concepts.<br>U3-06 Learnt various software and hardware interupts. | |
| **UNIT-4: Micro Controllers:** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems, **Embedded Hardware:** Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. **Peripherals:** Control and Status Registers, Device Driver, Timer watch Timer **The 8051 Microcontrollers:** Microcontrollers and Embedded processors, Overview of 8051 family,8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. **8051 Programming in C:** Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs | U4-01 Learning embedded systems and general purpose computers.<br>U4-02 Understaning Memory map, I/O map & Interrupt map Concepts.<br>U4-03 Learning applications of different types of memories.<br>U4-04 Understanding 8051 microcintrollers and its internal architecture.<br>U4-05 Learnt coding of 8051 programming in C and applications of 8051. | |
| UNIT-5:**Designing Embedded System with 8051 Microcontroller:**Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051. **Programming embedded systems:** structure of embedded program, infinite loop, compiling, linking and debugging. | U5-01 Designing different applications of 8051 microcontrollers.<br>U5-02 Learning | |

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| **Design And Development:** Embedded system development Environment – IDE, types of file generated on cross compilation, Embedded Product Development cycle and Trends in embedded Industry | various factors required to select a microcontroller.<br>U5-03 Understanding structure of embedded program.<br>U5-04 Understanding design and development of embedded systems and IDE.<br>U5-05 Learning cross compilation concept, embedded product development life cycle. | |

Course: USIT203 Web Applications Development

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – 1<br>**Internet and the World Wide Web:**<br>What is Internet? Applications of Internet, E-mail, Telnet, FTP, E-commerce and E-business, Internet Service Providers, Domain Name Server, Internet Address, World Wide Web (WWW), World Wide Web and its Evolution, Uniform Resource Locator (URL), Browsers, Common Features of Browsers, Search Engine, Web Server, HTTP Protocol.<br>**HTML5:**<br>Introduction, Formatting Text by using Tags, Using Lists, Creating Hyperlinks and Bookmarks, Defining Metadata about an HTML Document, Redirecting to another URL.<br>**CSS:**<br>Implementing Styles using CSS – Stylesheets, Formatting Text and Links using CSS,CSS Selectors, Changing Background, Adding Border, Margin and Padding, Setting Dimensions, Using Inline Container to mark up a part of a text. | U1 - 01 - Understanding and introduction of the internet and its application .<br><br>U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators .<br><br>U1 - 03 - Learning and application of HTML5 , LINKS , TAGS , CSS and FORMATTING . | • Analyze working of the Internet.<br>• Gain an insight into designing web pages.<br>• Use different ways of styling web pages using CSS.<br>• Implement basic and complex functionalities of JavaScript in a web page.<br>• Employ PHP Scripts to execute dynamic tasks in a web page.<br>• Perform various database tasks using PHP. |

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| **HTML Page Layout:**<br>Using Layout Elements, Semantic Elements, Creating, Positioning and Formatting Divisions, Floating Divisions next to each other, Responsive Web Design, Inline Frames.<br>**HTML Media, Tables and Forms:**<br>Embedding Images, Creating Client-side and Server-side Image Map, adding Favicon, Embedding audio and video on web page, Creating Simple Table, Table Dimension, Merging Table Cells, Formatting **Tables:** Applying Borders, Background and Foreground fills, Changing Cell Padding, Spacing and Alignment<br>Collecting user input with HTML Forms, Additional Input Types in HTML5. | U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning .<br><br>U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more .<br><br>U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML . | |
| UNIT -III<br>**JavaScript:**<br>Introduction, Difference between Client-side and Server-side Scripting, JavaScript Variables and Constants, Data Types, Statements, Comments, Functions, Variable Scope, Hoisting, Strict Mode, JavaScript Objects, Dialog Boxes, void Keyword<br><br>**Operators:** Arithmetic Operators, Assignment Operators, Comparison Operators, Logical Operators, Bitwise Operators<br>**Statements:**<br>Conditional Statements – if else, switch, Loops – | U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . | |

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| while, do while, for, for in, for of.<br>Loop Control – break, continue, labels<br>**JavaScript Objects:** User-defined Objects, with Keyword, Native Objects – Array, String, Date, Math, Number, RegExp<br>**DOM:** Introduction, DOM Properties and Methods.<br>**Browser BOM:** Moving back and forward with History, Cookies<br>**Events and Event Handlers:** HTML Events, DOM Events, DOM Event Listener, onAbort, onBlur, onChange, onClick, onDblClick, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onReset, onResize, onSelect, onSubmit, onUnload, | U3 - 02 - Understanding and learning statements and various functions .<br><br>U3 - 03 - Learning and application of documents and its objects . | |
| UNIT – IV<br>**PHP:**<br>Introduction, Server-side Scripting, PHP Syntax and Comments, Variables and Constants, Data Types, Control Structures, Looping, Loop Termination, Functions, PHP Form Handling, PHP Form Validation, Superglobals, PHP Arrays, PHP Strings, PHP RegEx, PHP Numbers, PHP Math, Basic PHP Errors | U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling . | |
| UNIT – V<br>**Advanced PHP:**<br>PHP Date and Time, PHP Include, PHP Cookies, PHP Sessions, Validating and Sanitizing Data with PHP Filters<br>**PHP and MySQL**<br>Why PHP and MySQL? Connect to MySQL, Creating Database and Tables, Inserting Single and Multiple Rows, Retrieving Last ID, MySQL Prepared, Selecting Data, Updating Data, Deleting Data, Limiting Data. | U5 - 01 - Understanding and learning of advanced PHP .<br><br>U5-02- Analyzing and implementing connection between PHP with MYSQL to work with database. | |

Course: USIT204 Numerical Methods

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation | U1 - 01 - The overall objective is to learn Error solving , handling and to apply various | CO1 Understand numerical techniques to find the roots of nonlinear equations and |

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| Laws and Engineering Problems Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors and the Taylor Series: The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty | formulas of any mathematical models<br>U1 - 02 -Learning different types of errors that take place in problem solving . | solution of systems of linear equations.<br>CO2 Understand the difference operators and the use of interpolation<br>CO3 Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations. |
| UNIT – II<br>Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation | U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method<br>U2 - 02 - Learning of different Interpolation . | |
| UNIT -III<br>Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method. Numerical differentiation and Integration: Numberical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules. | U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration<br>U3 - 02 - Learning Taylor's series and Simpson's rule . | |
| UNIT – IV<br>Numerical solution of 1st and 2nd order differential equations: Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2nd Order Differential Equations. Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression | U4 - 01 - Understanding and learning of many types of regressions<br>U4-02- Understanding and learning squares , non linear regression | |
| UNIT – V<br>Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution. Numerical Solutions of Partial Differential Equations: Classification of Partial Differential Equations of the second order. Difference equation corresponding to Laplace Equation, Liebmann's Iteration Process, Bender-Schmidt's Difference Equation corresponding to the parabolic equation, Crank Nicolson's difference equations corresponding to the parabolic equation, Difference equation corresponding to the Hyperbolic equation. | U5 - 01- Detailed study of linear programming problems & graphical solutions.<br>U5 - 02 - Understanding of Partial differential equations.<br>U5 - 03 - Understanding and learning Laplace, Bender-Schmidt's equations.<br>U5 - 04 - Understanding of hyperbolic equations. | |

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Course: USIT205 Green IT

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT - I<br>**Overview to Green IT:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.<br>**Regulating Green IT: Laws, Standards and Protocols** Introduction, The Regulatory Environment and IT Manufacturers RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment. Nonregulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Green Data Centres , Social Movements and Greenpeace. | U1-01: To learn various toxins present in electronic products.<br>U1-02: Detailed study of Company's Carbon Footprint.<br>U1-03: To study Initiatives taken by UN, Implementation of Basel Conventions.<br>U1-04: To know the significance of WEEE Directives.<br>U1-05: To learn the non regulatory government initiatives. | CO1 :To learn overview and issues addressed in Green Computing.<br>CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing.<br>CO3: To illustrate steps taken to increase power efficiency by reducing power consumption.<br>CO4: Explanation of methods to reduce cooling costs.<br>CO5: Addressing the power usage problems, storage problems and virtualization |
| UNIT - II<br>**Minimizing Power Usage:**<br>Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, LowPower Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.<br>**Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together. | U2-01: To illustrate power problems and issues to overcome these problems.<br>U2-02: To Study virtualization and managing power issues with low cost.<br>U2-03: To explain Usage of energy efficient drives.<br>U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same<br>U2-05: Designing centralised cooling system and its impact on cooling system. | CO6: Implementation of Steps to measure the cooling costs.<br>CO7: To improve the way of work culture in offices in order to use energy efficiently.<br>CO8: To understand cooling demands and steps taken to minimze the cooling costs.<br>CO9: To learn how to green IT infrastructure in our surroundings<br>CO10: To know the role of Chief Green Officer in an organisation and fulfilment of SMART goals by set by him. |
| UNIT -III<br>Greening IT: Green PCs, Notebooks and Servers, Green Data Centres , Green Cloud Computing, Green Data Storage , Green Software, Green Networking and Communications.<br>**Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to | U3 -01- Learning and analyzing the Global Impact of local actions.<br>U3-02 - Understanding green data storage, green software and green networking and communications.<br>U3 -02- Learning to use electronic device instead of p. | |

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| Outsource.<br>**Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles. | electronic device instead of paper and going paperless. | |
| UNIT - IV<br>**Recycling:** Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online<br>**Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection. | U4-01- Understanding the concept of why recycling and refurbishing is important.<br><br>U4 -02- Analyze the use of Hardware products.<br><br>U4 -03- Learning hard drive, CD and DVD recycling and disposal.<br>U5 -04 Understanding energy star programs and Remote Desktops. | |
| UNIT - V<br>**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.<br>Staying Green: Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations. | U5 -01- Learning about the use of IS to achieve environmental objectives.<br><br>U5 -02- Analyzing the green supply chain concepts.<br><br>U5 -03- Understanding the role of Chief Green Officer and CEO.<br><br>U5 -04 - Understanding various things about data such as tracking, Analysing and conducting audits. | |

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# Course Outcomes

SYBSC IT – SEM 3 2022-23

Course: USIT301 Python Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: The Python Programming Language,History, features,<br>Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors,Experimental Debugging,<br>Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,<br>Variables and ExpressionsValues and Types, Variables, Variable Names and Keywords, Type conversion,Operators and Operands,<br>Expressions, Interactive Mode and Script Mode, Order of Operations.<br>Conditional Statements: if, if-else, nested if –else<br>Looping: for, while, nested loops<br>Control statements: Terminating loops, skipping specific conditions | U1 -01- Understand the concept of Python Programming.<br><br>U1 -02- Learning to install the python.<br><br>U1 -03- Understanding the error which occurs while executing.<br><br>U1 -04- Learning about various keywords and variables in python. | CO1 Comprehend the basics of python programming<br>CO2 Ability to implement modular approach using python<br>CO3 Efficiently implement various data structures provided by python<br>CO4 Develop applications based on object oriented concept<br>CO5 Develop application using GUI and databases |
| UNIT – II<br>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?Importing with from, Return Values,<br>Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types<br>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting,<br>String Methods, The in Operator, String Comparison, String Operations. | U2 -01- Understand the concept of functions and type conversion.<br><br>U2 -02- Learning and understanding the concept of looping and counting. | |

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| UNIT – III<br>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods<br>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions<br>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods<br>Files: Text Files, The File Object Attributes, Directories<br>Exceptions: Built-in Exceptions, Handling Exceptions, Exception | U3 -01- Understand how to work with list<br>U3 -02- Learning how to access the value in tuple<br>U3 -03- Learning basic tuple operations<br>U3 -04- Analyze the Text Files, The File Object Attributes, Directories | |
| UNIT – IV<br>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.<br>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding<br>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue<br>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module | U4 -01- Understanding the concept of Regular Expressions.<br>U4 -02- Learning the overview of OOP<br>U4 -03- Learning and creating a thread and synchronizing thread.<br>U4 -04- Creating Modules and understand the different type of module. | |
| UNIT -V<br>Creating the GUI Form and Adding Widgets:<br>Widgets: Button, Canvas,Checkbutton, | U5 -01- Creating the GUI Form and Adding Widgets<br>U5 -02- Analyzing the Widgets such as | |

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| Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. Layout Management: Designing GUI applications with proper Layout Management features. Look and Feel Customization:Enhancing Look and Feel of GUI using different appearances of widgets. Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python. Configuring the MySQL connection. Designing the Python GUI database. Using the INSERT command. Using the UPDATE command. Using the DELETE command. Storing and retrieving data from MySQL database. | buttons, menu, radiobutton.<br><br>U5 -03- Learning how to design GUI applications with proper layout management features. | |

Course: USIT302 Data Structures

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure. Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. Array:Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, | U1 -01- Understand the concept of Data Structure and classification of data structure.<br><br>U1 -02- Learning about data types, algorithms and arrays.<br><br>U1 -03- Learning about various type of notations. | CO1 Ability to analyze algorithms and algorithm correctness.<br>CO2 Ability to summarize searching and sorting techniques.<br>CO3 Ability to describe stack, queue and linked list operation.<br>CO4 Ability to gain knowledge of tree and graph concepts.<br>CO5 Ability to analyze and choose appropriate data structure and algorithm for program development.<br>CO6 Efficiently use sorting and searching algorithm and know their complexities.<br>CO7 Improve coding skills by applying most suitable data structure for storage and access.<br>CO8 Ability to use trees and graph structures for representing and using complex and non-line data |

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| General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays. | | organization.<br>CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures.<br>CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts.<br>CO11 Determine and demonstrate bugs in progrsm, recognize neededbasic operation with data structures.<br>CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.<br>CO13 To use appropriate algorithmic strategy for better efficiency. |
| UNIT – II<br>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures | U2 -01- Understand types of linked lists.<br><br>U2 -02- Learning about the concept of linked list. | |
| UNIT – III<br>Stack: Introduction, Operations on the Stack, Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.<br>Queue: Introduction, Queue, Operations on the Queue, Memory | U3 -01- Understand the concepts of Stack Memory Representation<br><br>U3 - 02- Learning about what exactly Queue is.<br><br>U3 -03- Learning about various types of Queue. | |

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| Representation of Queue, Array representation of queue. Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue. Applications of Queues. | | |
| UNIT – IV Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, 12 6 Binary, Indexed Sequential Searches, Binary Search. Tree:Tree,Binary Tree, Properties of Binary Tree. Memory Representation of Binary Tree, Operations Performed on Binary Tree.Reconstruction of Binary Tree from its Traversals, Huffman Algorithm. Binary Search Tree, Operations on Binary Search Tree. Heap. Memory Representation of Heap, Operation on Heap. Heap Sort. Advanced Tree Structures:Red Black Tree. Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree. 2-3 Tree, B-Tree. | U4 -01- Understanding about binary trees like property, algorithms and representation.<br><br>U4 -02- Learning about Advanced Tree Structures. | |
| UNIT -V Hashing Techniques Hash function. Address calculation techniques. Common hashing functions Collision resolution, Linear probing. Quadratic.Double hashing. Buckethashing. Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees. | U5 -01- Understand about hashing techniques.<br><br>U5 -02- Learning about the introduction of graph and representation of graph. | |

Course: USIT303 Computer Networks

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction: Data communications, networks, network types,<br>Internet history,standards and administration,<br>Network Models:Protocol layering, TCP/IP protocol suite, The OSI<br>model.<br>Introduction to Physical layer:Data and signals, periodic analog<br>signals, digital signals, transmission impairment, data rate limits,<br>performance.<br>Digital and Analog transmission: Digital-to-digital conversion,<br>analog-to-digital conversion, transmission modes, digital-to-analog<br>conversion, analog-to-analog conversion. | U1 -01- Learning about Data communications.<br><br>U1 -02- Understanding Physical Layers.<br>U1 -03- Learning about Digital and Analog transmission. | CO1 Understand the importance of computer network and communications.<br>CO2 Learn about transmission media and their characteristics<br>CO3 Learn about role of various layers of ISO OSI Model in communications<br>CO4 Analyze data flow between TCP/IP model using Application, Transport and Network<br>Layer Protocols.<br>CO5 Demonstrate design issues, flow control and error control.<br>CO6 Illustrate applications of Computer Network capabilities, selection and usage for various<br>sectors of user community.<br>CO7 Knowledge about various protocols used in computer network.<br>CO8 Demonstrate different routing and switching algorithms. |
| UNIT – II<br>Bandwidth Utilization: Multiplexing and SpectrumSpreading:<br>Multiplexing, Spread Spectrum<br>Transmission media:Guided Media, Unguided Media<br>Switching: Introduction, circuit switched networks, packet switching,<br>structure of a switch.<br>Introduction to the Data Link Layer:Link layer addressing, Data<br>Link Layer Design Issues, Error detection and correction, block<br>coding, cyclic codes, checksum, forward error correction, error<br>correcting codes, error detecting codes. | U2 -01- Understanding about Bandwidth Utilization<br><br>U2 -02- Learning about Switching.<br><br>U2 -03- Learning about Data Link Layer | |
| UNIT – III<br>Data Link Control: DLC services, data link layer protocols, HDLC,<br>Point-to-point protocol.<br>Media Access Control: Random access, controlled access,<br>channelization, Wired LANs – Ethernet Protocol, standard ethernet, | U3 -01- Understand the concept of Data Link Control.<br><br>U3 -02- Learning about what media access control is.<br><br>U3 -03- Get to know about wireless LANs. | |

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| fast ethernet, gigabit ethernet, 10 gigabit ethernet,<br>Wireless LANs: Introduction, IEEE 802.11 project,<br>Bluetooth,<br>WiMAX, Cellular telephony, Satellite networks,<br>Connecting devices and Virtual LANs. | | |
| UNIT – IV<br>Introduction to the Network Layer: Network layer services, packet<br>switching, network layer performance, IPv4 addressing, forwarding of<br>IP packets, Internet Protocol, ICMPv4, Mobile IP<br>Unicast Routing:Introduction, routing algorithms, unicast routing<br>protocols,<br>Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6<br>protocol, transition from IPv4 to IPv6. | U4 -01- Understand the basic concept of Network Layer.<br><br>U4 -02- Get to know about Unicast Routing.<br><br>U4 -03- Learning about Next generation IP. | |
| UNIT -V<br>Introduction to the Transport Layer: Introduction, Transport layer<br>protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n<br>protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol,<br>Standard Client0Server Protocols:World wide-web and HTTP,<br>FTP, Electronic mail, Telnet, Secured Shell, Domain name system. | U5 -01- Understanding the basic concepts of Transport layer.<br><br>U5 -02- Learning Standard Client0Server Protocols | |

Course: USIT304 Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Databases and Transactions<br>What is database system, purpose of database system, view of data,<br>relational databases, database architecture, transaction management<br>Data Models<br>The importance of data models, Basic building blocks, Business rules.<br>The evolution of data models, Degrees of data abstraction.<br>Database Design,ER Diagram and Unified Modeling Language<br>Database design and ER Model:overview, | U1 - 01 - Understanding and learning the Introduction of Database and transaction .<br><br>U1 - 02 - Understanding and application of Data Models . .<br><br>U1 - 03 - Learning about ER diagram. | CO1 Understand the need of modelling data and then storing the data in organized manner<br>CO2 Ability to create appropriate structure to map with specific type of data.<br>CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and<br>retrieval of data.<br>CO4 Use latest methods of storage and retrieval of data as desired by the user. |

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| ERModel. Constraints.<br>ERDiagrams. ERDIssues. weak entity sets, Codd's rules, Relational<br>Schemas. Introduction to UML | | CO5 Develop models and management information systems as per requirements of clients. |
| UNIT – II<br>Relational database model:<br>Logical view of data. keys. integrity rules, Relational Database<br>design: features of good relational database design. atomic domain<br>and Normalization (1NF. 2NF. 3NF. BCNF).<br>Relational Algebra and Calculus<br>Relational algebra: introduction. Selection and projection. set<br>operations. renaming.Joins. Division. syntax, semantics. Operators.<br>grouping and ungrouping.relational comparison.<br>Calculus: Tuple relational calculus. Domain relational Calculus.<br>calculus vsalgebra.computational capabilities | U2 -01- Understanding the basic concept of Relational database model.<br><br>U2 - 02 - Understanding the basic concept of Relational database design.<br><br>U2 - 03 - Learning and understanding calculus . | |
| UNIT – III<br>Constraints. Views and SQL<br>Constraints. types of constrains. Integrity constraints. Views:<br>Introduction to views. data independence. security. updates on<br>views.comparison between tables and views<br>SQL: data definition.<br>aggregate function. Null Values. nested sub queries. Joined relations.<br>Triggers. | U3 - 01 - Learning the application of constraints , views and sql .<br><br>U3 - 02 – Understanding the concept of functions and values . | |
| UNIT – IV<br>Transaction management and Concurrency<br>Control Transaction management: ACID properties. serializability and<br>concurrency control. Lock based concurrency control (2PL.Deadlocks).Time stamping methods. optimistic methods. database<br>recovery management. | U4 - 01 - Learning about Transaction management and Concurrency Control.<br><br>U4 -02 - Learning and Application of different methods and database recovery management | |
| UNIT -V<br>PL-SQL: Beginning with PL / SQL,Identifiers and Keywords,<br>Operators. Expressions. Sequences,Control Structures. Cursors and<br>Transaction.Collections and composite data types. Procedures and<br>Functions. Exceptions Handling.Packages. With Clause and | U5 - 01 - Learning and Understanding the basic concept of PL-SQL<br><br>U5 - 02 - Application of different data types , procedures and clauses . | |

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| Hierarchical Retrieval, Triggers. | | |

Course: USIT305 Applied Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Matrices: Inverse of a matrix. Properties of matrices. Elementary Transformation. Rank of Matrix, Echelon or Normal Matrix. Inverse of matrix. Linear equations. Linear dependence and linear independence of vectors. Linear transformation. Characteristics roots and characteristics vectors. Properties of characteristic vectors. CaleyHamilton Theorem. Similarity of matrices. Reduction of matrix to a diagonal matrix which has elements as characteristics values.<br>Complex Numbers: Complex number. Equality of complex numbers. Graphical representation of complex number(Argand's Diagram). Polar form of complex numbers. Polar form of x+iy for different signs of x,y. Exponential form of complex numbers. Mathematical operation with complex numbers and their representation on Argand's Diagram. Circular functions of complex angles. Definition of hyperbolic function. Relations between circular and hyperbolic functions. Inverse hyperbolic functions. Differentiation and Integration. Graphs of the hyperbolic functions. Logarithms of complex quality. j(=i)as an operator(Electrical circuits) | U1 -01- Get to know about Inverse of a matrix. Properties of matrices.<br><br>U1 -02- Learning and Understanding about complex numbers and its different application . | CO1 Enhancing the Logic building capability.<br>CO2 Compute a given integral using the most efficient method.<br>CO3 Use integrals to formulate and solve application problems in science and engineering.<br>CO4 Matrices will help them better understand computer graphics.<br>CO5 Laplace will be helpful in understanding Digital Signal systems. |
| UNIT – II<br>Equation of the first order and of the first degree: Separation of variables. Equations homogeneous in x and y. Non-homogeneous linear equations. Exact differential Equation. Integrating Factor. Linear Equation and equation reducible to this form. Method of substitution. Differential equation of the first order of a degree higher than the first: Introduction. Solvable for p (or the method of factors). Solve for | U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods .<br><br>U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients. | |

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| y. Solve for x. Clairaut's form of the equation, Methods of Substitution, Method of Substitution.<br>Linear Differential Equations with Constant Coefficients: Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients. | U2 - 03 - Understanding and application of Particular integral | |
| UNIT – III<br>The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function). | U3 - 01 - Introduction to The Laplace Transform and its different theories and methods<br><br>U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations . | |
| UNIT – IV<br>Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals.<br>Applications of integration: Areas, Volumes of solids. | U4 - 01 - Application and learning of Multiple Integrals with its different types and properties . | |
| UNIT -V<br>Beta and Gamma Functions – Definitions, Properties and Problems.<br>Duplication formula.<br>Differentiation Under the Integral Sign<br>Error Functions | U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions | |

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# Course Outcomes

SYBSC IT – SEM 4 2022-23

Course: USIT401 Core Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit,<br>Lambda Expressions, Methods References, Type Annotations,<br>Method Parameter Reflection, setting the path environment variable,<br>Java Compiler And Interpreter, java programs, java applications,<br>main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks,<br>variables, variable name<br>Data types: primitive data types, Object Reference Types, Strings,<br>Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator,<br>relational operator, logical operator, bitwise operator, conditional operator. | U1 - 01 - Introduction to History, architecture and its components,Java Class<br><br>U1 - 02 - Understanding and Learning of Data Types and its different operators and properties . | CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>CO2 Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.<br>CO3 Be aware of the important topics and principles of software development.<br>CO4 Have the ability to write a computer program to solve specified problems.<br>CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs<br>CO6 Identify classes, objects, members of a class and relationships among them needed for a specific problem<br>CO7 Write Java application programs using OOP principles and proper program structuring<br>CO8 Demonstrate the concepts of polymorphism and inheritance<br>CO9 Write Java programs to implement error handling techniques using exception handling |
| UNIT – II<br>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement<br>Iterations: The While Loop, The Do ... While Loop, The For Loop,<br>The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement<br>Classes: Types of Classes, Scope Rules, Access Modifier, | U2 - 01 - Understanding and Learning of Control Flow Statements .<br><br>U2 - 02 - Learning and application of Iterations i.e loops and statements . | |

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| Instantiating Objects From A Class, Initializing The Class Object And<br>Its Attributes, Class Methods, Accessing A Method, Method<br>Returning A Value, Method's Arguments, Method Overloading,<br>Variable Arguments [Varargs], Constructors, this Instance, super<br>Instance, Characteristics Of Members Of A Class, constants, this<br>instance, static fields of a class, static methods of a class, garbage<br>collection. | U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values . | |
| UNIT – III<br>Inheritance: Derived Class Objects, Inheritance and Access Control,<br>Default Base Class Constructors, this and super keywords.<br>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods,<br>Interfaces, What Is An Interface? How Is An Interface Different From<br>An Abstract Class?, Multiple Inheritance, Default Implementation,<br>Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.<br>Packages: Creating Packages, Default Package, Importing Packages,<br>Using A Package | U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces .<br><br>U3 - 02 - Learning and understanding the concept of creating packages and importing it . | |
| UNIT – IV<br>Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional<br>Arrays, Vectors, Adding Elements To A Vector, Accessing Vector<br>Elements, Searching For Elements In A Vector, Working With The<br>Size of The Vector.<br>Multithreading: the thread control methods, thread life cycle, the<br>main thread, creating a thread, extending the thread class,<br>Exceptions: Catching Java Exceptions, Catching Run-Time<br>Exceptions, Handling Multiple Exceptions, The finally Clause, The<br>throws Clause<br>Byte streams: reading console input, writing console output, reading<br>file, writing file, writing binary data, reading binary data, getting | U4 - 01 - Detailed study of arrays and introduction and understanding its types .<br><br>U4 - 02 - Understanding and learning of multi threading and its various properties .<br><br>U4 - 03 - Application and Understanding of exception handling . | |

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| started with character streams, writing file, reading file | | |
| UNIT -V<br>Event Handling: Delegation Event Model, Events, Event classes,<br>Event listener interfaces, Using delegation event model, adapter<br>classes and inner classes.<br>Abstract Window Toolkit: Window Fundamentals, Component,<br>Container, Panel, Window, Frame, Canvas,Components – Labels,<br>Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields,<br>Text, Scrolling List, Scrollbars, Panels, Frames<br>Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout. | U5 - 01 - Understanding and learning of event handling and its models .<br>U5 -02 - Learning of Abstract Window Toolkit in detail .<br>U5 -03 - Detailed study of layouts . | |

Course: USIT402 Introduction to Embedded Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – 1<br>Introduction: Embedded Systems and general purpose<br>computersystems, history, classifications, applications and purpose<br>ofembedded systems<br>Core of embedded systems: microprocessors and<br>microcontrollers,RISC and CISC controllers, Big endian and Little<br>endian processors,Application specific ICs, Programmable logic<br>devices, COTS, sensors and actuators, communication interface,<br>embedded firmware, other system components.<br>Characteristics and quality attributes of embedded systems:<br>Characteristics, operational and non-operational quality attributes. | U1 - 02 - Understanding and introduction to Embedded system and its application .<br>U1 - 02 - Learning of the concept of Core of embedded systems.<br>U1 - 03 - Detailed study of Characteristics and quality attributes of embedded systems. | CO1 To have knowledge about the basic working of a microcontroller system and its programming in<br>assembly language.<br>CO2 To provide experience to integrate hardware and software for microcontroller applications systems.<br>CO3 Understand what is microcontroller, microcomputer and embedded system.<br>CO4 Become familier with programming environment used to develop embedded systems.<br>CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with<br>peripheral devices.<br>CO6 Learn debugging techniques for an embedded systems<br>CO7 Ability to understand the internal architecture and |

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| | | interfacing of different peripheral devices with Microcontrollers.<br>CO8 Ability to write the programs for microcontroller.<br>CO9 Ability to understand the role of embedded systems in industry.<br>CO10 Ability to understand the design concept of embedded systems. |
| UNIT – II<br>Embedded Systems – Application and Domain Specific:Application specific – washing machine, domain specific - automotive.<br>Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.<br>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers. | U2 - 01 - Study of Embedded systems and its application .<br>U2 - 02 - Understanding the concept of Embedded Hardware and types of memory .<br>U2 - 03 - Detailed study of the concept called peripherals . | |
| UNIT – III<br>The 8051 Microcontrollers:Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory, 8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs. | U3 - 01 - Studying and Understanding the The 8051 Microcontrollers.<br>U3 - 02 - Learning and application of 8051 Programming in C and its logic. | |
| UNIT – IV<br>Designing Embedded System with 8051 Microcontroller:Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051, Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging. | U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller .<br>U4 - 02 - Learning the concept of Programming embedded systems and the structure . | |

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| UNIT -V<br>Real Time Operating System (RTOS):Operating system basics, types of operating systems. Real-Time Characteristics, Selection Process of an RTOS.<br>Design and Development: Embedded system developmentEnvironment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry. | U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic .<br>U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files | |

Course: USIT403 Computer Oriented Statistical Techniques

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation,<br>Averages, or Measures of Central Tendency ,The Arithmetic Mean ,<br>The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean<br>,The Arithmetic Mean Computed from Grouped Data ,The Median<br>,The Mode, The Empirical Relation Between the Mean, Median, and<br>Mode, The Geometric Mean G. The Harmonic Mean H ,The Relation<br>Between the Arithmetic, Geometric, and Harmonic Means, The Root<br>Mean Square, Quartiles, Deciles, and Percentiles.Software and<br>Measures of Central Tendency.<br>The Standard Deviation and Other Measures of Dispersion:<br>Dispersion, or Variation,The Range, The Mean Deviation, The SemiInterquartile Range,The 10–90 Percentile Range, The Standard<br>Deviation, The Variance, Short Methods for Computing the Standard<br>Deviation,Properties of the Standard Deviation,Charlie's Check,<br>Sheppard's Correction for Variance, Empirical Relations Between | U1 - 01 - Learning the concept of tendencies and its different types of notation .<br>U1 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion .<br>U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail. | CO1 Recognize the error in the number generated by the solution.<br>CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.<br>CO3 Apply method of interpolation and extrapolation for prediction.<br>CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.<br>CO5 Calculate mean, median and mode for individual series.<br>CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation.<br>CO7 How to apply discrete and continuous probability distributions to various businessproblems.<br>CO8 Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.<br>CO9 Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.<br>CO10 Compute and interpret the results of Bivariate and Multivariate |

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| Measures of Dispersion, Absolute and Relative Dispersion;<br>Coe fli.Standar cient of Variation dized Variable: Standard Scores.<br>Software and Measures of Dispersion.<br>Introduction to R: Basic syntax, data types, variables, operators,<br>control statements, R-functions, R –Vectors, R –lists, R Arrays. | | Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software. |
| UNIT – II<br>Moments, Skewness, and Kurtosis :Moments , Moments for<br>Grouped Data ,Relations Between Moments , Computation of<br>Moments for Grouped Data, Charlie's Check and Sheppard's<br>Corrections. Moments in Dimensionless Form, Skewness, Kurtosis.<br>Population Moments, Skewness, and Kurtosis, Software Computation<br>of Skewness and Kurtosis.<br>Elementary Probability Theory: Definitions of Probability,<br>Conditional Probability: Independent and Dependent Events, Mutually<br>Exclusive Events, Probability Distributions, Mathematical<br>Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's<br>Approximation to n!,Relation of Probability to Point Set Theory.<br>Euler or Venn Diagrams and Probability.<br>Elementary Sampling Theory : Sampling Theory, Random Samples<br>and Random Numbers, Sampling With and Without Replacement,<br>Sampling Distributions, Sampling Distribution of Means, Sampling<br>Distribution of Proportions, Sampling Distributions of Di ff<br>and Sums, Standard Errors, Software Demonstration of Elementary<br>Sampling Theory. | U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis .<br><br>U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis.<br><br>U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory | |
| UNIT – III<br>Statistical Estimation Theory: Estimation of Parameters, Unbiased<br>Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; | U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory. | |

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| Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.<br>Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, .<br>Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R. | U3 - 02 - Remembering and Learning and the theory of Statistical Decision .<br><br>U3 - 03 - Detailed study of Statistics in R and its distribution . | |
| UNIT – IV<br>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The ChiSquare Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution.<br>The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare. | U4 - 01 - Understanding and Analyzing the Small Sampling Theory .<br><br>U4 - 02 - Remembering the concept of The Chi-Square Test and its properties . | |
| UNIT -V<br>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves,Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares,The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.<br>Correlation Theory: Correlation and | U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares . | |

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| Regression, Linear Correlation,Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coe ffi. cient of Correlation Remarks Concerning the Correlation Coe ffi. cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas. Regression Lines and the Linear Correlation Coe ffi. Correlation of Time cient Series. Correlation of Attributes. Sampling Theory of Correlation Sampling Theory of Regression. | US - 02 - The detailed study of correlation and its concept of theories and regression . | |

Course: USIT404 Software Engineering

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.<br>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.<br>Software Processes:<br>Process and Project, Component Software Processes.<br>Software Development Process Models.<br>• Waterfall Model.<br>• Prototyping.<br>• Iterative Development.<br>• Rational Unified Process.<br>• The RAD Model<br>• Time boxing Model.<br>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. | U1 - 01 - The learning and Introduction to Software engineering .<br><br>U1 - 02 - Analyzing and creating the software requirements and its requirements .<br><br>U1 - 03 - Learning and understanding different types of Software Development Process Models.<br><br>U1 - 04 - Understanding the Agile software development . | CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application.<br>CO2 Describe software engineering layered technology and Process frame work.<br>CO3 A general understanding of software process models such as the waterfall and evolutionary models.<br>CO4 Understanding of software requirements and the SRS documents.<br>CO5 Understanding of the role of project management including planning, scheduling, risk management, etc.<br>CO6 Describe data models, object models, context models and behavioural models.<br>CO7 Understanding of different software architectural styles. |

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| UNIT – II<br>Socio-technical system:Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.<br>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.<br>Requirements Engineering Processes: Feasibility study, Requirementselicitation and analysis, Requirements Validations, Requirements Management. System Models: Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods. | U2 - 01 - Learning in detailed of the concept Socio-technical system and its Essential characteristics of socio technical systems and more<br>U2 - 02 - Introduction and Learning of critical system and types of it .<br>U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models . | |
| UNIT – III<br>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.<br>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.<br>Project Management<br>Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.<br>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics. | U3 - 01 - Introduction to Architectural Design and its system and styles .<br>U3 - 02 - Learning and Understanding of User Interface Design .<br>U3 - 03 - Analyzing and creating Quality Management . | |
| UNIT – IV<br>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component | U4 - 01 - Understanding and learning about the Verification and Validation. | |

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| Testing, Test Case Design, Test Automation, Software Measurement: Size-Oriented Metrics, Function-OrientedMetrics, Extended Function Point Metrics Software Cost Estimation:Software Productivity, EstimationTechniques, Algorithmic Cost Modelling, Project Duration and Staffing | U4 - 02 - Analyze and creating testing components and its functions . | |
| UNIT -V<br>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling,<br>Process Change, The CMMI Process Improvement Framework.<br>Service Oriented Software Engineering: Services as reusable components,<br>Service Engineering, Software Development with Services.<br>Software reuse: The reuse landscape, Application frameworks,<br>Software product lines, COTS product reuse.<br>Distributed software engineering: Distributed systems issues,<br>Client–server computing, Architectural patterns for distributed systems, Software as a service | U5 - 01 - Analyze and creating the process of Improvement i.e product . quality etc . | |

Course: USIT405 Computer Graphics and Animation

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Computer Graphics:<br>Overview of Computer Graphics, Computer Graphics Application and<br>Software, Description of some graphics devices, Input Devices for<br>Operator Interaction, Active and Passive Graphics Devices, Display<br>Technologies, Storage Tube Graphics Displays, Calligraphic Refresh | U1 - 01 - Introduction to Computer graphics and its application and software description . | CO1 To familiarize students with basic principles and techniques for computer graphics.<br>CO2 To Provide knowledge of interactive computer graphics with techniques of clipping. |

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| Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays,<br>Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video<br>Basics, The Video Controller, Random-Scan Display Processor, LCD<br>displays.<br>Scan conversion – Digital Differential Analyzer (DDA) algorithm,<br>Bresenhams' Line drawing algorithm.Bresenhams' method of Circle<br>drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm,<br>Mid-point criteria, Problems of Aliasing, end-point ordering and<br>clipping lines, Scan Converting Circles, Clipping Lines algorithms–<br>Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons,<br>problem with multiple components. | U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping . | three<br>dimensional graphics and three dimensional transformations.<br>CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry.<br>CO4 This course will introduce students to all aspects of computer graphics including hardware,<br>software and applications.<br>CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional transformations. |
| UNIT – II<br>Two-Dimensional Transformations:<br>Transformations and Matrices, Transformation Conventions, 2D<br>Transformations, Homogeneous Coordinates and Matrix<br>Representation of 2D Transformations, Translations and<br>Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined<br>Transformation, Transformation of Points, Transformation of The<br>Unit Square, Solid Body Transformations, Rotation About an<br>Arbitrary Point, Reflection through an Arbitrary Line, A Geometric<br>Interpretation of Homogeneous Coordinates, The Window-to Viewport Transformations.<br>Three-Dimensional Transformations:<br>Three-Dimensional Scaling, Three-Dimensional Shearing, ThreeDimensional Rotation, Three-Dimensional Reflection, ThreeDimensional Translation, Multiple Transformation, Rotation about an<br>Arbitrary Axis in Space, Reflection through an Arbitrary Plane,<br>Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective | U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices .<br><br>U2 - 02 - Learning and creating Three-Dimensional<br>Transformations and many of its working and objectives . | |

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| Transformations. Techniques for Generating Perspective Views.<br>Vanishing Points. the Perspective Geometry and camera models.<br>Orthographic Projections. Axonometric Projections. Oblique<br>Projections. View volumes for projections. | U2 - 03 - Understanding the concepts of Vanishing Points. the Perspective Geometry and camera models. Orthographic Projections. Axonometric Projections etc . | |
| UNIT – III<br>Viewing in 3D<br>Stages in 3D viewing. Canonical View Volume (CVV). Specifying an<br>Arbitrary 3D View. Examples of 3D Viewing. The Mathematics of<br>Planar Geometric Projections. Combined transformation matrices for<br>projections and viewing. Coordinate Systems and matrices. camera<br>model and viewing pyramid.<br>Light:Radiometry,Transport.Equation,Photometry<br>Color:Colorimetry,ColorSpaces,ChromaticAdaptation. Color<br>Appearance | U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective .<br><br>U3 - 02 - Remembering and learning light and color and its various components . | |
| UNIT – IV<br>Visible-Surface Determination:<br>Techniques for efficient Visible-Surface Algorithms. Categories of<br>algorithms. Back face removal. The z-Buffer Algorithm. Scan-line<br>method. Painter's algorithms (depth sorting). Area sub-division<br>method. BSP trees. Visible-Surface Ray Tracing. comparison of the | U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques . | |

Sem - IV

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| methods.<br>Plane Curves and Surfaces:<br>Curve Representation, Nonparametric Curves, Parametric Curves,<br>Parametric Representation of a Circle, Parametric Representation of<br>an Ellipse, Parametric Representation of a Parabola, Parametric<br>Representation of a Hyperbola, Representation of Space Curves,<br>Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit,<br>B-spline Curve Subdivision, Parametric Cubic Curves, Quadric<br>Surfaces, Bezier Surfaces | U4 - 02 - Creating and Learning the planes and curves and surfaces along with its different working and drawings . | |
| UNIT -V<br>Computer Animation:<br>Principles of Animation, Key framing, Deformations, Character<br>Animation, Physics-Based Animation, Procedural Techniques, Groups<br>of Objects.<br>Image Manipulation and Storage:<br>What is an Image? Digital image file formats, Image compression<br>standard – JPEG, Image Processing - Digital image enhancement,<br>contrast stretching, Histogram Equalization, smoothing and median<br>Filtering | U5 - 01 - Learning and understanding the concept of Computer Animation in detail .<br><br>U5 - 02 - Creating and analyzing Image Manipulation and Storage in detail . | |

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# Course Outcomes

## FYBSC IT – SEM 5 2022-23

Course: USIT501 Software Project Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Software Project Management:Introduction. Why is Software Project Management Important? What is a Project?<br>Software Projects versus Other Types of Project. Contract Management and Technical Project Management. Activities Covered by Software Project Management. Plans, Methods and Methodologies.<br>Some Ways of Categorizing Software Projects. Project Charter.<br>Stakeholders. Setting Objectives. The Business Case. Project Success and Failure. What is Management? Management Control. Project Management Life Cycle. Traditional versus Modern Project Management Practices.<br>Project Evaluation and Programme Management: Introduction.<br>Business Case. Project Portfolio Management. Evaluation of Individual Projects. Cost–benefit Evaluation Techniques. Risk Evaluation. Programme Management. Managing the Allocation of Resources within Programmes. Strategic Programme Management.<br>Creating a Programme. Aids to Programme Management. Some Reservations about Programme Management. Benefits Management.<br>An Overview of Project Planning:Introduction to Step Wise Project Planning. Step 0: Select Project. Step 1: Identify Project Scope and Objectives. Step 2: Identify Project Infrastructure. Step 3: Analyse Project Characteristics. Step 4: Identify Project Products and | U1 -01- Understanding Why is Software Project Management Important.<br>U1 -02- Learning the basic concept of project.<br>U1 -03- Understanding and learning about what is management.<br>U1 -04- Learning about Overview of Project Planning. | CO1 Professional terminologies of software industry.<br>CO2 Problem solving algorithms and techniques.<br>CO3 Understand the development work environment<br>CO4 To make students realize software project management is not just theory subject to pass, instead it will help them live their professional life with ease.<br>CO5 This subject makes a student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player. |

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| Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify<br>Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize<br>Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning | | |
| UNIT – II<br>Selection of an Appropriate Project Approach:Introduction, Build<br>or Buy? Choosing Methodologies and Technologies, Software<br>Processes and Process Models, Choice of Process Models, Structure<br>versus Speed of Delivery, The Waterfall Model, The Spiral Model,<br>Software Prototyping, Other Ways of Categorizing Prototypes,<br>Incremental Delivery, Atern/Dynamic Systems Development Method,<br>Rapid Application Development, Agile Methods, Extreme<br>Programming (XP), Scrum, Lean Software Development, Managing<br>Iterative Processes, Selecting the Most Appropriate Process Model.<br>Software Effort Estimation:Introduction, Where are the Estimates<br>Done? Problems with Over- and Under-Estimates, The Basis for<br>Software Estimating, Software Effort Estimation Techniques, Bottomup Estimating, The Top-down Approach and Parametric Models,<br>Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points,<br>COCOMO II: A Parametric Productivity Model, Cost Estimation,<br>Staffing Pattern, Effect of Schedule Compression, Capers Jones<br>Estimating Rules of Thumb. | U2 -01- Analyzing the Appropriate Project Approach.<br><br>U2 -02- How to choose proper methods and technologies for software development<br><br>U2 -03- Analyzing the most Appropriate Process Model.<br><br>U2 -04- Understanding about Software Effort Estimation Techniques. | |
| UNIT – III<br>Activity Planning: Introduction, Objectives of Activity Planning,<br>When to Plan, Project Schedules, Projects and Activities, Sequencing<br>and Scheduling Activities, Network Planning Models, Formulating a<br>Network Model, Adding the Time Dimension, The Forward Pass,<br>Backward Pass, Identifying the Critical Path, | U3 -01- Learning about how to plan, when to plan and proper project schedules.<br><br>U3 -02- Understanding about risk management. | |

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| Activity Float.<br>Shortening the Project Duration. Identifying Critical Activities<br>Activity-on-Arrow Networks.<br>Risk Management: Introduction. Risk. Categories of Risk. Risk<br>Management Approaches. A Framework for Dealing with Risk. Risk<br>Identification. Risk Assessment. Risk Planning. Risk Management.<br>Evaluating Risks to the Schedule. Boehm"s Top 10 Risks and Counter<br>Measures. Applying the PERT Technique. Monte Carlo Simulation.<br>Critical Chain Concepts.<br>Resource Allocation: Introduction. Nature of Resources. Identifying<br>Resource Requirements. Scheduling Resources. Creating Critical<br>Paths. Counting the Cost. Being Specific. Publishing the Resource<br>Schedule. Cost Schedules. Scheduling Sequence. | U3 -03- Analyzing the Resource Allocation.<br>U3 -04- Analyzing the Cost Schedules | |
| UNIT – IV<br>Monitoring and Control: Introduction. Creating the Framework.<br>Collecting the Data. Review. Visualizing Progress. Cost Monitoring.<br>Earned Value Analysis. Prioritizing Monitoring. Getting the Project<br>Back to Target. Change Control. Software Configuration Management<br>(SCM).<br>Managing Contracts: Introduction. Types of Contract. Stages in<br>Contract Placement. Typical Terms of a Contract. Contract<br>Management. Acceptance.<br>Managing People in Software Environments: Introduction.<br>Understanding Behaviour. Organizational Behaviour: A Background.<br>Selecting the Right Person for the Job. Instruction in the Best<br>Methods. Motivation. The Oldham–Hackman Job Characteristics<br>Model. Stress. Stress Management. Health and Safety. Some Ethical<br>and Professional Concerns. | U4 -01- Understanding Monitoring and Control.<br>U4 -02- Learning about how to manage contracts.<br>U4 -03- Understanding Behaviour. Organizational Behaviour | |
| UNIT – V<br>Working in Teams: Introduction. becoming a Team. | U5 - Learning about how to work in teams. | |

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| Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report. | U5 -02- Analyzing how good the software quality should be. U5 -03- Learning about how the project closure should be. | |

Course: USIT502 Internet of Things

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I The Internet of Things: An Overview: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances. Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS. | U1 -01- Understanding what is Internet Of Things. U1 -02- Learning Flavour of the Internet of Things. U1 -03- Understanding the principles of internet. U1 -04- Understanding different types of IP addresses. | CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping. CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors. CO3 The Internet of Things (IOT) is the next wave, world is going to witness. CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and everything which you use in day-to-day life). CO5 Internet of Things is a term given to the attempt of connecting objects to the |

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| Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports. Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols. | | internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion. |
| UNIT – II Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform. Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. | U2 -01- Learning about Costs versus Ease of Prototyping.<br><br>U2 -02- Understanding what is open and closed source.<br><br>U3 -03- learning about Arduino and Raspberry Pi. | |
| UNIT – III Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols. | U3 -01- Understanding how to prototype the physical design.<br><br>U3 -02- Learning the basic concept of Laser cutting.<br><br>U3 -03- Understanding the concept of Scrapping, comet, polling and other protocols. | |

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| MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol. | | |
| UNIT – IV<br>Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries.Debugging.<br>Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups. | U4 -01- Understanding what is memory management.<br><br>U4 -02- Learning the basic concept of Business Model.<br><br>U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups. | |
| UNIT – V<br>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards, Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.<br>Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control,Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition. | U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards.<br><br>U5 -02- Learning about Ethics.<br><br>U5 -03- Analyzing the Correctness and Maintainability, Security, Performance | |

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Course: USIT503 Advanced Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.<br>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.<br>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming. | U1 -01- Understanding .NET framework .<br><br>U1 -02- Learning about Types, Objects, and Namespaces.<br><br>U3 - 03- Learning about values types and reference type. | CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.<br>CO2 Enable learners to use Visual Studio -an advanced design tool<br>CO3 To gain in-depth learning of various concepts and features of NET coding and developing of web applications.<br>CO4 To Provide knowledge of different State management techniques<br>CO5 To explore ADO.NET- a model for interacting with databases.<br>CO6 Using XML various security fundamentals will be explored |
| UNIT – II<br>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.<br>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control. | U2 -01- Understanding the basic concept of Web form fundamentals.<br><br>U2 -02- Learning about Form controls.<br><br>U2 -03- Understanding Validation and how to Use Validation Controls. | |
| UNIT – III | U3 -01- Learning and understanding about | |

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| Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing<br>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options<br>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages, | the basic concept of Error Handling, Logging, and Tracing.<br><br>U3 -02- Learning State Management.<br><br>U3 -03- Learning about how to apply Themes and master pages. | |
| UNIT – IV<br>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.<br>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,<br>The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView | U4 -01- Understanding the fundamentals of ADO.NET.<br><br>U4 -02- Learning about Data Binding.<br><br>U4 -03- Learning about the basic concept of Data controls. | |
| UNIT – V<br>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.<br>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.<br>ASP.NET AJAX: Understanding | U5 -01- Understanding what is XML.<br><br>U5 -02- Learning about what is Security Fundamentals.<br><br>U5 -03- Understanding Ajax, Using Partial Refreshes. | |

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| Ajax. Using Partial Refreshes. Using Progress Notification. Implementing Timed Refreshes. Working with the ASP.NET AJAX Control Toolkit. | | |

Course: USIT505 Linux System Administration

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.<br>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History.<br>Performing Basic File System Management Tasks. Working with Directories, Piping and Redirection, Finding Files<br>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management. Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate<br>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages | U1 -01- Understanding about Red Hat Enterprise Linux.<br>U1 -02- Analyzing and Working with the Bash Shell.<br>U1 -03- Learning about System Administration Tasks | CO1 To familiarize students with Linux Installation.<br>CO2 Enable Students to Install RPM and use Red hat Package Management<br>CO3 To Make Students Install Samba Server and the use of Samba Server<br>CO4 To make Students Install Apache, Send Mail.<br>CO5 Write Shell Scripts in Linux. |
| UNIT – II<br>Configuring and Managing Storage: Understanding Partitions and | U2 -01- Learning about how to configure and manage storage. | |

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| Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes | U2 -02- Understanding NetworkManager, Working with Services and Runlevels.<br><br>U2 -03- Learning about how to troubleshoot the network.<br><br>U2 -04- Learning the basic concept of SSH.<br><br>U2 -05- Learning about Permissions. | |

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| UNIT – III<br>Securing Server with iptables: Understanding Firewalls, Setting Up<br>a Firewall with system-config-firewall, Allowing Services, Trusted<br>Interfaces, Masquerading, Configuration Files, Setting Up a Firewall<br>with iptables, Tables, Chains, and Rules, Composition of Rule,<br>Configuration Example, Advanced iptables Configuration,<br>Configuring Logging, The Limit Module, Configuring NAT<br>Setting Up Cryptographic Services: Introducing SSL, Proof of<br>Authenticity: The Certificate Authority, Managing Certificates with<br>openssl, Creating a Signing Request, Working with GNU Privacy<br>Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys,<br>Encrypting Files with GPG, GPG Signing, Signing RPM Files<br>Configuring Server for File Sharing: What is NFS? Advantages and<br>Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4,<br>Mounting an NFS Share, Making NFS Mounts Persistent, Configuring<br>Automount, Configuring Samba, Setting Up a Samba File Server,<br>Samba Advanced Authentication Options, Accessing Samba Shares,<br>Offering FTP Services. | U3 -01- Learning about Securing Server with iptables<br><br>U3 -02- Learning how to set up a firewall. | |
| UNIT – IV<br>Configuring DNS and DHCP:Introduction to DNS, The DNS<br>Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone<br>Types, Setting Up a DNS Server, Setting Up a Cache-Only Name<br>Server, Setting Up a Primary Name Server, Setting Up a Secondary<br>Name Server, Understanding DHCP, Setting Up a DHCP Server<br>Setting Up a Mail Server: Using the Message Transfer Agent, the<br>Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an<br>SMTP Server, Working with Mutt, Basic | U4 -01- Understanding how to configure DNS and DHCP.<br><br>U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd. | |

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| Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL | | |
| UNIT – V<br>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures. Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB. High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster. | U5 -01- Learning about Bash Shell Scripting.<br><br>U5 -02- Understanding Variables, Variables, Subshells, and Sourcing.<br><br>U5 -03- Learning High-Availability Clustering. | |

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| Configuring GFS2 File Systems<br>Setting Up an Installation Server: Configuring a Network Server as<br>an Installation Server, Setting Up a TFTP and DHCP Server for PXE<br>Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot,<br>Creating the TFTP PXE Server Content, creating a Kickstart File,<br>Using a Kickstart File to Perform an Automated, Installation,<br>Modifying the Kickstart File with, system-config-kickstart, Making<br>Manual Modifications to the Kickstart File | | |

Course: USIT506 Enterprise Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Understanding Java EE: WhatisanEnterpriseApplication? Whatisjavaenterpriseedition? JavaEETechnologies, JavaEEevolution,<br>Glassfishserver<br>JavaEE Architecture,Serverand Containers:<br>TypesofSystemArchitecture, JavaEEServer, JavaEEContainers.<br>Introduction to Java Servlets: TheNeedforDynamicContent,<br>JavaServletTechnology, WhyServlets? WhatcanServletsdo?<br>Servlet API and Lifecycle: JavaServletAPI, TheServletSkeleton,<br>TheServletLifeCycle, ASimpleWelcomeServlet<br>WorkingwithServlets: GettingStarted,<br>UsingAnnotationsInsteadofDeploymentDescriptor.<br>Working with Databases: WhatIsJDBC? JDBCArchitecture,<br>AccessingDatabase, TheServletGUI and DatabaseExample. | U1 -01- Understanding what is Java EE.<br><br>U1 -02- Learning about the basic concept of Java servlets.<br><br>U2 -03- Understanding how to work with database. | CO1 Identify advance concepts of java programming with database connectivity.<br>CO2 Design and develop platform independent applications using a variety of component based<br>frameworks.<br>CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.<br>CO4 The objective is to equip the students with the advanced feature of contemporary java which would<br>enable them to handle complex programs relating to managing data and processes over the network.<br>CO5 The major objective of this course is to provide a sound foundation to the students on the concepts, |

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| | | precepts and practices, in a field that is of immense concern to the industry and business. |
| UNIT – II<br>Request Dispatcher: Resquestdispatcher Interface, Methods of<br>Requestdispatcher, Requestdispatcher Application.<br>COOKIES: KindsofCookies, WhereCookiesAreUsed? CreatingCookiesUsingServlet,<br>DynamicallyChangingtheColorsofAPage<br>SESSION: WhatAreSessions? LifecycleofHttpSession, SessionTrackingWithServletAPI, AServlet Session Example<br>Workingwith Files: UploadingFiles,<br>CreatinganUploadFileApplication, DownloadingFiles,<br>CreatingaDownloadFileApplication,<br>Workingwith Non-Blocking I/O:<br>CreatingaNonBlockingReadApplication, CreatingTheWeb Application,<br>CreatingJavaClass, Creating Servlets, Retrieving The File, Creating<br>index.jsp | U2 -01- learning the concept of Request Dispatcher.<br><br>U2 -02- Learning about cooking.<br><br>U2 -03- Learning how to work with files. | |
| UNIT – III<br>Introduction To Java ServerPages: WhyuseJava ServerPages?<br>DisadvantagesOfJSP, JSPvsServlets, LifeCycleofaJSPPage,<br>HowdoesaJSPfunction? HowdoesJSPexecute? AboutJava ServerPages<br>Getting Started With Java ServerPages: Comments, JSPDocument,<br>JSPElements, JSPGUIExample.<br>Action Elements: IncludingotherFiles,<br>ForwardingJSPPagetoAnotherPage,<br>PassingParametersforotherActions, LoadingaJavabean,<br>Implicit Objects, Scopeand ElExpressions: ImplicitObjects,<br>CharacterQuotingConventions,<br>UnifiedExpressionLanguage[UnifiedEl],<br>ExpressionLanguage.<br>Java Server Pages Standard Tag Libraries:<br>WhatiswronginusingJSPScriptletTags?<br>HowJSTLFixesJSPScriptlet'sShortcomings?<br>DisadvantagesOfJSTL,<br>TagLibraries. | U3 -01- Understand about Java Server pages.<br><br>U3 -02- Learning about LifeCycle of a JSP Page.<br><br>U3 -03- Understanding about Action Element. | |
| UNIT – IV<br>Introduction To EnterpriseJavabeans: EnterpriseBeanArchitecture, | U4 -01- Understanding Enterprise java Bean. | |

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| BenefitsofEnterpriseBean, TypesofEnterpriseBean, AccessingEnterpriseBeans, EnterpriseBeanApplication, PackagingEnterpriseBeans<br>Workingwith Session Beans: WhentouseSessionBeans? TypesofSessionBeans, RemoteandLocalInterfaces, AccessingInterfaces, LifecycleofEnterpriseBeans, PackagingEnterpriseBeans, Exampleof StatefulSessionBean, Example ofStatelessSessionBean, Example of SingletonSessionBeans.<br>Working with Message DrivenBeans; LifecycleofaMessageDrivenBean, UsesofMessageDrivenBeans, TheMessage DrivenBeansExample.<br>Interceptors: Request andIntereceptor, Defining An Interceptor, AroundInvokeMethod, ApplyingInterceptor, Adding An Intereceptor<br>To An Enterprise Bean, Build and Run the Web Application.<br>Java Naming and Directory Interface: What is Naming Service?<br>What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE. | U4 -02- Learning about types of Java bean<br><br>U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail . | |
| UNIT – V<br>Persistence, Object/Relational Mapping And JPA: WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping.<br>Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications.<br>Writing JPA Application: ApplicationRequirementSpecifications. | U5 - 01 -Introduction and learning about Persistence, Object/Relational Mapping And JPA in detail with its meaning .<br><br>U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications . | |

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| SoftwareRequirements,<br>TheApplicationDevelopmentApproach,<br>CreatingDatabaseandTablesinMysql,<br>creatingaWebApplication,<br>AddingtheRequiredLibraryFiles,<br>creatingaJavabeanClass,<br>CreatingPersistenceUnit[Persistence.Xml],<br>CreatingJSPS,<br>TheJPAApplicationStructure,<br>RunningtheJPAApplication.<br>Introduction to Hibernate: WhatisHibernate?<br>WhyHibernate?<br>Hibernate,DatabaseandTheApplication,<br>ComponentsofHibernate,<br>ArchitectureofHibernate, HowHibernateWorks?<br>WritingHibernate,Application:<br>ApplicationRequirementSpecifications,<br>SoftwareRequirements,<br>TheApplicationDevelopmentApproach,<br>CreatingDatabaseandTablesinMysql,<br>creatingaWebApplication,<br>AddingtheRequiredLibraryFiles,<br>creatingaJavabeanClass,<br>CreatingHibernateConfigurationFile,<br>AddingaMappingClass,<br>CreatingJSPS, RunningTheHibernateApplication. | U5 - 03 - Creating and learning of JSPS,<br>The JPA ApplicationStructure, along with this learning how to run the program .<br><br>U5 - 04 - Learning how to write and hiber net application in details with all the information required . | |

# Course Outcomes

## TYBSC IT – SEM 6 2022-23

Course: USIT601 Software Quality Assurance

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.<br>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management. | U1 - 01 - Describe fundamental concepts of software quality assurance.<br>U1 - 02 - Explore test planning and its management. | CO1 Ability to identify and apply modern software testing methods in software development<br>CO2 Understand testing strategies and defect management<br>CO3 Recognise the importance of software quality assurance<br>CO4 Know about quality improvement, cost control and contribute toward efficient delivery of software solutions |
| UNIT – II<br>Fundamentals of testing: Introduction, Necessity of | U2 - 01 - To learn the basic testing techniques. | |

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| testing. What is testing? Fundamental test process. The psychology of testing, Historical Perspective of Testing. Definitions of Testing. Approaches to Testing. Testing During Development Life Cycle. Requirement Traceability Matrix. Essentials of Software Testing. Workbench, Important Features of Testing Process. Misconceptions About Testing. Principles of Software Testing. Salient Features of Good Testing. Test Policy. Test Strategy or Test Approach. Test Planning. Testing Process and Number of Defects Found in Testing. Test Team Efficiency. Mutation Testing. Challenges in Testing. Test Team Approach. Process Problems Faced by Testing. Cost Aspect of Testing. Establishing Testing Policy. Methods. Structured Approach to Testing. Categories of Defect. Defect. Error. or Mistake in Software. Developing Test Strategy. Developing Testing Methodologies (Test Plan). Testing Process. Attitude Towards Testing (Common People Issues). Test Methodologies/Approaches. People Challenges in Software Testing. Raising Management Awareness for Testing. Skills Required by Tester. Testing throughout the software life cycle. Software development models. Test levels. Test types. the targets of testing. Maintenance testing | U2 - 02 - Develop knowledge of testing process and features. | |
| UNIT – III<br>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing. Robust Boundary Value Testing. Worst-Case Boundary ValueTesting. Special Value Testing. Examples. Random Testing. Guidelines for Boundary Value Testing. Equivalence Class Testing: Equivalence Classes. Traditional Equivalence Class Testing. Improved Equivalence Class Testing. Edge Testing. | U3 - 01 - To learn Boundary value analysis.<br>U3 - 02 - Develop knowledge of the Testing techniques. | |

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| Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations. Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations. Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools. | | |
| UNIT – IV<br>Software Verification and Validation:Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis od Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.<br>V-test Model:Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities | U4 - 01 - Analyze Verfication and Validation.<br>U4 - 02 - Introduce V - Model and Testing during test | |
| UNIT – V<br>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages, Special Tests:Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing. | U5 - 01 - understanding the levels of testings. | |

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| Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing,<br>Parallel Testing, Execution Testing, Operations Testing, Compliance<br>Testing, Usability Testing, Decision Table Testing, Documentation<br>Testing, Training testing, Rapid Testing, Control flow graph,<br>Generating tests on the basis of Combinatorial Designs, State Graph,<br>Risk Associated with New Technologies, Process maturity level of<br>Technology, Testing Adequacy of Control in New technology usage,<br>Object Oriented Application Testing, Testing of Internal Controls,<br>COTS Testing, Client Server Testing, Web Application Testing,<br>Mobile Application Testing, eBusiness eCommerce Testing, Agile<br>Development Testing, Data Warehousing Testing. | | |

Course: USIT602 Security in Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Information Security Overview: The Importance of Information<br>Protection, The Evolution of Information Security, Justifying Security<br>Investment, Security Methodology, How to Build a Security Program,<br>The Impossible Job, The Weakest Link, Strategy and Tactics,<br>Business Processes vs. Technical Controls.<br>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.<br>Secure Design Principles: The CIA Triad and Other Models, Defense<br>Models, Zones of Trust, Best Practices for Network Defense. | U1 - 01 - simplify Information Security Overview<br>U1 - 02 - determine Secure Design Principles | CO1 Insight into secure design principles and defense models.<br>CO2 Knowledge about storage and database security.<br>CO3 Implement IDS, Firewalls and wireless security.<br>CO4 Skills to implement secure cloud environment for web and application security<br>CO5 Ability to implement physical security for implementing secure information environment. |
| UNIT – II<br>Authentication and Authorization: Authentication, Authorization<br>Encryption: A Brief History of Encryption, Symmetric-Key | U2 - 01 - classify Authentication and Authorization<br>U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure | |

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| Cryptography, Public Key Cryptography, Public Key Infrastructure.<br>Storage Security: Storage Security Evolution, Modern Storage<br>Security, Risk Remediation, Best Practices.<br>Database Security: General Database Security Concepts.<br>Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and<br>Monitoring | | |
| UNIT – III<br>Secure Network Design: Introduction to Secure Network Design,<br>Performance, Availability, Security.<br>Network Device Security: Switch and Router Basics, Network<br>Hardening.<br>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.<br>Wireless Network Security: Radio Frequency Security Basics, DataLink Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening<br>Practices and Recommendations, Wireless Intrusion Detection and<br>Prevention, Wireless Network Positioning and Secure Gateways. | U3 - 01 - Learn Firewall Capabilities, Firewall Design.<br>U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and<br>Prevention, Wireless Network Positioning and Secure Gateways. | |
| UNIT – IV<br>Intrusion Detection and Prevention Systems: IDS Concepts, IDS<br>Types and Detection Models, IDS Features, IDS Deployment<br>Considerations, Security Information and Event Management (SIEM).<br>Voice over IP (VoIP) and PBX Security: Background, VoIP<br>Components,VoIP Vulnerabilities and Countermeasures, PBX, TEM:<br>Telecom Expense Management.<br>Operating System Security Models: Operating System Models,<br>Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security, | U4 - 01 - Learn Operating System Security Models.<br>U4 - 02 - Learn Intrusion Detection and Prevention Systems | |

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| UNIT – V<br>Virtual Machines and Cloud Computing: Virtual Machines. Cloud Computing.<br>Secure Application Design: Secure Development Lifecycle.<br>Application Security Practices, Web Application Security. Client Application Security. Remote Administration Security.<br>Physical Security: Classification of Assets, Physical Vulnerability Assessment. Choosing Site Location for Security. Securing Assets:<br>Locks and Entry Controls, Physical Intrusion Detection. | U5 - 01 - Introduce Cloud computing.<br>U5 - 02 - Analyze application Security. Remote Administration Security. | |

Course: USIT603 Business Intelligence

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Business intelligence: Effective and timely decisions. Data, information and knowledge. The role of mathematical models. Business intelligence architectures. Ethics and business intelligence<br>Decision support systems: Definition of system. Representation of the decision-making process. Evolution of information systems. Definition of decision support system. Development of a decision support system | U1 - 01 - Describe the concepts and components of Business Intelligence (BI).<br>U1 - 02 -Critically evaluate use of BI for supporting decision making in an organisation.<br>U1 - 03 - Understand and use the technologies and tools that make up BI. | CO1 Ability to use decision support system for BI Applications<br>CO2 Ability to develop and use mathematical models for data mining and data preparations<br>CO3 Know how and when to apply classification and clustering techniques for solving BI problems<br>CO4 Explore insights into important emerging applications of BI<br>CO5 Developing skills to design expert system solutions for business applications |
| UNIT – II<br>Mathematical models for decision making: Structure of mathematical models. Development of a model. Classes of models<br>Data mining: Definition of data mining. Representation of input data . | U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction<br>U2 - 02 - To develop knowledge of data mining.<br>U2 - 03 - Analyze Data Validation and data preparation. | |

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| Data mining process, Analysis methodologies<br>Data preparation: Data validation, Data transformation, Data reduction | | |
| UNIT – III<br>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks,<br>Support vector machines<br>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models | U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods<br><br>U3 - 02 - Explain Clustering and classification model. | |
| UNIT – IV<br>Business intelligence applications:<br>Marketing models: Relational marketing, Sales force management,<br>Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management<br>systems, Data envelopment analysis: Efficiency measures, Efficient frontier,<br>The CCR model, Identification of good operating practices | U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model<br><br>U4 - 02 - Identify marketing models and production models. | |
| UNIT – V<br>Knowledge Management: Introduction to Knowledge Management,<br>Organizational Learning and Transformation, Knowledge Management<br>Activities, Approaches to Knowledge Management, Information<br>Technology (IT) In Knowledge Management, Knowledge Management<br>Systems Implementation, Roles of People in Knowledge Management | U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems<br>U5 - 02 - generate knowledge of AI and other Automation techniques.<br><br>U5 - 03 - Develop Knowledge of expert system. | |

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| Artificial Intelligence and Expert Systems:<br>Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert<br>Systems, Applications of Expert Systems, Structure of Expert Systems,<br>Knowledge Engineering, Development of Expert Systems | | |

Course: USIT604 Principles of Geographic Information Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>A Gentle Introduction to GIS<br>The nature of GIS: Some fundamental observations, Defining GIS,<br>GISystems, GIScience and GIApplications, Spatial data and<br>Geoinformation.<br>The real world and representations of it: Models and modelling,<br>Maps, Databases, Spatial databases and spatial analysis<br>Geographic Information and Spatial Database<br>Models and Representations of the real world<br>Geographic Phenomena: Defining geographic phenomena, types of<br>geographic phenomena, Geographic fields, Geographic objects,<br>Boundaries<br>Computer Representations of Geographic Information: Regular<br>tessellations, irregular tessellations, Vector representations, Topology<br>and Spatial relationships, Scale and Resolution, Representation of<br>Geographic fields, Representation of Geographic objects<br>Organizing and Managing Spatial Data<br>The Temporal Dimension | U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).<br><br>U1 - 02 -Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | CO1 Explore mapped data, Spatial Data Types, Data Creation, Georeferencing, Spatial Analysis<br>CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis<br>CO3 Analyze spatial data, using QGIS analysis tools<br>CO4 Develop and Manage Geodatabases for real world data<br>CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others |
| UNIT – II<br>Data Management and Processing Systems | U2 - 01 -Demonstrate organizational skills in file and database management. | |

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| Hardware and Software Trends<br>Geographic Information Systems: GIS Software. GIS Architecture and functionality, Spatial Data Infrastructure (SDI)<br>Stages of Spatial Data handling: Spatial data handling and preparation. Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.<br>Database management Systems: Reasons for using a DBMS.<br>Alternatives for data management, The relational data model.<br>Querying the relational database.<br>GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality. | U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology. | |
| UNIT – III<br>Spatial Referencing and Positioning<br>Spatial Referencing: Reference surfaces for mapping. Coordinate Systems. Map Projections. Coordinate Transformations<br>Satellite-based Positioning: Absolute positioning. Errors in absolute positioning. Relative positioning. Network positioning. code versus phase measurements. Positioning technology<br>Data Entry and Preparation<br>Spatial Data Input: Direct spatial data capture. Indirect spatial data capture. Obtaining spatial data elsewhere<br>Data Quality: Accuracy and Positioning. Positional accuracy, Attribute accuracy, temporal accuracy, Lineage. Completeness. Logical consistency<br>Data Preparation: Data checks and repairs. Combining data from multiple sources<br>Point Data Transformation: Interpolating discrete data. Interpolating continuous data | U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions.<br>U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. | |
| UNIT – IV<br>Spatial Data Analysis<br>Classification of analytical GIS Capabilities<br>Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification<br>Overlay functions: Vector overlay | U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms.<br>U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in | |

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| operators.Raster overlay operators Neighbourhood functions: Proximity computations. Computation of diffusion. Flow computation. Raster based surface analysis<br>Analysis: Network analysis, interpolation, terrain modeling<br>GIS and Application models:GPS, Open GIS Standards. GIS Applications and Advances<br>Error Propagation in spatial data processing: How Errors propagate. Quantifying error propagation | GIS, and seek help from software/website help menus and the GIS community to solve problems. | |
| UNIT – V<br>Data Visualization<br>GIS and Maps. The Visualization Process<br>Visualization Strategies: Present or explore?<br>The cartographic toolbox: What kind of data do I have? How can I map my data?<br>How to map? How to map qualitative data. How to map quantitative data. How to map the terrain elevation. How to map time series Map Cosmetics, Map Dissemination | U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.<br><br>U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS). | |

Course: USIT605 IT Service Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUT |
|---|---|---|
| UNIT – I<br>IT Service Management: Introduction. What is service management?<br>What are services? Business Process. Principles of Service management: Specialisation and Coordination. The agency principle.<br>Encapsulation. Principles of systems. The service Life Cycle.<br>Functions and processes across the life cycle.<br>Service Strategy Principles: Value creation. Service Assets. Service Provider Service Structures, Service Strategy Principles.<br>Service Strategy:Define the market. Develop the offerings. Develop Strategic Assets. Prepare for execution.<br>Challenges, Critical Success factors and | U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM<br>U1 - 02 - understand how ITSM can operate in an organisation to improve processes<br>U1 - 03 - understand best management practice from a technical and non-technical perspective | CO1 Ability t interoperability networks with local, access a with service in<br>CO2 Ability t manage, opera networks, serv and contents<br>CO3 Ability to making about s<br>CO4 Learn a service operati<br>CO5 Ability Improvement i |

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| risks:Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks. | | |
| UNIT – II<br>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models<br>Service Design Processes:Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security | U2 - 01 - communicate management theories and ideas in writing<br>U1 - 02 - problem solve through the lens of management theories<br>U1 - 03 - critically evaluate information from a variety of sources | |
| UNIT – III<br>Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition<br>Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management, Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions. | U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions<br>U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms and businesses.<br>U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems. | |
| UNIT – IV<br>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, a chieving balance in service operations, Providing service, Operation staff | U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector.<br>U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in | |

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| involvement in service design and service transition, Operational<br>Health, Communication, Documentation<br>Service Operation Processes:Event Management, Incident<br>Management, Request fulfilment, Problem Management, Access<br>Management, Operational activities of processes covered in other<br>lifecycle phases.<br>Challenges, Critical Success factors and risks:Challenges, Critical<br>Success factors, Risks | general.<br>U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance. | |
| UNIT – V<br>Continual Service Improvement(CSI) Principles: CSI Approach,<br>CSI and organizational change, Ownership, CSI register, External and<br>Internal drivers, Service level management, Knowledge management,<br>The Deming cycle, Service Measurement, IT governance,<br>Frameworks, models, standards and quality Systems, CSI inputs and<br>outputs.<br>CSI Process: The seven-step improvement process. CSI Methods<br>nad Techniques: Methods and techniques, Assessments,<br>benchmarking, Service Measurement, Metrics, Return on Investment,<br>Service reporting, CSI and other service management processes,<br>Organising for CSI:Organisational development, Functions, roles,<br>Customer Engagement, Responsibility model - RACI, Competence<br>and training.<br>Technology considerations: Tools to support CSI activities.<br>Implementing CSI:Critical Considerations for implementing<br>CSI,The start, Governance, CSI and organisational change,<br>Communication Strategy and Plan | U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets.<br><br>U5 - 02 -Locate and access appropriate sources of information in order to be able to make informed decisions about effective services delivery.<br><br>U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios. | |

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ACADEMIC YEAR 2021-2022

**Program: Bachelors of Science in Information Technology.**

## Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

## Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
**PSO5:** Identify, design, and analyze complex computer software systems and implement and interpret the results from those systems.
**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

# COURSE OUTCOME

FYBSC IT – SEM 1
2021-2022

Course: USIT101 Imperative Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:**<br>Types of Programming languages, History, features and application. Simple program logic, program development cycle, pseudocode statements and flowchart symbols, sentinel value to end a program, programming and user environments, evolution of programming models., desirable program characteristics. **Fundamentals:**<br>Structure of a program. Compilation and Execution of a Program, Character Set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Variable definition, symbolic constants. | U1-01 - Understand Fundamentals of Programming<br>U1-02 - Exploring C Programming<br>U1-03 - Classifying Data using Data types in C Programming | **CO1** - To develop the programming skills using fundamentals of basic c language.<br>**CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable.<br>**CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling.<br>**CO4** - To teach the basics of pre-processors available with C compiler.<br>**CO5** - To understand the procedural oriented programming concept.<br>**CO6** - To enable Learners to develop the logic of the program. |
| **UNIT II**<br><br>**Operators and Expressions:**<br>Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions.<br>**Data Input and output:**<br>Single character input and output, entering input data, scanf function, printf function, gets and puts functions, interactive programming. | U2 - 01 - Managing Input and Output Operations<br>U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions | |
| **UNIT III**<br><br>**Conditional Statements and Loops:**<br>Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. | U3 - 01 - Controlling the Program Order: Decision Making<br>U3 - 02 - Repeating Sequence of Instructions: Loops<br>U3 - 03 - Understand Group of Statements: Functions | |

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| Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value. | | |
| **UNIT IV**<br><br>**Program structure:** Storage classes, automatic variables, external variables, static variables, multifile programs, more library functions, Pre-processor: Features, #define and #include, **Directives and Macros Arrays:** Definition, processing, passing arrays to functions, multidimensional arrays, arrays and strings. | U4 - 01 - Arranging the Same Data Systematically: Arrays<br>U4 -02 - Learn Characters Arrays | |
| **UNIT V**<br><br>**Pointers:**<br>Fundamentals, declarations, Pointers Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays And Pointers, Pointer Arrays, passing functions to other functions<br>**Structures and Unions:**<br>Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers. | U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions<br>U5 - 02 - Pointing to a Location: Pointers | |

Course: USIT102 Digital Electronics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**Number System:**<br>Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number | U1-01 Students learned the difference between Analog System and Digital System<br>U1-02 Understanding different number system | **CO1** - Course Outcomes: concepts and techniques used in digital electronics.<br>**CO2** - Have a detailed understanding of the |

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| system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes – ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY). Error detection and correction, Universal Product Code, Code conversion.<br>**Binary Arithmetic:**<br>Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic | and their conversions.<br>U1-03 Understanding weighted codes and non-weighted codes<br>U1-04 Analyzing Error Detection and Error Correction codes with examples<br>U1-05 Enable students to solve binary arithmetic problems | fundamentals<br>**CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system.<br>**CO4** - Analyze different typs of digital electronic circuit using various mapping and logical tools and know the techniques to prepare simplified circuit using various mapping and mathematical methods.<br>**CO5** - Understand different types of logic gates and the relationship between logic gates.<br>**CO6** - Develop a digital logic and apply it to solve real life problems.<br>**CO7** - Understand, Analyze, design and implement combinational and sequential logic circuits.<br>**CO8** - Enable students to develop skill to build digital circuits. |
| **UNIT II:**<br><br>**Boolean Algebra and Logic Gates:** Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.<br>**Minterm, Maxterm and Karnaugh Maps:** Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method. | U2-01 Understanding and Solving Boolean Algebra problems.<br>U2-02 Learning Basic Gates, Universal Gates, and other gates<br>U2-03 Understanding Minterms and Maxtrems<br>U2-04 Understanding and solving reduction techniques using Karnaugh maps.<br>U2-05 Understanding and solving reduction techniques using Quine Mc Cluskey Method. | |
| **UNIT III:**<br><br>**Combinational Logic Circuits:** Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations | U3-01 Designing and implementing Combinational Logic Circuits<br>U3-02 Understanding Code converters design and | |

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| **Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator. | Implementations<br>U3-03 Learning different Arithmetic Circuits | |
| **UNIT IV:**<br><br>**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:**<br>Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.<br>**Sequential Circuits:**<br>Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flipflop, Race-around condition, Master – slave JK flip-flop, T flip-flop, conversion from one type of flip-flop to another, Application of flipflops. | U4-01 Designing and implementing Multiplexer and De-multiplexer<br>U4-02 Designing and implementing Encoder and Decoder<br>U4-03 Learning Sequential Circuits<br>U4-04 Designing and learning various Flipflops and their conversions | |
| **UNIT V:**<br><br>**Counters:**<br>Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.<br>**Shift Register:**<br>Introduction, parallel and shift registers, serial shifting, serial–in serial– out, serial–in parallel–out, parallel–in parallel–out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters. | U5-01 Designing and implementing Asynchronous counters<br>U5-02 Learning functions of different IC's 7490, 7492.<br>U5-03 Learning Shift Register Circuits<br>U5-04 Designing and implementing Synchronous counters<br>U5-05 Analyzing IC 7495 and learning Seven Segment Displays | |

Course: USIT103 Operating Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:** What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.<br>**Processes and Threads:** Processes, threads, interprocess communication, | U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.<br>U1 - 02 - Analyze Processes & threads | **CO1** Analyze the structure and functions of operating systems.<br>**CO2** Understand role of operating system as process manager, resource manager, file system manager, memory manager and I/O manager |

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| scheduling, IPC problems | | **CO3** Understand the Mutual exclusion and Deadlock detection<br>**CO4** Understand benefits of cloud and virtualization.<br>**CO5** Understand differences of three types of computing: multiprocessor, multicomputer and distributed systems |
| **UNIT – II**<br>**Memory Management:** No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation.<br>**File Systems:** Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system. | U2 - 01 - Analyze important algorithms eg. Process scheduling and memory management algorithms<br>U2 - 02 - Understand the different types of files & directories<br>U2 - 03 - Applying algorithms in OS | |
| **UNIT – III**<br>**Input-Output:** Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management,<br>**Deadlocks:** Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues. | U3 - 01 - Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock<br>U3 - 02 - Evaluate the operating system's resource management techniques, deadlock management techniques, memory management techniques. | |
| **UNIT – IV**<br>**Virtualization and Cloud:** History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds.<br>**Multiple Processor Systems:** Multiprocessors, multicomputers, distributed systems. | U4 - 01 - Understanding the different types of hypervisors<br>U4 - 02 - Analyzing different processor systems<br>U4 - 03 - Evaluate between multiprocessors, multicomputers & distributed system | |
| **UNIT – V**<br>**Case Study on LINUX and ANDROID:** History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, I/O in Linux, Linux file system, security in Linux, Android<br>**Case Study on Windows:** History of windows through Windows 10, programming windows, system structure, | U5 - 01 - Understands different types of operating systems<br>U5 - 02 - Remembering different types of functioning in different types of Microsoft Windows. | |

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| processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows. | | |

Course: USIT104 Discrete Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:** Variables, The Language of Sets, The Language of Relations and Function<br>**Set Theory:** Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem.<br>**The Logic of Compound Statements:** Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments. | U1 - 01 - Understands the various languages.<br>U1 - 02 - Remembering the different definitions and the Element.<br>U1 -03 - Applying and analyzing the logic of compound statements. | **CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures.<br>**CO2** Be able to apply basic counting techniques to solve combinatorial problems.<br>**CO3** Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.<br>**CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.<br>**CO5** Have substantial experience to comprehend formal logical arguments. |
| **UNIT II:**<br>**Quantified Statements:** Predicates and Quantified Statements,<br>Statements with Multiple Quantifiers, Arguments with Quantified Statements<br>**Elementary Number Theory and Methods of Proof:** Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms. | U2 - 01 - Understands the different statements.<br>U2 - 02- Remembering the different methods of proof and theorem. | |
| **UNIT III:**<br>**Sequences, Mathematical Induction, and Recursion:** Sequences, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by | U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion.<br>U3 -02- Learning | |

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| iteration, Second order linear homogenous recurrence relations with constant coefficients. general recursive definitions and structural induction.<br>**Functions:** Functions Defined on General Sets, One-to-One and Onto,<br>Inverse Functions, Composition of Functions, Cardinality with<br>Applications to Computability | different types of functions. | |
| **UNIT IV:**<br>**Relations:** Relations on Sets, Reflexivity, Symmetry, and Transitivity,<br>Equivalence Relations, Partial Order Relations<br>**Graphs and Trees:** Definitions and Basic Properties, Trails, Paths, and<br>Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs,<br>Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths. | U4 - 01 - Understand the various types of Relations.<br>U4 -02 - Analyzing the Graphs & trees. | |
| **UNIT V:**<br>**Counting and Probability:** Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule,Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r-Combinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events. | U5 - 01 - leaning to count the number of times an event could occur. | |

Course: US/T105 Communication Skills

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness<br>**Understanding Business Communication:** Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication. | U1 - 01 - Understanding the 7Cs of Communication skills.<br><br>U1-02- Analyzing and Applying Communication skills | **CO1** Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.<br>**CO2** Identify ethical, legal, cultural, and global issues affecting business communication.<br>**CO3** Utilize analytical and problem-solving skills appropriate to business communication.<br>**CO4** Participate in team activities that lead to the development of collaborative work skills.<br>**CO5** Select appropriate organizational formats and channels used in developing and presenting business messages.<br>**CO6** Compose and revise accurate business documents using computer technology.<br>**CO7** Communicate via electronic mail, internet, and other technologies.<br>**CO8** Deliver an effective oral business presentation.<br>**CO9** To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments<br>**CO10** To participate in an online learning environment successfully by developing the implication-based understanding of Paraphrasing, deciphering instructions, interpreting guidelines, discussion boards & Referencing Styles.<br>**CO11** To demonstrate his/her ability to write error free while making an optimum use of correct Business Vocabulary & Grammar.<br>**CO12** To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.<br>**CO13** To draft effective business correspondence with brevity and |

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| | | clarity.<br>**CO14** To stimulate their Critical thinking by designing and developing clean and lucid writing Skills.<br>**CO15** To demonstrate his verbal and non-verbal communication ability through presentations. |
| **UNIT II:**<br><br>**Writing Business Messages and Documents:**<br>Business writing, Business Correspondence, Instructions<br>Business Reports and Proposals, Career building and Resume writing.<br>**Developing Oral Communication Skills for Business:**<br>Effective Listening, Business Presentations and Public Speaking,Conversations, Interview | U2 - 01 - Applying and learning the writing of Business messages and documents<br><br>U2 - 02 - Understanding and remembering the development of Oral communication skills for business | |
| **UNIT III:**<br><br>**Developing Oral Communication Skills for Business:**<br>Meetings and Conferences, Group Discussions and Team<br>Presentations, Team Briefing,<br>**Understanding Specific Communication Needs:**<br>Communication across Functional Areas | U3 - 01 - Analyzing and Evaluating the development of Oral communication skills for business<br><br>U3 - 02 - Understanding and Remembering specific communication needs | |
| **UNIT IV:**<br><br>**Understanding Specific Communication Needs:**<br>Corporate Communication, Persuasive Strategies in Business<br>Communication, Ethics in Business Communication, Business<br>Communication Aids | U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs | |
| **UNIT V:**<br>**Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates.<br>**Adding graphics to your presentation:** Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance. | U5 - 01 - Learning and Understanding the different ways of presentation process.<br><br>U5 - 02 - Creating and applying the graphics to your presentation. | |

## Course Outcomes

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 2021–2022

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT - I**<br>**Object Oriented Methodology:**<br>Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS.<br>**Principles of OOPS:**<br>OOPS Paradigm, Basic Concepts of OOPS:<br>Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing | U1 -01- Learning about what exactly the object oriented is.<br><br>U1 -02- Understands the principles of OOPs. | CO1: Students will understand the need of object oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment.<br>CO2: Student will understand how to model the real world scenario using class diagram and be able to exhibit communication between objects using sequence diagram.<br>CO3: Students will be able to implement relationships between classes.<br>CO4: Students will be able to demonstrate various collection classes.<br>CO5: Students will be able to create and user interfaces and packages<br>CO6: The students will be able to demonstrate programs on exceptions, multithreading and applets. |
| **UNIT - II**<br>**Classes and Objects:**<br>Simple classes (Class specification, class members accessing), Defining member functions, passing object as an argument, Returning object from functions, friend classes, Pointer to object, Array of pointer to object.<br>**Constructors and Destructors:**<br>Introduction, Default Constructor, Parameterized Constructor and examples, Destructors | U2 -01- Understands the classes and Objects in OOPs.<br><br>U2 -02- Remembering the Constructors and Destructors. | |
| **UNIT - III**<br>**Polymorphism:**<br>Concept of function overloading, overloaded operators, overloading unary and binary operators, overloading comparison operator, overloading | U3 -01- Understands the concept of overloading.<br><br>U3 -02- Analyze the Virtual functions. | |

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| arithmetic assignment operator, Data Conversion between objects and basic types,<br>**Virtual Functions:**<br>Introduction and need, Pure Virtual Functions,<br>Static Functions, this Pointer, abstract classes, virtual destructors. | | |
| UNIT IV:<br>**Program development using Inheritance:** Introduction, understanding inheritance, Advantages provided by inheritance, choosing the access specifier, Derived class declaration, derived class constructors, class hierarchies, multiple inheritance, multilevel inheritance, containership, hybrid inheritance.<br>**Exception Handling:**<br>Introduction, Exception Handling Mechanism,<br>Concept of throw & catch with example | U4 -01- Understand the concept of inheritance and types of inheritance.<br><br>U4 -02- Learning the concept of Exception handling. | |
| **UNIT V:**<br>**Templates:**<br>Introduction, Function Template and examples, Class Template and examples.<br>**Working with Files:**<br>Introduction, File Operations, Various File Modes, File Pointer and their Manipulation | U5 -01- Understand the concept of Templates.<br><br>U5 -02- Working and creating various files | |

Course: USIT202 Microprocessor Architecture

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Microprocessor, microcomputers, and Assembly Language:<br>Microprocessor, Microprocessor | U1-01 Understanding Microprocessor Concepts, Microcomputers.<br>U1-02 Learning large | **CO1:** Describe the architecture & organization of 8085 Microprocessor.<br>**CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish |

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| Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications.<br>Microprocessor Architecture and Microcomputer System:<br>Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing,<br>Microprocessor-Based System Application.<br>8085 Microprocessor Architecture and Memory Interface:<br>Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer,<br>Memory Interfacing, Interfacing the 8155 Memory Segment,<br>Illustrative Example: Designing Memory for the MCTS Project,<br>Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer. | computers to small chip microcontrollers.<br>U1-O3 Understanding microprocessor internal Architecture and pin configuration.<br>U1-O4 Study of Microprocessor based system applications.<br>U1-O5 Learning 8155 memory segment, memory interfacing.<br>U1-O6 Illustration of memory design for MCTS project. | the use of different instructions and apply it in assembly language programming.<br>**CO3:** Relate the addressing modes used in the instructions.<br>**CO4.** Realize the Interfacing of memory & various I/O devices with 8085 microprocessor.<br>**CO5.** Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. **CO6.** Learning different programming techniques of 8085.<br>**CO7** Understanding the concepts of Subroutines.<br>CO8 Learning Code Conversion Technique and its applications.<br>CO9 Learning various 8085 Interrupts, its IO concepts and applications.<br>CO10 Studying Pentium, Pentium Pro microprocessors, Core processors and SUN SPARC procesor. |
| UNIT 2 :Interfacing of I/O Devices<br>Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.<br>Introduction to 8085 Assembly Language Programming:<br>The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program.<br>Introduction to 8085 Instructions:<br>Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program. | U2-01 Learning interfacing of IO Devices Concepts,<br>U2-02 Distinguishing memory mapped IO and peripheral mapped IO.<br>U2-03 Programming using 8085 assembly language.<br>U2-4 Learning Programming model and 8085 Instruction Set.<br>U2-05 Understanding various debugging techniques. | |
| UNIT-3:Programming Techniques With Additional Instructions:<br>Programming Techniques: Looping, Counting and Indexing,<br>Additional Data Transfer and 16-Bit Arithmetic Instructions,<br>Arithmetic Instruction Related to Memory, Logic Operations: Rotate,<br>Logics Operations: Compare, Dynamic Debugging.<br>Counters and Time Delays:<br>Counters and Time Delays, Illustrative | U3-01 Laerning Instruction Classifications<br>U3-02Learning various assembly language programs and coding techniques.<br>U3-03 Illustartion of counters and time dalys<br>U3-04 Demonstation of stacks and subroutines.<br>U3-05 Learning advanced subroutine concepts. | |

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| Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.<br>Stacks and Sub-Routines:<br>Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts. | | |
| UNIT-4:Code Conversion, BCD Arithmetic, and 16-Bit Data Operations: BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-toSeven-Segment-LED Code Conversion, Binary-to-ASCII and ASCIIto-Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction To Advanced Instructions and Applications, Multiplication, Subtraction With Carry.<br>Software Development System and Assemblers:<br>Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers.<br>Interrupts:<br>The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes. | U4-01 Learning code conversion techniques.<br>U4-02 Application of code conversion techniques.<br>U4-03 Learning advanced instructions and its applications.<br>U4-04 Understanding Assemblers, cross assemblers.<br>U4-05 Analyzing Vectored Interrupts | |
| UNIT-5:The Pentium and Pentium Pro microprocessors: Introduction, Special Pentium registers, Memory management, Pentium instructions, Pentium Pro microprocessor, Special Pentium Pro features.<br>Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, I3, I5 and i7.<br>SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format | U5-01 Explaining Pentium and Pentium Pro microprocessors<br>U5-02 Learning Core microprocessors<br>U5-03 Distintive study of various core processors.<br>U5-04 Understanding SUN SPARC Microprocessors.<br>U5-05 Learning Instruction Format of SUN SPARC. | |



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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Internet and the World Wide Web:<br>What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol<br>HTML5:<br>Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets. | U1 - 01 - Understanding and introduction of internet and its application .<br><br>U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators .<br><br>U1 - 03 - Learning and application of HTML5 , LINKS , TAGS , CSS and FORMATTING . | CO1 Understand Internet and Web Programming basic concepts.<br>CO2 Understand the front end and back end Web Applications.<br>CO3 Understand the latest web programming tools and techniques.<br>CO4 Developing static and dynamic Web Applications.<br>CO5 Integrating and blending latest web technologies for creating Web Applications. |
| UNIT – II<br>HTML5 Page layout and navigation:<br>Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navgation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.<br>HTML5 Tables, Forms and Media: | U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning .<br><br>U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more . | |

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| Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, Incorporating audio on web page. | U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML . | |
| UNIT -III<br>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, | U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values .<br>U3 - 02 - Understanding and learning statements and various functions .<br>U3 - 03 - Learning and application of documents and its objects . | |

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| String, regExp<br>Document and its associated objects: document, Link, Area, Anchor,<br>Image, Applet, Layer<br>Events and Event Handlers : General Information about Events,<br>Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload | | |
| UNIT – IV<br>PHP:<br>Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems | U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling . | |
| UNIT – V<br>Advanced PHP and MySQL : PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail | U5 - 01 - Understanding and learning of advances PHP and MySql . | |

Course: USIT204 Numerical and Statistical Methods

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation Laws and Engineering Problems<br>Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors<br>Truncation Errors and the Taylor Series:<br>The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty | U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models<br>Also to learn different types of errors that take place in problem solving . | CO1 To develop the mathematical skills of the students in the area of numerical methods.Describe and discuss the key terminology, concepts, tools and techniques used in business statistical analysis.<br>CO2 To know about various types of Errors, Calculate the error correction and get actual root of the equation.<br>CO3 Understand different methods of solution of the equations and compare them.<br>CO4 How to calculate and apply measures of location and measures of dispersion – grouped and ungrouped data cases.<br>CO5 How to apply discrete and continuous probability distribution to various business problems.<br>CO6 Student will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods.<br>CO7 Solve a range of problems using the techniques covered.<br>CO8 Discuss the uses and limitations of statistical analysis. |
| UNIT – II<br>Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method.<br>Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation. | U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of different interpolation . | |
| UNIT -III<br>Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method.<br>Numerical differentiation and Integration: | U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule . | |

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| Numberical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules.<br>Numerical solution of 1st and 2nd order differential equations:<br>Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2 nd Order Differential Equations. | | |
| UNIT – IV<br>Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression<br>Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution | U4 - 01 - Understanding and learning of many types of regressions<br><br>U4-02- Understanding and learning squares , non linear regression<br><br>U4 -03 - Understanding and learning linear programming and types of solutions. | |
| UNIT – V<br>Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance.<br>Distributions: Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications. | U5-01- Detailed study of variables<br><br>U5-02 - Understanding of Probability and variance .<br><br>U5- 03 - Understanding and learning distributions<br><br>U5 - 04 - Applying and Understanding of various types of distributions and its application . | |

Course: USIT205 Green Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT - I<br>**Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.<br>**Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea. | U1-01: To learn various toxins present in electronic products.<br>U1-02: Detailed study of Company's Carbon Footprint.<br>U1-03: To study Initiatives taken by UN, Implementation of Basel Conventions.<br>U1-04: To know the significance of WEEE Directives.<br>U1-05: To learn the steps to curb E-wastes by Asian countries. | |
| UNIT - II<br>**Minimizing Power Usage:**<br>Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, LowPower Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.<br>**Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together. | U2-01: To illustrate power problems and issues to overcome these problems.<br>U2-02: To Study virtualization and managing power issues with low cost.<br>U2-03: To explain Usage of energy efficient drives.<br>U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same<br>U2-05: Designing centralised cooling system and its impact on cooling system. | |
| UNIT -III<br>**Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.<br>**Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.<br>UNIT-IV | U3 -01- Learning and analyzing the Global Impact of local actions.<br>U3 -02- Learning to use electronic device instead of paper and going paperless. | |

SHETH L.U.J. & SHRI M.J. COLLEGE OF ARTS & COMMERCE
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| **Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, life Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, Cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online<br>**Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice | the concept of why recycling is important<br><br>LO 02- Analyze the use of hardware products | |
| UNIT - V<br>**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.<br>**Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations. | US -01- Learning about the use of IS to achieve environmental objectives.<br><br>US -02- Analyzing the data which has been gathered. | CO1 :To learn overview and issues addressed in Green Computing.<br>CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing.<br>CO3: To illustrate steps taken to increase power efficiency by reducing power consumption.<br>CO4: Explanation of methods to reduce cooling costs.<br>CO5: Addressing the power usage problems, storage problems and virtualization |
| | | CO6: Implementation of Steps to measure the cooling costs.<br>CO7: To improve the way of work culture in offices in order to use energy efficiently.<br>CO8: To understand cooling demands and steps taken to minimize the cooling costs.<br>CO9: To learn how to green IT infrastructure in our surroundings<br>CO10: To know the role of Chief Green Officer in an organisation and fulfilment of SMART goals by set by him. |

**Course Outcomes**

FYBSC IT – SEM 3
2021-2022

Course: USIT301 Python Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: The Python Programming Language,History, features,<br>Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors,Experimental Debugging,<br>Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,<br>Variables and ExpressionsValues and Types, Variables, Variable Names and Keywords, Type conversion,Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.<br>Conditional Statements: if, if-else, nested if –else<br>Looping: for, while, nested loops<br>Control statements: Terminating loops, skipping specific conditions | U1 -01- Understand the concept of Python Programming.<br><br>U1 -02- Learning to install the python.<br><br>U1 -03- Understanding the error which occurs while executing.<br><br>U1 -04- Learning about various keywords and variables in python. | CO1 Comprehend the basics of Python programming<br>CO2 Ability to implement modular approach using python<br>CO3 Efficiently implement various data structures provided by python<br>CO4 Develop applications based on object oriented concept<br>CO5 Develop application using GUI and databases |
| UNIT – II<br>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types<br>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations. | U2 -01- Understand the concept of functions and type conversion.<br><br>U2 -02- Learning and understanding the concept of looping and counting. | |
| UNIT – III<br>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and | U3 -01- Understand how to work with list<br><br>U3 -02- Learning how to access the value in tuple<br><br>U3 -03- Learning basic tuple operations | |

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| methods<br>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions<br>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods<br>Files: Text Files, The File Object Attributes, Directories<br>Exceptions: Built-in Exceptions, Handling Exceptions, Exception | U3 -04- Analyze the Text Files, The File Object Attributes, Directories | |
| UNIT – IV<br>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.<br>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding<br>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue<br>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module | U4 -01- Understanding the concept of Regular Expressions.<br><br>U4 -02- Learning the overview of OOP<br><br>U4 -03- Learning and creating a thread and synchronizing thread.<br><br>U4 -04- Creating Modules and understand the different type of module. | |
| UNIT -V<br>Creating the GUI Form and Adding Widgets:<br>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox.<br>Handling Standard attributes and Properties of Widgets.<br>Layout Management: Designing GUI applications with proper Layout Management features.<br>Look and Feel Customization:Enhancing Look and Feel of GUI using different appearances of widgets. | U5 -01- Creating the GUI Form and Adding Widgets<br><br>U5 -02- Analyzing the Widgets such as buttons, menu, radiobutton.<br><br>U5 -03- Learning how to design GUI applications with proper layout management features. | |

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| Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database. | | |

Course: USIT302 Data Structures

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation.<br>Array:Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays. | U1 -01- Understand the concept of Data Structure and classification of data structure.<br>U1 -02- Learning about data types, algorithms and arrays.<br>U1 -03- Learning about various type of notations. | CO1 Ability to analyze algorithms and algorithm correctness.<br>CO2 Ability to summarize searching and sorting techniques.<br>CO3 Ability to describe stack, queue and linked list operation.<br>CO4 Ability to gain knowledge of tree and graph concepts.<br>CO5 Ability to analyze and choose appropriate data structure and algorithm for program development.<br>CO6 Efficiently use sorting and searching algorithm and know their complexities.<br>CO7 Improve coding skills by applying most suitable data structure for storage and access.<br>CO8 Ability to use trees and graph structures for representing and using complex and non-line data organization.<br>CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures.<br>CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts.<br>CO11 Determine and demonstrate bugs in progrsm, recognize neededbasic operation with data structures. |

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| | | CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.<br>CO13 To use appropriate algorithmic strategy for better efficiency. |
| UNIT – II<br>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures | U2 -01- Understand types of linked lists.<br><br>U2 -02- Learning about the concept of linked list. | |
| UNIT – III<br>Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack. Evaluation of Arithmetic Expression, Matching Parenthesis, Infix and postfix operations, Recursion.<br>Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue, Applications of Queues. | U3 -01- Understand the concepts of Stack Memory Representation<br><br>U3 - 02- Learning about what exactly Queue is.<br><br>U3 -03- Learning about various types of Queue. | |
| UNIT – IV<br>Bubble, Selection, Insertion, | U4 -01- Understanding about binary trees like property, algorithms and | |

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| Merge Sort. Searching: Sequential, 12<br>6<br>Binary, Indexed Sequential Searches, Binary Search.<br>Tree:Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree,<br>Heap, Memory Representation of Heap, Operation on Heap, Heap Sort.<br>Advanced Tree Structures:Red Black Tree, Operations Performed<br>on Red Black Tree, AVL Tree, Operations performed on AVL Tree,<br>2-3 Tree, B-Tree. | representation.<br><br>U4 -02- Learning about Advanced Tree Structures. | |
| UNIT -V<br>Hashing Techniques<br>Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing<br>Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees | U5 -01- Understand about hashing techniques.<br><br>U5 -02- Learning about the introduction of graph and representation of graph. | |

Course: USIT303 Computer Networks

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: Data communications, | U1 -01- Learning about Data communications. | CO1 Understand the importance of computer network and communications.<br>CO2 Learn about transmission media and their |

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| networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion. | U1 -02- Understanding Physical Layers.<br>U1 -03- Learning about Digital and Analog transmission. | characteristics<br>CO3 Learn about role of various layers of ISO OSI Model in communications<br>CO4 Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.<br>CO5 Demonstrate design issues, flow control and error control.<br>CO6 Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.<br>CO7 Knowledge about various protocols used in computer network.<br>CO8 Demonstrate different routing and switching algorithms. |
| UNIT – II Bandwidth Utilization: Multiplexing and SpectrumSpreading: Multiplexing, Spread Spectrum Transmission media:Guided Media, Unguided Media Switching: Introduction, circuit switched networks, packet switching, structure of a switch. Introduction to the Data Link Layer:Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes. | U2 -01- Understanding about Bandwidth Utilization<br>U2 -02- Learning about Switching.<br>U2 -03- Learning about Data Link Layer | |
| UNIT – III Data Link Control. DLC services, data link layer protocols, HDLC, | U3 -01- Understand the concept of Data Link Control. | |

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| Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs. | U3 -02- Learning about what media access control is.<br><br>U3 -03- Get to know about wireless LANs. | |
| UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6 | U4 -01- Understand the basic concept of Network Layer.<br><br>U4 -02- Get to know about Unicast Routing.<br><br>U4 -03- Learning about Next generation IP. | |
| UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World | U5 -01- Understanding the basic concepts of Transport layer.<br><br>U5 -02- Learning Standard Client0Server Protocols | |

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| wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system. | | |

Course: USIT304 Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Databases and Transactions<br>What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management<br>Data Models<br>The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.<br>Database Design, ER Diagram and Unified Modeling Language<br>Database design and ER Model:overview, ERModel, Constraints, ERDiagrams, ERDissues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML | U1 - 01 - Understanding and learning the Introduction of Database and transaction .<br>U1 - 02 - Understanding and application of Data Models . .<br>U1 - 03 - Learning about ER diagram. | CO1 Understand the need of modelling data and then storing the data in organized manner<br>CO2 Ability to create appropriate structure to map with specific type of data.<br>CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and retrieval of data.<br>CO4 Use latest methods of storage and retrieval of data as desired by the user.<br>CO5 Develop models and management information systems as per requirements of clients. |
| UNIT – II<br>Relational database model:<br>Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).<br>Relational Algebra and Calculus<br>Relational algebra: Introduction, Selection | U2 -01- Understanding the basic concept of Relational database model.<br>U2 - 02 - Understanding the basic concept of Relational database design. | |

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| and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities | U2 - 03 - Learning and understanding calculus . | |
| UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. | U3 - 01 - Learning the application of constraints , views and sql .<br><br>U3 - 02 - Understanding the concept of functions and values . | |
| UNIT – IV Transaction management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL,Deadlocks),Time stamping methods, optimistic methods, database recovery management. | U4 - 01 - Learning about Transaction management and Concurrency Control.<br><br>U4 -02 - Learning and Application of different methods and database recovery management | |
| UNIT -V PL-SQL: Beginning with PL / SQL,Identifiers and Keywords, Operators, Expressions, Sequences,Control | U5 - 01 - Learning and Understanding the basic concept of PL-SQL<br><br>U5 - 02 - Application of | |

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| Structures, Cursors and Transaction,Collections and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers. | different data types , procedures and clauses . | |

Course: USIT305 Applied Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear Independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, CaleyHamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.<br>Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and | U1 -01- Get to know about inverse of a matrix, Properties of matrices.<br><br>U1 -02- Learning and Understanding about complex numbers and its different application . | CO1 Enhancing the Logic building capability.<br>CO2 Compute a given integral using the most efficient method.<br>CO3 Use integrals to formulate and solve application problems in science and engineering.<br>CO4 Matrices will help them better understand computer graphics.<br>CO5 Laplace will be helpful in understanding Digital Signal systems. |

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| Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j[=i]as an operator[Electrical circuits] | | |
| UNIT – II<br>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.<br>Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p [or the method of factors], Solvable for y, Solve for x, Clairaut's form of the equation, Methods of substitution, Method of Substitution.<br>Linear Differential Equations with Constant Coefficients:Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X, the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients | U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods .<br>U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients.<br>U2 - 03 - Understanding and application of Particular integral | |
| UNIT – III<br>The Laplace Transform: Introduction, Definition of the Laplace | U3 - 01 - Introduction to The Laplace Transform and its different theories and methods | |

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| Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function), | U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations . | |
| UNIT – IV<br>Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals.<br>Applications of integration: Areas, Volumes of solids. | U4 - 01 - Application and learning of Multiple Integrals with its different types and properties . | |
| UNIT -V<br>Beta and Gamma Functions – Definitions,Properties and Problems.<br>Duplication formula.<br>Differentiation Under the Integral Sign<br>Error Functions | U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions | |

## Course Outcomes

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Course: USIT401 Core Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable,<br>Java Compiler And Interpreter, java programs, java applications,<br>main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks,<br>variables, variable name<br>Data types: primitive data types, Object Reference Types, Strings,<br>Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator,<br>relational operator, logical operator, bitwise operator, conditional operator. | U1 - 01 - Introduction to History, architecture and its components,Java Class<br><br>U1 - 02 - Understanding and Learning of Data Types and its different operators and properties . | CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>CO2 Understand fundamentals of object-oriented programming in Java, including defining<br>classes, invoking methods, using class libraries, etc.<br>CO3 Be aware of the important topics and principles of software development.<br>CO4 Have the ability to write a computer program to solve specified problems.<br>CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs<br>CO6 Identify classes, objects, members of a class and relationships among them needed for a specific<br>problem<br>CO7 Write Java application programs using OOP principles and proper program structuring<br>CO8 Demonstrate the concepts of polymorphism and inheritance<br>CO9 Write Java programs to implement error handling techniques using exception handling |
| UNIT – II<br>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement<br>Iterations: The While Loop, The Do ... While Loop, The For Loop,<br>The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement | U2 - 01 - Understanding and Learning of Control Flow Statements .<br><br>U2 - 02 - Learning and application of Iterations i.e loops and statements .<br><br>U2 - 02 - Learning about the | |

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| Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading. Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this Instance, static fields of a class, static methods of a class, garbage collection. | classes and its different objects , methods , attributes , and values . | |
| UNIT – III Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package | U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces .<br>U3 - 02 - Learning and understanding the concept of creating packages and importing it . | |
| UNIT – IV Enumerations, Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector. | U4 - 01 - Detailed study of arrays and introduction and understanding its types .<br>U4 - 02 - Understanding and learning of multi threading | |

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| Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file | and its various properties .<br><br>U4 - 03 - Application and Understanding of exception handling . | |
| UNIT -V Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas.Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout. | U5 - 01 - Understanding and learning of event handling and its models .<br><br>U5 -02 - Learning of Abstract Window Toolkit in detail .<br><br>U5 - 03 - Detailed study of layouts . | |

Course: USIT402 Introduction to Embedded Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I Introduction: Embedded Systems and general purpose computersystems, history, classifications, applications and purpose ofembedded systems Core of embedded systems: microprocessors and | U1 - 02 - Understanding and introduction to Embedded system and its application .<br><br>U1 - 02 - Learning of the concept of Core of embedded systems. | CO1 To have knowledge about the basic working of a microcontroller system and its programming in assembly language. CO2 To provide experience to integrate hardware and software for microcontroller applications |

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| microcontrollers,RISC and CISC controllers, Big endian and Little endian processors,Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.<br>Characteristics and quality attributes of embedded systems:<br>Characteristics, operational and non-operational quality attributes. | U1 - 03 - Detailed study of Characteristics and quality attributes of embedded systems. | systems.<br>CO3 Understand what is microcontroller, microcomputer and embedded system.<br>CO4 Become familier with programming environment used to develop embedded systems.<br>CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices.<br>CO6 Learn debugging techniques for an embedded systems<br>CO7 Ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.<br>CO8 Ability to write the programs for microcontroller.<br>CO9 Ability to understand the role of embedded systems in industry.<br>CO10 Ability to understand the design concept of embedded systems. |
| UNIT – II<br>Embedded Systems – Application and Domain Specific:Application specific – washing machine, domain specific - automotive.<br>Embedded Hardware: Memory map, I/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.<br>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers. | U2 - 01 - Study of Embedded systems and its application .<br>U2 - 02 - Understanding the concept of Embedded Hardware anf types of memory .<br>U2 - 03 - Detailed study of the concept called peripherals . | |
| UNIT – III<br>The 8051 Microcontrollers:Microcontrollers and Embedded processors, Overview of 8051 family 8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.<br>8051 Programming in C:<br>Data Types and time delay in 8051 C, | U3 - 01 - Studying and Understanding the The 8051 Microcontrollers.<br>U3 - 02 - learning and application of 8051 Programming in C and its logic. | |

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| I/O Programming, Logic operations, Data conversion Programs. | | |
| UNIT – IV<br>Designing Embedded System with 8051 Microcontroller:Factors to be considered in selecting a controller, Why 8051 Microcontroller, Designing with 8051.<br>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging. | U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller .<br>U4 - 02 - Learning the concept of Programming embedded systems and the structure . | |
| UNIT -V<br>Real Time Operating System (RTOS):Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.<br>Design and Development: Embedded system developmentEnvironment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry. | U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic .<br>U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files | |

Course: USIT403 Computer Oriented Statistical Techniques

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and | U1 - 01 - Learning the concept of tendencies and its different types of notation .<br>U1 - 02 - The detailed study of The | CO1 Recognize the error in the number generated by the solution.<br>CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.<br>CO3 Apply method of interpolation and extrapolation for prediction.<br>CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.<br>CO5 Calculate mean, median and mode for individual series.<br>CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation. |

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| Measures of Central Tendency. The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation,The Range, The Mean Deviation, The Semiinterquartile Range,The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation,Properties of the Standard Deviation,Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coe ffi,Standar cient of Variation dized Variable; Standard Scores, Software and Measures of Dispersion. Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays. | Standard Deviation and Other Measures of Dispersion .<br><br>U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail. | CO7 How to apply discrete and continuous probability distributions to various businessproblems. CO8 Perform Test of Hypothesis as well as calculate confidence Interval for a population parameter for single sample and two sample cases. Understand the concept of p-values. CO9 Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit. CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software. |
| UNIT – II Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability: Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, | U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis .<br><br>U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis. | |

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| Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability.<br>Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory. | U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory | |
| UNIT – III<br>Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.<br>Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, -<br>Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R. | U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.<br>U3 - 02 - Remembering and Learning and the theory of Statistical Decision .<br>U3 - 03 - Detailed study of Statistics in R and its distribution . | |
| UNIT – IV<br>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The ChiSquare Distribution, | U4 - 01 - Understanding and Analyzing the Small Sampling Theory . | |

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| Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare. | U4 - 02 - Remembering the concept of The Chi-Square Test and its properties . | |
| UNIT -V<br>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves,Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares,The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.<br>Correlation Theory: Correlation and Regression, Linear Correlation,Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coe ffi, cient of Correlation Remarks Concerning the Correlation Coe ffi, cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas, Regression Lines and the Linear Correlation Coe ffi, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression. | U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares .<br>U5 - 02 - The detailed study of correlation and its concept of theories and regression . | |

Course: USIT404 Software Engineering

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.<br>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.<br>Software Processes: Process and Project, Component Software Processes.<br>Software Development Process Models.<br>• Waterfall Model.<br>• Prototyping.<br>• Iterative Development.<br>• Rational Unified Process.<br>• The RAD Model<br>• Time boxing Model.<br>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. | U1 - 01 - The learning and Introduction to Software engineering .<br><br>U1 - 02 - Analyzing and creating the software requirements and its requirements .<br><br>U1 - 03 - Learning and understanding different types of Software Development Process Models.<br><br>U1 - 04 - Understanding the Agile software development . | CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application.<br>CO2 Describe software engineering layered technology and Process frame work.<br>CO3 A general understanding of software process models such as the waterfall and evolutionary models.<br>CO4 Understanding of software requirements and the SRS documents.<br>CO5 Understanding of the role of project management including planning, scheduling, risk management, etc.<br>CO6 Describe data models, object models, context models and behavioural models.<br>CO7 Understanding of different software architectural styles. |
| UNIT – II<br>Socio-technical system:Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.<br>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.<br>Requirements Engineering Processes: Feasibility study, Requirementselicitation and analysis, Requirements Validations, Requirements Management.<br>System Models: Models and its | U2 - 01 - Learning in detailed of the concept Socio-technical system and its Essential characteristics of socio technical systems and more<br><br>U2 - 02 - Introduction and Learning of critical system and types of it .<br><br>U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models . | |

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| types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods. | | |
| UNIT – III<br>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.<br>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.<br>Project Management<br>Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.<br>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics. | U3 - 01 - Introduction to Architectural Design and its system and styles .<br>U3 - 02 - Learning and Understanding of User Interface Design .<br>U3 - 03 - Analyzing and creating Quality Management . | |
| UNIT – IV<br>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.<br>Software Measurement: Size-Oriented Metrics, Function-OrientedMetrics, Extended Function Point Metrics Software Cost Estimation:Software Productivity, EstimationTechniques, Algorithmic Cost Modelling, Project Duration and Staffing | U4 - 01 - Understanding and learning about the Verification and Validation.<br>U4 - 02 - Analyze and creating testing components and its functions . | |
| UNIT -V<br>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis | U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc . | |

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| and Modeling,<br>Process Change, The CMMI Process Improvement Framework.<br>Service Oriented Software Engineering: Services as reusable components,<br>Service Engineering, Software Development with Services.<br>Software reuse: The reuse landscape, Application frameworks,<br>Software product lines, COTS product reuse.<br>Distributed software engineering: Distributed systems issues,<br>Client–server computing, Architectural patterns for distributed<br>systems, Software as a service | | |

Course: USIT405 Computer Graphics and Animation

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Computer Graphics:<br>Overview of Computer Graphics, Computer Graphics Application and<br>Software, Description of some graphics devices, Input Devices for<br>Operator Interaction, Active and Passive Graphics Devices, Display<br>Technologies, Storage Tube Graphics Displays, Calligraphic Refresh<br>Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays,<br>Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video<br>Basics, The Video Controller, Random-Scan Display Processor, LCD<br>displays.<br>Scan conversion – Digital Differential Analyzer (DDA) algorithm,<br>Bresenhams' Line drawing algorithm.Bresenhams' method of Circle<br>drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm,<br>Mid-point criteria, Problems of Aliasing, end-point ordering and<br>clipping lines, Scan Converting Circles, Clipping Lines algorithms–<br>Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, | U1 - 01 - Introduction to Computer graphics and its application and software description .<br><br>U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping . | CO1 To familiarize students with basic principles and techniques for computer graphics.<br>CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional transformations.<br>CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry.<br>CO4 This course will introduce students to all aspects of computer graphics |

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| Clipping Polygons,<br>problem with multiple components. | | including hardware, software and applications.<br>CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional transformations. |
| UNIT – II<br>Two-Dimensional Transformations:<br>Transformations and Matrices, Transformation Conventions, 2D<br>Transformations, Homogeneous Coordinates and Matrix<br>Representation of 2D Transformations, Translations and<br>Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined<br>Transformation, Transformation of Points, Transformation of The<br>Unit Square, Solid Body Transformations, Rotation About an<br>Arbitrary Point, Reflection through an Arbitrary Line, A Geometric<br>Interpretation of Homogeneous Coordinates, The Window-toViewport Transformations.<br>Three-Dimensional Transformations:<br>Three-Dimensional Scaling, Three-Dimensional Shearing, ThreeDimensional Rotation, Three-Dimensional Reflection, ThreeDimensional Translation, Multiple Transformation, Rotation about an<br>Arbitrary Axis in Space, Reflection through an Arbitrary Plane,<br>Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective<br>Transformations, Techniques for Generating Perspective Views,<br>Vanishing Points, the Perspective Geometry and camera models,<br>Orthographic Projections, Axonometric Projections, Oblique<br>Projections, View volumes for projections. | U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices .<br><br>U2 - 02 - Learning and creating Three-Dimensional Transformations and many of its working and objectives .<br><br>U2 - 03 - Understanding the concepts of Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections etc . | |
| UNIT – III<br>Viewing in 3D<br>Stages in 3D viewing, Canonical View Volume (CVV), Specifying an<br>Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of<br>Planar Geometric Projections, Combined transformation matrices for<br>projections and viewing, Coordinate Systems and matrices, camera | U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective . | |

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| model and viewing pyramid.<br>Light:Radiometry,Transport,Equation,Photometry<br>Color:Colorimetry,ColorSpaces,ChromaticAdaptation,<br>Color<br>Appearance | U3 - 02 - Remembering and learning light and color and its various components . | |
| UNIT – IV<br>Visible-Surface Determination:<br>Techniques for efficient Visible-Surface Algorithms, Categories of<br>algorithms, Back face removal, The z-Buffer Algorithm, Scan-line<br>method, Painter's algorithms (depth sorting). Area sub-division<br>method, BSP trees, Visible-Surface Ray Tracing, comparison of the<br>methods.<br>Plane Curves and Surfaces:<br>Curve Representation, Nonparametric Curves, Parametric Curves,<br>Parametric Representation of a Circle, Parametric Representation of<br>an Ellipse, Parametric Representation of a Parabola, Parametric<br>Representation of a Hyperbola, Representation of | U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques .<br><br>U4 - 02 - Creating and Learning the planes and curves and surfaces along with its different working and drawings . | |

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| Space Curves,<br>Cubic Splines, , Bezier Curves, B spline Curves, B-spline Curve Fit,<br>B-spline Curve Subdivision, Parametric Cubic Curves, Quadric<br>Surfaces Bezier Surfaces | | |
| UNIT -V<br>Computer Animation<br>Principles of Animation, key framing, Deformations, Character<br>Animation, Physics Based Animation, Procedural Techniques, Groups<br>of Objects<br>Image Manipulation and Storage:<br>What is an Image? Digital image file formats, Image compression<br>Standard – JPEG, Image Processing - Digital image enhancement,<br>Contrast stretching, Histogram Equalization, smoothing and median<br>Filtering | US 01 - Learning and understanding the concept of Computer Animation in detail .<br><br>US - 02 - Creating and analyzing Image Manipulation and Storage in detail . | |

Course Outcomes

FYBSC IT – SEM 5

Course: USIT501 Software Project Management 2021-2022

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Software Project Management:Introduction, Why<br>is Software Project Management Important? What is a Project?<br>Software Projects versus Other Types of Project, Contract<br>Management and Technical Project Management, | U1 -01- Understanding Why is Software Project Management Important.<br><br>U1 -02- Learning the basic concept of project. | CO1 Professional terminologies of software industry.<br>CO2 Problem solving algorithms and techniques.<br>CO3 Understand the development work environment<br>CO4 To make students realize software project management is not just theory subject to pass, instead it<br>will help them live their professional life with ease.<br>CO5 This subject makes a |

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| Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize | U1 -03- Understanding and learning about what is management.<br><br>U1 -04- Learning about Overview of Project Planning. | student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player. |

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| Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning | | |
| UNIT – II<br>Selection of an Appropriate Project Approach:Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery. Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.<br>Software Effort Estimation:Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottomup Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb. | U2 -01- Analyzing the Appropriate Project Approach.<br>U2 -02- How to choose proper methods and technologies for software development<br>U2 -03- Analyzing the most Appropriate Process Model.<br>U2 -04- Understanding about Software Effort Estimation Techniques. | |

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| UNIT – III<br>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.<br>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm"s Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.<br>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence. | U3 -01- Learning about how to plan, when to plan and proper project schedules.<br>U3 -02- Understanding about risk management.<br>U3 -03- Analyzing the Resource Allocation.<br>U3 -04- Analyzing the Cost Schedules | |
| UNIT – IV<br>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, | U4 -01- Understanding Monitoring and Control.<br>U4 -02- Learning about how to manage contracts. | |

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| Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns. | U4 -03- Understanding Behaviour, Organizational Behaviour | |
| UNIT – V Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, | U5 - Learning about how to work in teams.<br>U5 -02- Analyzing how good the software quality should be.<br>U5 -03- Learning about how the project closure should be. | |

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| Quality Plans.<br>Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report. | | |

Course: USIT502 Internet of Things

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Internet of Things: An Overview: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?<br>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances.<br>Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols. | U1 -01- Understanding what is Internet Of Things.<br>U1 -02- Learning Flavour of the Internet of Things.<br>U1 -03- Understanding the principles of internet.<br>U1 -04- Understanding different types of IP addresses. | CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping.<br>CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors.<br>CO3 The Internet of Things (IOT) is the next wave, world is going to witness.<br>CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and everything which you use in day-to-day life).<br>CO5 Internet of Things is a term given to the attempt of connecting objects to the Internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion. |
| UNIT – II<br>Thinking About Prototyping: | U2 -01- Learning about Costs versus Ease of Prototyping. | |

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| Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. | U2 -02- Understanding what is open and closed source.<br><br>U3 -03- learning about Arduino and Raspberry PI. | |
| UNIT – III Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained | U3 -01- Understanding how to prototype the physical design.<br><br>U3 -02- Learning the basic concept of Laser cutting.<br><br>U3 -03- Understanding the concept of Scrapping, comet, polling and other protocols. | |

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| Application Protocol. | | |
| UNIT – IV<br>Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries,Debugging.<br>Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups. | U4 -01- Understanding what is memory management.<br><br>U4 -02- Learning the basic concept of Business Model.<br><br>U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups. | |
| UNIT – V<br>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards, Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.<br>Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control,Crowdsourcing, Environment, Physical Thing, | U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards.<br><br>U5 -02- Learning about Ethics.<br><br>U5 -03- Analyzing the Correctness and Maintainability, Security, Performance | |

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| Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition. | | |

Course: USITS03 Advanced Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.<br>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.<br>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming. | U1 -01- Understanding what exactly .NET framework is.<br>U1 -02- Learning about Types, Objects, and Namespaces.<br>U3 - 03- Learning about values types and reference type. | CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.<br>CO2 Enable learners to use Visual Studio -an advanced design tool<br>CO3 To gain in-depth learning of various concepts and features of .NET coding and developing of web applications.<br>CO4 To Provide knowledge of different State management techniques<br>CO5 To explore ADO.NET- a model for interacting with databases.<br>CO6 Using XML various security fundamentals will be explored |
| UNIT – II<br>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.<br>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control. | U2 -01- Understanding the basic concept of Web form fundamentals.<br>U2 -02- Learning about Form controls.<br>U2 -03- Understanding Validation and how to Use Validation Controls. | |

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| The TreeView Control, The Menu Control. | | |
| UNIT – III<br>Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing<br>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options<br>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages, | U3 -01- Learning and understanding about the basic concept of Error Handling, Logging, and Tracing.<br><br>U3 -02- Learning State Management.<br><br>U3 -03- Learning about how to apply themes and master pages. | |
| UNIT – IV<br>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.<br>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,<br>The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView | U4 -01- Understanding the fundamentals of ADO.NET.<br><br>U4 -02- Learning about Data Binding.<br><br>U4 -03- Learning about the basic concept of Data controls. | |
| UNIT – V<br>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.<br>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.<br>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX | U5 -01- Understanding what is XML.<br><br>U5 -02- Learning about what is Security Fundamentals.<br><br>U5 -03- Understanding Ajax, Using Partial Refreshes. | |

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| Control Toolkit. | | |

Course: USIT505 Linux System Administration

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.<br>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files<br>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate<br>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages | U1 -01- Understanding about Red Hat Enterprise Linux.<br>U1 -02- Analyzing and Working with the Bash Shell.<br>U1 -03- Learning about System Administration Tasks | CO1 To familiarize students with Linux installation.<br>CO2 Enable Students to Install RPM and use Red hat Package Management<br>CO3 To Make Students install Samba Server and the use of Samba Server<br>CO4 To make Students Install Apache, Send Mail.<br>CO5 Write Shell Scripts in Linux. |
| UNIT – II<br>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, | U2 -01- Learning about how to configure and manage storage.<br>U2 -02- Understanding NetworkManager, Working with Services and Runlevels.<br>U2 -03- Learning about how to troubleshoot the network. | |

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| Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes<br>Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access<br>Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes | U2 -04- Learning the basic concept of SSH.<br>U2 -05- Learning about Permissions. | |
| UNIT – III<br>Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit | U3 -01- Learning about Securing Server with iptables<br>U3 -02- Learning how to set up a firewall. | |

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| Module, Configuring NAT<br>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files<br>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services. | | |
| UNIT – IV<br>Configuring DNS and DHCP:Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server<br>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP<br>Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL | U4 -01- Understanding how to configure DNS and DHCP.<br><br>U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd. | |

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| UNIT – V<br>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures,<br>Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.<br>High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster,<br>Configuring GFS2 File Systems<br>Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File | U5 -01- Learning about Bash Shell Scripting.<br>U5 -02- Understanding Variables, Variables, Subshells, and Sourcing.<br>U5 -03- Learning High-Availability Clustering. | |

Course: USIT506 Enterprise Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Understanding Java EE: | U1 -01- Understanding what is Java EE. | CO1 Identify advance concepts of java |

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| WhatisanEnterpriseApplication? Whatisjavaenterpriseedition? JavaEETechnologies, JavaEEevolution, Glassfishserver<br>JavaEE Architecture,Serverand Containers: TypesofSystemArchitecture, JavaEEServer, JavaEEContainers.<br>Introduction to Java Servlets: TheNeedforDynamicContent, JavaServletTechnology, WhyServlets? WhatcanServletsdo?<br>Servlet API and Lifecycle: JavaServletAPI, TheServletSkeleton, TheServletLifeCycle, ASimpleWelcomeServlet<br>WorkingwithServlets: GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor.<br>Working with Databases: WhatisJDBC? JDBCArchitecture, AccessingDatabase, TheServletGUI and DatabaseExample. | U1 -02- Learning about the basic concept of Java servlets.<br><br>U2 -03- Understanding how to work with database. | programming with database connectivity.<br>CO2 Design and develop platform independent applications using a variety of component based frameworks.<br>CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.<br>CO4 The objective is to equip the students with the advanced feature of contemporary Java which would enable them to handle complex programs relating to managing data and processes over the network.<br>CO5 The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business. |
| UNIT – II<br>Request Dispatcher: Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application.<br>COOKIES: KindsofCookies, WhereCookiesAreUsed? CreatingCookiesUsingServlet, DynamicallyChangingtheColorsofAPage<br>SESSION: WhatAreSessions? LifecycleofHttpSession, SessionTrackingWithServletAPI, AServlet Session Example<br>Workingwith Files: UploadingFiles, CreatinganUploadFileApplication, DownloadingFiles, CreatingaDownloadFileApplication.<br>Workingwith Non-Blocking I/O: CreatingaNonBlockingReadApplication, CreatingTheWeb Application, CreatingJavaClass, Creating Servlets, Retrieving The File, Creating index.jsp | U2 -01- learning the concept of Request Dispatcher.<br><br>U2 -02- Learning about cooking.<br><br>U2 -03- Learning how to work with files. | |
| UNIT – III<br>Introduction To Java ServerPages: WhyuseJava | U3 -01- Understand about Java Server pages. | |

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| ServerPages?<br>DisadvantagesOfJSP, JSPVsServlets,<br>LifeCycleofaJSPPage,<br>HowdoesaJSPfunction? HowdoesJSPexecute?<br>AboutJava ServerPages<br>Getting Started With Java ServerPages:<br>Comments, JSPDocument,<br>JSPElements, JSPGUIExample.<br>Action Elements: IncludingotherFiles,<br>ForwardingJSPPagetoAnotherPage,<br>PassingParametersforotherActions,<br>LoadingaJavabean.<br>Implicit Objects, Scopeand ElExpressions:<br>ImplicitObjects,<br>CharacterQuotingConventions,<br>UnifiedExpressionLanguage[UnifiedEL],<br>ExpressionLanguage.<br>Java Server Pages Standard Tag Libraries:<br>WhatiswronginusingJSPScriptletTags?<br>HowJSTLFixesJSPScriptlet'sShortcomings?<br>DisadvantagesOfJSTL,<br>TagLibraries. | U3 -02- Learning about LifeCycle of a JSP Page.<br><br>U3 -03- Understanding about Action Element. | |
| UNIT – IV<br>Introduction To EnterpriseJavabeans:<br>EnterpriseBeanArchitecture,<br>BenefitsofEnterpriseBean, TypesofEnterpriseBean,<br>AccessingEnterpriseBeans,<br>EnterpriseBeanApplication,<br>PackagingEnterpriseBeans<br>Workingwith Session Beans:<br>WhentouseSessionBeans?<br>TypesofSessionBeans, RemoteandLocalInterfaces,<br>AccessingInterfaces, LifecycleofEnterpriseBeans,<br>PackagingEnterpriseBeans, Exampleof<br>StatefulSessionBean, Example<br>ofStatelessSessionBean, Example of<br>SingletonSessionBeans.<br>Working with Message DrivenBeans:<br>LifecycleofaMessageDrivenBean,<br>UsesofMessageDrivenBeans,<br>TheMessage DrivenBeansExample.<br>Interceptors: Request andInterceptor, Defining An Interceptor,<br>AroundInvokeMethod, ApplyingInterceptor,<br>Adding An Interceptor<br>To An Enterprise Bean, Build and Run the Web Application.<br>Java Naming and Directory Interface: What is Naming Service?<br>What is Directory Service? What is Java Naming and Directory<br>Interface? Basic Lookup, JNDI Namespace in Java EE, Resources and<br>JNDI, Datasource Resource Definition in Java EE. | U4 -01- Understanding Enterprise Java Bean.<br><br>U4 -02- Learning about types of Java bean<br><br>U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail. | |
| UNIT – V<br>Persistence, Object/Relational Mapping And JPA: | U5 - 01 -Introduction and learning | |

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| WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping, Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications, Writing JPA Application: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. Introduction to Hibernate: WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? WritingHibernateApplication: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication. | about Persistence, Object/Relational Mapping And JPA in detail with its meaning .<br><br>U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications .<br><br>U5 - 03 - Creating and learning of JSPS, The JPA ApplicationStructure, along with this learning how to run the program .<br><br>U5 - 04 - Learning how to write and hiber net application in details with all the information required . | |

**Course Outcomes**

TYBSC IT – SEM 6
2021-2022

Course: USIT601 Software Quality Assurance

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality | U1 - 01 - Describe fundamental concepts of software quality assurance.<br>U1 - 02 - Explore test planning and its management. | CO1 Ability to identify and apply modern software testing methods in software development<br>CO2 Understand testing strategies and defect management<br>CO3 Recognise the importance of software quality assurance<br>CO4 Know about quality |

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| Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.<br>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management. | | improvement, cost control and contribute toward efficient delivery of software solutions |
| UNIT – II<br>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing. | U2 - 01 - To learn the basic testing techniques.<br>U2 - 02 - Develop knowledge of testing process and features. | |

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| Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing | | |
| UNIT – III<br>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools. | U3 - 01 - To learn Boundary value analysis.<br>U3 - 02 - Develop knowledge of the Testing techniques. | |
| UNIT – IV<br>Software Verification and Validation:Introduction, Verification, Verification Workbench, Methods | U4 - 01 - Analyze Verfication and Validation.<br>U4 - 02 - Introduce V - Model and Testing during test | |

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| of Verification, Types of reviews on the basis od Stage Phase, Entities Involved In verification, Reviews in testing lifecycle, Coverage In Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.<br>V-test Model:Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding,<br>VV Model, Critical Roles and Responsibilities | | |
| UNIT – V<br>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.<br>Special Tests:Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph. | US - 01 - understanding the levels of testings. | |

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| Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing. | | |

Course: USIT602 Security in Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.<br>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.<br>Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense. | U1 - 01 - simplify Information Security Overview<br>U1 - 02 - determine Secure Design Principles | CO1 Insight into secure design principles and defense models.<br>CO2 Knowledge about storage and database security.<br>CO3 Implement IDS, Firewalls and wireless security.<br>CO4 Skills to implement secure cloud environment for web and application security<br>CO5 Ability to implement physical security for implementing secure information environment. |
| UNIT – II<br>Authentication and Authorization: Authentication, Authorization<br>Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.<br>Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. | U2 - 01 - classify Authentication and Authorization<br>U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure. | |

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| Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring | | |
| UNIT – III<br>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.<br>Network Device Security: Switch and Router Basics, Network Hardening.<br>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.<br>Wireless Network Security: Radio Frequency Security Basics, DataLink Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways. | U3 - 01 - Learn Firewall Capabilities, Firewall Design.<br>U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways. | |
| UNIT – IV<br>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).<br>Voice over IP (VoIP) and PBX Security: Background, VoIP Components,VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.<br>Operating System Security Models: Operating System | U4 - 01 - Learn Operating System Security Models.<br>U4 - 02 - Learn Intrusion Detection and Prevention Systems | |

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| Models.<br>Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security. | | |
| UNIT – V<br>Virtual Machines and Cloud Computing: Virtual Machines, Cloud<br>Computing.<br>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.<br>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets:<br>Locks and Entry Controls, Physical Intrusion Detection. | U5 - 01 - Introduce Cloud computing.<br>U5 - 02 - Analyze application Security, Remote Administration Security. | |

Course: USIT603 Business Intelligence

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence<br>architectures, Ethics and business intelligence<br>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system | U1 - 01 - Describe the concepts and components of Business Intelligence (BI).<br><br>U1 - 02 -Critically evaluate use of BI for supporting decision making in an organisation.<br><br>U1 - 03 - Understand and use the technologies and tools that make up BI. | CO1 Ability to use decision support system for BI Applications<br>CO2 Ability to develop and use mathematical models for data mining and data preparations<br>CO3 Know how and when to apply classification and clustering techniques for solving BI problems<br>CO4 Explore insights into important emerging applications of BI<br>CO5 Developing skills to design expert system solutions for business applications |
| UNIT – II<br>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models<br>Data mining: Definition of data mining, Representation of input data<br><br>Data mining process, Analysis methodologies | U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction<br><br>U2 - 02 - To develop knowledge of data mining.<br><br>U2 - 03 - Analyze Data Validation and | |

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| Data preparation: Data validation, Data transformation, Data reduction | data preparation. | |
| UNIT – III<br>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines<br>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models | U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods<br><br>U3 - 02 - Explain Clustering and classification model. | |
| UNIT – IV<br>Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices | U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model<br><br>U4 - 02 - Identify marketing models and production models. | |
| UNIT – V<br>Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management<br>Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems | U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems<br>U5 - 02 - generate knowledge of AI and other Automation techniques.<br><br>U5 - 03 - Develop Knowledge of expert system. | |

Course: USIT604 Principles of Geographic Information Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>A Gentle Introduction to GIS<br>The nature of GIS: Some fundamental observations, Defining GIS,<br>GISystems, GIScience and GIApplications, Spatial data and Geoinformation.<br>The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis<br>Geographic Information and Spatial Database<br>Models and Representations of the real world<br>Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries<br>Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology<br>and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects<br>Organizing and Managing Spatial Data<br>The Temporal Dimension | U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).<br><br>U1 - 02 -Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | CO1 Explore mapped data, Spatial Data Types, Data Creation, Georeferencing, Spatial Analysis<br>CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis<br>CO3 Analyze spatial data, using QGIS analysis tools<br>CO4 Develop and Manage Geodatabases for real world data<br>CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others |
| UNIT – II<br>Data Management and Processing Systems<br>Hardware and Software Trends<br>Geographic Information Systems: GIS Software, GIS Architecture and | U2 - 01 -Demonstrate organizational skills in file and database management.<br><br>U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and | |

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| functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality. | Technology. | |
| UNIT – III Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data | U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. | |

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| checks and repairs, Combining data from multiple sources<br>Point Data Transformation: Interpolating discrete data, Interpolating continuous data | | |
| UNIT – IV<br>Spatial Data Analysis<br>Classification of analytical GIS Capabilities<br>Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification<br>Overlay functions: Vector overlay operators, Raster overlay Operators<br>Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis<br>Analysis: Network analysis, interpolation, terrain modeling<br>GIS and Application models GPS, Open GIS Standards, GIS Applications and Advances<br>Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation | U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms.<br><br>U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems. | |
| UNIT – V<br>Data Visualization<br>GIS and Maps, The Visualization Process<br>Visualization Strategies: Present or explore?<br>The cartographic toolbox: What kind of data do I have? How can I map my data?<br>How to map? How to map qualitative data, How to map quantitative data, How to map the | U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis<br><br>U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS) | |

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| terrain elevation, How to map time series Map Cosmetics, Map Dissemination | | |

Course: USIT605 IT Service Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>IT Service Management: Introduction, What is service management?<br>What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle,<br>Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across | U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM<br>U1 - 02 - understand how ITSM can operate in an organisation to improve processes<br>U1 - 03 - understand best management practice from a technical and non-technical perspective | CO1 Ability to deal with the convergence, interoperability and design of heterogeneous networks with<br>local, access and core networks, as well as with service integration.<br>CO2 Ability to model, design, implement, manage, operate, administrate and maintain networks, services<br>and contents |

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| the life cycle.<br>Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles.<br>Service Strategy:Define the market, Develop the offerings, Develop<br>Strategic Assets, Prepare for execution.<br>Challenges, Critical Success factors and risks:Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks. | | CO3 Ability to plan networks and decision-making about services.<br>CO4 Learn about service transition and service operations.<br>CO5 Ability to apply Continual Service Improvement in an organization. |
| UNIT – II<br>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and<br>documenting business requirements and drivers, Design activities,<br>Design aspects, Subsequent design activities, Design constraints,<br>Service oriented architecture, Business Service Management, Service<br>Design Models<br>Service Design Processes Service Catalogue Management, Service Level Management, Capacity Management, Availability Management,<br>IT Service Continuity Management, Information Security | U2 - 01 - communicate management theories and ideas in writing<br>U1 - 02 - problem solve through the lens of management theories<br><br>U1 - 03 - critically evaluate information from a variety of sources | |
| UNIT – III<br>Service Transition Fundamentals, Service Transition Principles:<br>Principles Supporting Service Transition, Policies for Service Transition<br>Service Transition Processes Transition planning and support.<br>Change Management, Service Asses Configuration Management,<br>Service and Deployment Management, Service Validation and<br>Testing, Evaluation, Knowledge Management. | U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions<br><br>U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms and businesses<br><br>U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems | |

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| Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions. | | |
| UNIT – IV<br>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation<br>Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.<br>Challenges, Critical Success factors and risks:Challenges, | U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector.<br>U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in general.<br>U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance | |

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| Critical Success factors, Risks | | |
| UNIT – V<br>Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI Inputs and outputs.<br>CSI Process: The seven-step improvement process. CSI Methods nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, Organising for CSI:Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training. Technology considerations: Tools to support CSI activities. Implementing CSI:Critical Considerations for implementing CSI,The start, Governance, CSI and organisational change, Communication Strategy and Plan | U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets.<br><br>U5 - 02 -Locate and access appropriate sources of information in order to be able to make informed decisions about effective services delivery.<br><br>U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios. | |

ACADEMIC YEAR 2020-2021

**Program: Bachelors of Science in Information Technology.**

## Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

## Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
**PSO5:** Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

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ACADEMIC YEAR 2020-2021

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Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

## Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
**PSO5:** Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

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# COURSE OUTCOME

FYBSC IT – SEM 1

2020-2021

Course: USIT101 Imperative Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:**<br>Types of Programming languages, History, features and application. Simple program logic, program development cycle, pseudocode statements and flowchart symbols, sentinel value to end a program, programming and user environments, evolution of programming models., desirable program characteristics. **Fundamentals:**<br>Structure of a program, Compilation and Execution of a Program, Character Set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Variable definition, symbolic constants. | U1-01 - Understand Fundamentals of Programming<br>U1-02 - Exploring C Programming<br>U1-03 - Classifying Data using Data types in C Programming | **CO1** - To develop the programming skills using fundamentals of basic c language.<br>**CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable.<br>**CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling.<br>**CO4** - To teach the basics of pre-processors available with C compiler.<br>**CO5** - To understand the procedural oriented programming concept.<br>**CO6** - To enable Learners to develop the logic of the program. |
| **UNIT II**<br><br>**Operators and Expressions:**<br>Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions.<br>**Data Input and output:**<br>Single character input and output, entering input data, scanf function, printf function, gets and puts functions, interactive programming. | U2 - 01 - Managing Input and Output Operations<br>U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions | |
| **UNIT III**<br><br>**Conditional Statements and Loops:**<br>Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. | U3 - 01 - Controlling the Program Order: Decision Making<br>U3 - 02 - Repeating Sequence of Instructions: Loops<br>U3 - 03 - Understand Group of Statements: Functions | |

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| Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value. | | |
| **UNIT IV**<br><br>**Program structure:** Storage classes, automatic variables, external variables, static variables, multifile programs, more library functions, Pre-processor: Features, #define and #include, **Directives and Macros Arrays:** Definition, processing, passing arrays to functions, multidimensional arrays, arrays and strings. | U4 - 01 - Arranging the Same Data Systematically: Arrays<br>U4 -02 - Learn Characters Arrays | |
| **UNIT V**<br><br>**Pointers:**<br>Fundamentals, declarations, Pointers Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays And Pointers, Pointer Arrays, passing functions to other functions<br>**Structures and Unions:**<br>Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers. | U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions<br>U5 - 02 - Pointing to a Location: Pointers | |

Course: USIT102 Digital Electronics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**Number System:**<br>Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number | U1-01 Students learned the difference between Analog System and Digital System<br>U1-02 Understanding different number system | **CO1** - Course Outcomes: concepts and techniques used in digital electronics.<br>**CO2** - Have a detailed understanding of the |

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| system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes – ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection and correction, Universal Product Code, Code conversion.<br>**Binary Arithmetic:**<br>Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complemeet, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic | and their conversions.<br>U1-03 Understanding weighted codes and non-weighted codes<br>U1-04 Analyzing Error Detection and Error Correction codes with examples<br>U1-05 Enable students to solve binary arithmetic problems | fundamentals<br>**CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system.<br>**CO4** - Analyze different typs of digital electronic circuit using various mapping and logical tools and know the techniques to prepare simplified circuit using various mapping and mathematical methods.<br>**CO5** - Understand different types of logic gates and the relationship between logic gates.<br>**CO6** - Develop a digital logic and apply it to solve real life problems.<br>**CO7** - Understand, Analyze, design and implement combinational and sequential logic circuits.<br>**CO8** - Enable students to develop skill to build digital circuits. |
| **UNIT II:**<br><br>**Boolean Algebra and Logic Gates:** Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.<br>**Minterm, Maxterm and Karnaugh Maps:** Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method. | U2-01 Understanding and Solving Boolean Algebra problems.<br>U2-02 Learning Basic Gates, Universal Gates, and other gates<br>U2-03 Understanding Minterms and Maxtrems<br>U2-04 Understanding and solving reduction techniques using Karnaugh maps.<br>U2-05 Understanding and solving reduction techniques using Quine Mc Cluskey Method. | |
| **UNIT III:**<br><br>**Combinational Logic Circuits:** Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations | U3-01 Designing and implementing Combinational Logic Circuits<br>U3-02 Understanding Code Converters design and | |

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| **Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator. | implementations<br>U1-03 Learning different Arithmetic Circuits | |
| **UNIT IV:**<br><br>**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:**<br>Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.<br>**Sequential Circuits:**<br>Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-flop, JK flipflop, Race-around condition, Master – slave JK flip-flop, T flip-flop, conversion from one type of flip-flop to another, Application of flipflops. | U4-01 Designing and implementing Multiplexer and De-multiplexer<br>U4-02 Designing and implementing Encoder and Decoder<br>U4-03 Learning Sequential Circuits<br>U4-04 Designing and learning various Flipflops and their conversions | |
| **UNIT V:**<br><br>**Counters:**<br>Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.<br>**Shift Register:**<br>Introduction, parallel and shift registers, serial shifting, serial–in serial– out, serial–in parallel–out, parallel–in parallel–out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters. | U5-01 Designing and implementing Asynchronous counters<br>U5-02 Learning functions of different IC's 7490, 7492.<br>U5-03 Learning Shift Register Circuits<br>U5-04 Designing and implementing Synchronous counters<br>U5-05 Analyzing IC 7495 and learning Seven Segment Displays | |

Course: USIT103 Operating Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:** What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.<br>**Processes and Threads:** Processes, threads, interprocess communication, | U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.<br>U1 - 02 - Analyze Processes & threads | **CO1** Analyze the structure and functions of operating systems.<br>**CO2** Understand role of operating system as process manager, resource manager, file system manager, memory manager and I/O manager |

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| scheduling, IPC problems. | | **CO3** Understand the Mutual exclusion and Deadlock detection<br>**CO4** Understand benefits of cloud and virtualization.<br>**CO5** Understand differences of three types of computing: multiprocessor, multicomputer and distributed systems |
| **UNIT – II**<br>**Memory Management:** No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation.<br>**File Systems:** Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system. | U2 - 01 - Analyze important algorithms eg. Process scheduling and memory management algorithms<br>U2 - 02 - Understand the different types of files & directories<br>U2 - 03 - Applying algorithms in OS | |
| **UNIT – III**<br>**Input-Output:** Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management,<br>**Deadlocks:** Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues. | U3 - 01 - Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock<br>U3 - 02 - Evaluate the operating system's resource management techniques, deadlock management techniques, memory management techniques. | |
| **UNIT – IV**<br>**Virtualization and Cloud:** History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds.<br>**Multiple Processor Systems:** Multiprocessors, multicomputers, distributed systems. | U4 - 01 - Understanding the different types of hypervisors<br>U4 - 02 - Analyzing different processor systems<br>U4 - 03 - Evaluate between multiprocessors, multicomputers & distributed system | |
| **UNIT – V**<br>**Case Study on LINUX and ANDROID:** History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, I/O in Linux, Linux file system, security in Linux. Android<br>**Case Study on Windows:** History of windows through Windows 10, programming windows, system structure, | U5 - 01 - Understands different types of operating systems<br>U5 - 02 - Remembering different types of functioning in different types of Microsoft Windows. | |

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| processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows. | | |

Course: USIT104 Discrete Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:** Variables, The Language of Sets, The Language of Relations and Function<br>**Set Theory:** Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem.<br>**The Logic of Compound Statements:** Logical Form and Logical<br>Equivalence, Conditional Statements, Valid and Invalid Arguments. | U1 - 01 - Understands the various languages.<br>U1 - 02 - Remembering the different definitions and the Element.<br>U1 -03 - Applying and analyzing the logic of compound statements. | **CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures.<br>**CO2** Be able to apply basic counting techniques to solve combinatorial problems.<br>**CO3** Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.<br>**CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.<br>**CO5** Have substantial experience to comprehend formal logical arguments. |
| **UNIT II:**<br>**Quantified Statements:** Predicates and Quantified Statements,<br>Statements with Multiple Quantifiers, Arguments with Quantified<br>Statements<br>**Elementary Number Theory and Methods of Proof:** Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms. | U2 - 01 - Understands the different statements.<br>U2 - 02- Remembering the different methods of proof and theorem. | |
| **UNIT III:**<br>**Sequences, Mathematical Induction, and Recursion:** Sequences, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by | U3 - 01 - Learning, understanding and analyzing the Sequences,<br>Mathematical Induction and recursion.<br>U3 -02- Learning | |

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| iteration, Second order linear homogenous recurrence relations with constant coefficients. general recursive definitions and structural induction.<br>**Functions:** Functions Defined on General Sets, One-to-One and Onto,<br>Inverse Functions, Composition of Functions, Cardinality with<br>Applications to Computability | different types of functions. | |
| **UNIT IV:**<br>**Relations:** Relations on Sets, Reflexivity, Symmetry, and Transitivity.<br>Equivalence Relations, Partial Order Relations<br>**Graphs and Trees:** Definitions and Basic Properties, Trails, Paths, and<br>Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs,<br>Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths. | U4 - 01 - Understand the various types of Relations.<br>U4 -02 - Analyzing the Graphs & trees. | |
| **UNIT V:**<br>**Counting and Probability:** Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule,Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r-Combinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events. | U5 - 01 - leaning to count the number of times an event could occur. | |

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Course: USIT105 Communication Skills

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness<br>**Understanding Business Communication:** Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication. | U1 - 01 - Understanding the 7Cs of Communication skills .<br><br>U1-02- Analyzing and Applying Communication skills | **CO1** Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.<br>**CO2** Identify ethical, legal, cultural, and global issues affecting business communication.<br>**CO3** Utilize analytical and problem-solving skills appropriate to business communication.<br>**CO4** Participate in team activities that lead to the development of collaborative work skills.<br>**CO5** Select appropriate organizational formats and channels used in developing and presenting business messages.<br>**CO6** Compose and revise accurate business documents using computer technology.<br>**CO7** Communicate via electronic mail, Internet, and other technologies.<br>**CO8** Deliver an effective oral business presentation.<br>**CO9** To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments<br>**CO10** To participate in an online learning environment successfully by developing the implication-based understanding of Paraphrasing, deciphering instructions, interpreting guidelines, discussion boards & Referencing Styles.<br>**CO11** To demonstrate his/her ability to write error free while making an optimum use of correct Business Vocabulary & Grammar.<br>**CO12** To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.<br>**CO13** To draft effective business correspondence with brevity and |

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| | | clarity.<br>**CO14** To stimulate their Critical thinking by designing and developing clean and lucid writing Skills.<br>**CO15** To demonstrate his verbal and non-verbal communication ability through presentations. |
| **UNIT II:**<br><br>**Writing Business Messages and Documents:**<br>Business writing, Business Correspondence, Instructions<br>Business Reports and Proposals, Career building and Resume writing.<br>**Developing Oral Communication Skills for Business:**<br>Effective Listening, Business Presentations and Public Speaking,Conversations, Interview | U2 - 01 - Applying and learning the writing of Business messages and documents<br><br>U2 - 02 - Understanding and remembering the development of Oral communication skills for business | |
| **UNIT III:**<br><br>**Developing Oral Communication Skills for Business:**<br>Meetings and Conferences, Group Discussions and Team<br>Presentations, Team Briefing.<br>**Understanding Specific Communication Needs:**<br>Communication across Functional Areas | U3 - 01 - Analyzing and Evaluating the development of Oral communication skills for business<br><br>U3 - 02 - Understanding and Remembering specific communication needs | |
| **UNIT IV:**<br><br>**Understanding Specific Communication Needs:**<br>Corporate Communication, Persuasive Strategies in Business<br>Communication, Ethics in Business Communication, Business<br>Communication Aids | U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs | |
| **UNIT V:**<br>**Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates.<br>**Adding graphics to your presentation:** Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance. | U5 - 01 - Learning and Understanding the different ways of presentation process .<br><br>U5 - 02 - Creating and applying the graphics to your presentation . | |

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**Course Outcomes**

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 -2020-2021

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT - I**<br>**Object Oriented Methodology:**<br>Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS.<br>**Principles of OOPS:**<br>OOPS Paradigm, Basic Concepts of OOPS:<br>Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing | U1 -01- Learning about what exactly the object oriented is.<br><br>U1 -02- Understands the principles of OOPs. | CO1: Students will understand the need of object oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment.<br>CO2: Student will understand how to model the real world scenario using class diagram and be able to exhibit communication between objects using sequence diagram.<br>CO3: Students will be able to implement relationships between classes.<br>CO4: Students will be able to demonstrate various collection classes.<br>CO5: Students will be able to create and user interfaces and packages<br>CO6: The students will be able to demonstrate programs on exceptions, multithreading and applets. |
| **UNIT - II**<br>**Classes and Objects:**<br>Simple classes (Class specification, class members accessing), Defining member functions, passing object as an argument, Returning object from functions, friend classes, Pointer to object, Array of pointer to object.<br>**Constructors and Destructors:**<br>Introduction, Default Constructor, Parameterized Constructor and examples, Destructors | U2 -01- Understands the classes and Objects in OOPs.<br><br>U2 -02- Remembering the Constructors and Destructors. | |
| **UNIT - III**<br>**Polymorphism:**<br>Concept of function overloading, overloaded operators, overloading unary and binary operators, overloading comparison operator, overloading | U3 -01- Understands the concept of overloading.<br><br>U3 -02- Analyze the Virtual functions. | |

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| arithmetic assignment operator, Data Conversion between objects and basic types,<br>**Virtual Functions:**<br>Introduction and need, Pure Virtual Functions,<br>Static Functions, this Pointer, abstract classes, virtual destructors. | | |
| UNIT IV:<br>**Program development using Inheritance:** Introduction, understanding inheritance, Advantages provided by inheritance, choosing the access specifier, Derived class declaration, derived class constructors, class hierarchies, multiple inheritance, multilevel inheritance, containership, hybrid inheritance.<br>**Exception Handling:**<br>Introduction, Exception Handling Mechanism,<br>Concept of throw & catch with example | U4 -01- Understand the concept of inheritance and types of inheritance.<br><br>U4 -02- Learning the concept of Exception handling. | |
| **UNIT V:**<br>**Templates:**<br>Introduction, Function Template and examples, Class Template and examples.<br>**Working with Files:**<br>Introduction, File Operations, Various File Modes, File Pointer and their Manipulation | U5 -01- Understand the concept of Templates.<br><br>U5 -02- Working and creating various files | |

Course: USIT202 Microprocessor Architecture

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT 1: Microprocessor, microcomputers, and Assembly Language:<br>Microprocessor, Microprocessor | U1-O1 Understanding Microprocessor Concepts, Microcomputers.<br>U1-O2 Learning large | **CO1:**Describe the architecture & organization of 8085 Microprocessor.<br>**CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish |

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| Instruction Set and Computer Languages, from Large Computers to Single-Chip Microcontrollers, Applications.<br>Microprocessor Architecture and Microcomputer System:<br>Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing,<br>Microprocessor-Based System Application.<br>8085 Microprocessor Architecture and Memory Interface:<br>Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer,<br>Memory Interfacing, Interfacing the 8155 Memory Segment,<br>Illustrative Example: Designing Memory for the MCTS Project,<br>Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer. | computers to small chip microcontrollers.<br>U1-03 Understanding microprocessor internal Architecture and pin configuration.<br>U1-04 Study of Microprocessor based system applications.<br>U1-05 Learning 8155 memory segment, memory interfacing.<br>U1-06 Illustration of memory design for MCTS project. | the use of different instructions and apply it in assembly language programming.<br>**CO3**: Relate the addressing modes used in the instructions.<br>**CO4**. Realize the interfacing of memory & various I/O devices with 8085 microprocessor.<br>**CO5**. Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. **CO6**. Learning different programming techniques of 8085.<br>**CO7** Understanding the concepts of Subroutines.<br>CO8 Learning Code Conversion Technique and its applications.<br>CO9 Learning various 8085 interrupts, its IO concepts and applications.<br>CO10 Studying Pentium, Pentium Pro microprocessors, Core processors and SUN SPARC procesor. |
| UNIT 2 :Interfacing of I/O Devices<br>Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.<br>Introduction to 8085 Assembly Language Programming:<br>The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program.<br>Introduction to 8085 Instructions:<br>Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program. | U2-01 Learning Interfacing of IO Devices Concepts,<br>U2-02 Distinguishing memory mapped IO and peripheral mapped IO.<br>U2-03 Programming using 8085 assembly language.<br>U2-4 Learning Programming model and 8085 Instruction Set.<br>U2-05 Understanding various debugging techniques. | |
| UNIT-3:Programming Techniques With Additional Instructions:<br>Programming Techniques: Looping, Counting and Indexing,<br>Additional Data Transfer and 16-Bit Arithmetic Instructions,<br>Arithmetic Instruction Related to Memory, Logic Operations: Rotate,<br>Logics Operations: Compare, Dynamic Debugging.<br>Counters and Time Delays:<br>Counters and Time Delays, Illustrative | U3-01 Laerning Instruction Classifications<br>U3-02Learning various assembly language programs and coding techniques.<br>U3-03 Illustartion of counters and time dalys<br>U3-04 Demonstation of stacks and subroutines.<br>U3-05 Learning advanced subroutine concepts. | |

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| Program: Hexadecimal Counter,<br>Illustrative Program: zero to nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.<br>Stacks and Sub-Routines:<br>Stack, Subroutine, Restart, Conditional Call, Return Instructions,<br>Advanced Subroutine concepts. | | |
| UNIT-4 Code Conversion, BCD Arithmetic, and 16-Bit Data Operations:<br>BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-toSeven-Segment-LED Code Conversion, Binary-to ASCII and ASCIIto-Binary Code Conversion, BCD Addition, BCD Subtraction,<br>Introduction To Advanced Instructions and Applications,<br>Multiplication, Subtraction With Carry.<br>Software Development System and Assemblers:<br>Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers,<br>Writing Program Using Cross Assemblers.<br>Interrupts:<br>The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes. | U4-01 Learning code conversion techniques.<br>U4-02 Application of code conversion techniques.<br>U4-03 Learning advanced instructions and its applications.<br>U4-04 Understanding Assemblers, cross assemblers.<br>U4-05 Analyzing Vectored Interrupts | |
| UNIT-5:The Pentium and Pentium Pro microprocessors: Introduction,<br>Special Pentium registers, Memory management, Pentium instructions,<br>Pentium Pro microprocessor, Special Pentium Pro features.<br>Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, I3, I5 and i7.<br>SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format | U5-01 Explaining Pentium and Pentium Pro microprocessors<br>U5-02 Learning Core microprocessors<br>U5-03 Distintive study of various core processors.<br>U5-04 Understanding SUN SPARC Microprocessors.<br>U5-05 Learning Instruction Format of SUN SPARC. | |

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Internet and the World Wide Web:<br>What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol<br>HTML5:<br>Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets. | U1 - 01 - Understanding and introduction of internet and its application .<br><br>U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators .<br><br>U1 - 03 - Learning and application of HTML5 , LINKS , TAGS , CSS and FORMATTING . | CO1 Understand Internet and Web Programming basic concepts.<br>CO2 Understand the front end and back end Web Applications.<br>CO3 Understand the latest web programming tools and techniques.<br>CO4 Developing static and dynamic Web Applications.<br>CO5 Integrating and blending latest web technologies for creating Web Applications. |
| UNIT – II<br>HTML5 Page layout and navigation:<br>Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.<br>HTML5 Tables, Forms and Media: | U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning .<br><br>U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more . | |

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| Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page. | U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML . | |
| UNIT -III<br>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, | U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values .<br>U3 - 02 - Understanding and learning statements and various functions .<br>U3 - 03 - Learning and application of documents and its objects . | |

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| String, regExp<br>Document and its associated objects: document, Link, Area, Anchor,<br>Image, Applet, Layer<br>Events and Event Handlers : General Information about Events,<br>Defining Event Handlers, event, onAbort, onBlur, onChange, onClick,<br>onDblClick, onDragDrop, onError, onFocus, onKeyDown,<br>onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove,<br>onMouseOut, onMouseOver, onMouseUp, onMove, onReset,<br>onResize, onSelect, onSubmit, onUnload | | |
| UNIT – IV<br>PHP:<br>Why PHP and MySQL? Server-side scripting, PHP syntax and<br>variables, comments, types, control structures, branching, looping,<br>termination, functions, passing information with PHP, GET, POST,<br>formatting form variables, superglobal arrays, strings and string<br>functions, regular expressions, arrays, number handling, basic PHP<br>errors/problems | U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling . | |
| UNIT – V<br>Advanced PHP and MySQL : PHP/MySQL Functions, Integrating<br>web forms and databases, Displaying queries in tables, Building Forms<br>from queries, String and Regular Expressions, Sessions, Cookies and<br>HTTP, E-Mail | U5 - 01 - Understanding and learning of advances PHP and MySql . | |

Course: USIT204 Numerical and Statistical Methods

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation Laws and Engineering Problems<br>Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors<br>Truncation Errors and the Taylor Series: The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty | U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models<br>Also to learn different types of errors that take place in problem solving . | CO1 To develop the mathematical skills of the students in the area of numerical methods.Describe and discuss the key terminology, concepts, tools and techniques used in business statistical analysis.<br>CO2 To know about various types of Errors, Calculate the error correction and get actual root of the equation.<br>CO3 Understand different methods of solution of the equations and compare them.<br>CO4 How to calculate and apply measures of location and measures of dispersion – grouped and ungrouped data cases.<br>CO5 How to apply discrete and continuous probability distribution to various business problems.<br>CO6 Student will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods.<br>CO7 Solve a range of problems using the techniques covered.<br>CO8 Discuss the uses and limitations of statistical analysis. |
| UNIT – II<br>Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method.<br>Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation. | U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of different Interpolation . | |
| UNIT -III<br>Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method.<br>Numerical differentiation and Integration: | U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule . | |

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| Numberical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules.<br>Numerical solution of 1st and 2nd order differential equations:<br>Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2 nd Order Differential Equations. | | |
| UNIT – IV<br>Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression<br>Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution | U4 - 01 - Understanding and learning of many types of regressions<br><br>U4-02- Understanding and learning squares , non linear regression<br><br>U4 -03 - Understanding and learning linear programming and types of solutions. | |
| UNIT – V<br>Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance.<br>Distributions: Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications. | U5-01- Detailed study of variables<br><br>U5-02 - Understanding of Probability and variance .<br><br>U5- 03 - Understanding and learning distributions<br><br>U5 - 04 - Applying and Understanding of various types of distributions and its application . | |

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Course: USIT205 Green Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT - I<br>**Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.<br>**Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea. | U1-01: To learn various toxins present in electronic products.<br>U1-02: Detailed study of Company's Carbon Footprint.<br>U1-03: To study Initiatives taken by UN, Implementation of Basel Conventions.<br>U1-04: To know the significance of WEEE Directives.<br>U1-05: To learn the steps to curb E-wastes by Asian countries. | |
| UNIT - II<br>**Minimizing Power Usage:**<br>Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, LowPower Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.<br>**Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together. | U2-01: To illustrate power problems and issues to overcome these problems.<br>U2-02: To Study virtualization and managing power issues with low cost.<br>U2-03: To explain Usage of energy efficient drives.<br>U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same<br>U2-05: Designing centralised cooling system and its impact on cooling system. | |
| UNIT -III<br>**Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.<br>**Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.<br>UNIT-IV | U3 -01- Learning and analyzing the Global Impact of local actions.<br>U3 -02- Learning to use electronic device instead of paper and going paperless. | |

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| **Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle from beginning to end, Life Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, Cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind set, David vs. America Online<br>**Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice | the concept of why recycling is important<br>H. 07- Analyze the use of hardware products | |
| UNIT - V<br>**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.<br>**Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations. | US -01- Learning about the use of IS to achieve environmental objectives.<br>US -02- Analyzing the data which has been gathered. | CO1 :To learn overview and issues addressed in Green Computing.<br>CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing.<br>CO3: To illustrate steps taken to increase power efficiency by reducing power consumption.<br>CO4: Explanation of methods to reduce cooling costs.<br>CO5: Addressing the power usage problems, storage problems and virtualization |
| | | CO6: Implementation of Steps to measure the cooling costs.<br>CO7: To improve the way of work culture in offices in order to use energy efficiently.<br>CO8: To understand cooling demands and steps taken to minimze the cooling costs.<br>CO9: To learn how to green IT infrastructure in our surroundings<br>CO10: To know the role of Chief Green Officer in an organisation and Fulfilment of SMART goals by set by him. |

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**Course Outcomes**

FYBSC IT – SEM 1
2020-2021

Course: USIT301 Python Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction: The Python Programming Language,History, features,<br>Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors,Experimental Debugging,<br>Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,<br>Variables and ExpressionsValues and Types, Variables, Variable Names and Keywords, Type conversion,Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.<br>Conditional Statements: if, if-else, nested if –else<br>Looping: for, while, nested loops<br>Control statements: Terminating loops, skipping specific conditions | U1 -01- Understand the concept of Python Programming.<br><br>U1 -02- Learning to install the python.<br><br>U1 -03- Understanding the error which occurs while executing.<br><br>U1 -04- Learning about various keywords and variables in python. | CO1 Comprehend the basics of python programming<br>CO2 Ability to implement modular approach using python<br>CO3 Efficiently implement various data structures provided by python<br>CO4 Develop applications based on object oriented concept<br>CO5 Develop application using GUI and databases |
| UNIT – II<br>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types<br>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations. | U2 -01- Understand the concept of functions and type conversion.<br><br>U2 -02- Learning and understanding the concept of looping and counting. | |
| UNIT – III<br>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and | U3 -01- Understand how to work with list<br><br>U3 -02- Learning how to access the value in tuple<br><br>U3 -03- Learning basic tuple operations | |

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| methods<br>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions<br>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods<br>Files: Text Files, The File Object Attributes, Directories<br>Exceptions: Built-in Exceptions, Handling Exceptions, Exception | U3 -04- Analyze the Text Files, The File Object Attributes, Directories | |
| UNIT – IV<br>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.<br>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding<br>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue<br>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module | U4 -01- Understanding the concept of Regular Expressions.<br><br>U4 -02- Learning the overview of OOP<br><br>U4 -03- Learning and creating a thread and synchronizing thread.<br><br>U4 -04- Creating Modules and understand the different type of module. | |
| UNIT -V<br>Creating the GUI Form and Adding Widgets:<br>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox.<br>Handling Standard attributes and Properties of Widgets.<br>Layout Management: Designing GUI applications with proper Layout Management features.<br>Look and Feel Customization:Enhancing Look and Feel of GUI using different appearances of widgets. | U5 -01- Creating the GUI Form and Adding Widgets<br><br>U5 -02- Analyzing the Widgets such as buttons, menu, radiobutton.<br><br>U5 -03- Learning how to design GUI applications with proper layout management features. | |

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| Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database. | | |

Course: USIT302 Data Structures

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation.<br>Array:Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays. | U1 -01- Understand the concept of Data Structure and classification of data structure.<br><br>U1 -02- Learning about data types, algorithms and arrays.<br><br>U1 -03- Learning about various type of notations. | CO1 Ability to analyze algorithms and algorithm correctness.<br>CO2 Ability to summarize searching and sorting techniques.<br>CO3 Ability to describe stack, queue and linked list operation.<br>CO4 Ability to gain knowledge of tree and graph concepts.<br>CO5 Ability to analyze and choose appropriate data structure and algorithm for program development.<br>CO6 Efficiently use sorting and searching algorithm and know their complexities.<br>CO7 Improve coding skills by applying most suitable data structure for storage and access.<br>CO8 Ability to use trees and graph structures for representing and using complex and non-line data organization.<br>CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures.<br>CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts.<br>CO11 Determine and demonstrate bugs in progrsm, recognize neededbasic operation with data structures. |

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| | | CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.<br>CO13 To use appropriate algorithmic strategy for better efficiency. |
| UNIT – II<br>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures | U2 -01- Understand types of linked lists.<br>U2 -02- Learning about the concept of linked list. | |
| UNIT – III<br>Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.<br>Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue, Applications of Queues. | U3 -01- Understand the concepts of Stack Memory Representation<br>U3 - 02- Learning about what exactly Queue is.<br>U3 -03- Learning about various types of Queue. | |
| UNIT – IV<br>Bubble, Selection, Insertion, | U4 -01- Understanding about binary trees like property, algorithms and | |

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| Merge Sort. Searching: Sequential, 12<br>&<br>Binary, Indexed Sequential Searches, Binary Search Tree. Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree,<br>Heap, Memory Representation of Heap, Operation on Heap, Heap Sort.<br>Advanced Tree Structures:Red Black Tree, Operations Performed<br>on Red Black Tree, AVL Tree, Operations performed on AVL Tree,<br>2-3 Tree, B-Tree. | representation.<br><br>U4 -02- Learning about Advanced Tree Structures. | |
| UNIT -V<br>Hashing Techniques<br>Hash function, Address calculation techniques, Common hashing<br>functions Collision resolution, Linear probing, Quadratic,Double<br>hashing, Buckethashing, Deletion and rehashing<br>Graph: Introduction, Graph, Graph Terminology, Memory<br>Representation of Graph, Adjacency Matrix Representation of Graph,<br>Adjacency List or Linked Representation of Graph, Operations<br>Performed on Graph, GraphTraversal, Applications of the Graph,<br>Reachability, Shortest Path Problems, Spanning Trees. | U5 -01- Understand about hashing techniques.<br><br>U5 -02- Learning about the introduction of graph and representation of graph. | |

Course: USIT303 Computer Networks

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: Data communications, | U1 -01- Learning about Data communications. | CO1 Understand the importance of computer network and communications.<br>CO2 Learn about transmission media and their |

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| networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion. | U1 -02- Understanding Physical Layers.<br>U1 -03- Learning about Digital and Analog transmission. | characteristics<br>CO3 Learn about role of various layers of ISO OSI Model in communications<br>CO4 Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.<br>CO5 Demonstrate design issues, flow control and error control.<br>CO6 Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.<br>CO7 Knowledge about various protocols used in computer network.<br>CO8 Demonstrate different routing and switching algorithms. |
| UNIT – II Bandwidth Utilization: Multiplexing and SpectrumSpreading: Multiplexing, Spread Spectrum Transmission media:Guided Media, Unguided Media Switching: Introduction, circuit switched networks, packet switching, structure of a switch. Introduction to the Data Link Layer:Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes. | U2 -01- Understanding about Bandwidth Utilization<br>U2 -02- Learning about Switching.<br>U2 -03- Learning about Data Link Layer | |
| UNIT – III Data Link Control: DLC services, data link layer protocols, HDLC, | U3 -01- Understand the concept of Data Link Control. | |

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| Point to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs. | U3 -02- Learning about what media access control is<br><br>U3 -03- Get to know about wireless LANs. | |
| UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6. | U4 -01- Understand the basic concept of Network Layer.<br><br>U4 -02- Get to know about Unicast Routing.<br><br>U4 -03- Learning about Next generation IP. | |
| UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World | U5 -01- Understanding the basic concepts of Transport layer.<br><br>U5 -02- Learning Standard Client0Server Protocols | |

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| wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system. | | |

Course: USIT304 Database Management Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Databases and Transactions<br>What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management<br>Data Models<br>The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.<br>Database Design,ER Diagram and Unified Modeling Language<br>Database design and ER Model:overview, ERModel, Constraints, ERDiagrams, ERDIssues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML | U1 - 01 - Understanding and learning the Introduction of Database and transaction .<br><br>U1 - 02 - Understanding and application of Data Models . .<br><br>U1 - 03 - Learning about ER diagram. | CO1 Understand the need of modelling data and then storing the data in organized manner<br>CO2 Ability to create appropriate structure to map with specific type of data.<br>CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and retrieval of data.<br>CO4 Use latest methods of storage and retrieval of data as desired by the user.<br>CO5 Develop models and management information systems as per requirements of clients. |
| UNIT – II<br>Relational database model:<br>Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).<br>Relational Algebra and Calculus<br>Relational algebra: Introduction, Selection | U2 -01- Understanding the basic concept of Relational database model.<br><br>U2 - 02 - Understanding the basic concept of Relational database design. | |

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| and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities | U2 - 03 - Learning and understanding calculus . | |
| UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. | U3 - 01 - Learning the application of constraints , views and sql .<br><br>U3 - 02 - Understanding the concept of functions and values . | |
| UNIT – IV Transaction management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL,Deadlocks),Time stamping methods, optimistic methods, database recovery management. | U4 - 01 - Learning about Transaction management and Concurrency Control.<br><br>U4 -02 - Learning and Application of different methods and database recovery management | |
| UNIT -V PL-SQL: Beginning with PL / SQL,Identifiers and Keywords, Operators, Expressions, Sequences,Control | U5 - 01 - Learning and Understanding the basic concept of PL-SQL<br><br>U5 - 02 - Application of | |

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| Structures, Cursors and Transaction,Collections and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers. | different data types procedures and clauses . | |

Course: USIT305 Applied Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, CaleyHamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.<br>Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and | U1 -01- Get to know about Inverse of a matrix, Properties of matrices.<br><br>U1 -02- Learning and Understanding about complex numbers and its different application . | CO1 Enhancing the Logic building capability.<br>CO2 Compute a given integral using the most efficient method.<br>CO3 Use integrals to formulate and solve application problems in science and engineering.<br>CO4 Matrices will help them better understand computer graphics.<br>CO5 Laplace will be helpful in understanding Digital Signal systems. |

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| Integration. Graphs of the hyperbolic functions. Logarithms of complex quality. j(=i)as an operator(Electrical circuits) | | |
| UNIT – II<br>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y. Non-homogeneous linear equations, Exact differential Equation, Integrating Factor.<br>Linear Equation and equation reducible to this form, Method of substitution.<br>Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution.<br>Linear Differential Equations with Constant Coefficients:Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X, the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients. | U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods .<br>U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients.<br>U2 - 03 - Understanding and application of Particular integral | |
| UNIT – III<br>The Laplace Transform: Introduction, Definition of the Laplace | U3 - 01 - Introduction to The Laplace Transform and its different theories and methods | |

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| Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function), | U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations . | |
| UNIT – IV<br>Multiple Integrals: Double Integral, Change of the order of the Integration, Double Integral in polar co-ordinates, Triple Integrals.<br>Applications of Integration: Areas, Volumes of solids. | U4 - 01 - Application and learning of Multiple Integrals with its different types and properties . | |
| UNIT -V<br>Beta and Gamma Functions – Definitions,Properties and Problems.<br>Duplication formula.<br>Differentiation Under the Integral Sign<br>Error Functions | U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions | |

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## Course Outcomes

SYBSC IT – SEM 4
2020-2021

Course: USIT401 Core Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable,<br>Java Compiler And Interpreter, Java programs, java applications,<br>main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks,<br>variables, variable name<br>Data types: primitive data types, Object Reference Types, Strings,<br>Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator,<br>relational operator, logical operator, bitwise operator, conditional operator. | U1 - 01 - Introduction to History, architecture and its components, Java Class<br><br>U1 - 02 - Understanding and Learning of Data Types and its different operators and properties . | CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>CO2 Understand fundamentals of object-oriented programming in Java, including delining classes, invoking methods, using class libraries, etc.<br>CO3 Be aware of the important topics and principles of software development.<br>CO4 Have the ability to write a computer program to solve specified problems.<br>CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs<br>CO6 Identify classes, objects, members of a class and relationships among them needed for a specific problem<br>CO7 Write Java application programs using OOP principles and proper program structuring<br>CO8 Demonstrate the concepts of polymorphism and inheritance<br>CO9 Write Java programs to implement error handling techniques using exception handling |
| UNIT – II<br>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement<br>Iterations: The While Loop, The Do ... While Loop, The For Loop,<br>The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement | U2 - 01 - Understanding and Learning of Control Flow Statements .<br><br>U2 - 02 - Learning and application of Iterations i.e loops and statements .<br><br>U2 - 02 - Learning about the | |

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| Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection. | classes and its different objects , methods , attributes , and values . | |
| UNIT – III<br>Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.<br>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.<br>Packages: Creating Packages, Default Package, Importing Packages, Using A Package | U3 - 01 - Detailed study of interance and understanding its object , classes and interfaces .<br>U3 - 02 - Learning and understanding the concept of creating packages and importing it . | |
| UNIT – IV<br>Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector. | U4 - 01 - Detailed study of arrays and introduction and understanding its types .<br>U4 - 02 - Understanding and learning of multi threading | |

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| Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file | and its various properties .<br><br>U4 - 03 - Application and Understanding of exception handling . | |
| UNIT -V Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window Frame, Canvas.Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout. | U5 - 01 - Understanding and learning of event handling and its models .<br><br>U5 -02 - Learning of Abstract Window Toolkit in detail .<br><br>U5 - 03 - Detailed study of layouts . | |

Course: USIT402 Introduction to Embedded Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I Introduction: Embedded Systems and general purpose computersystems, history, classifications, applications and purpose ofembedded systems Core of embedded systems: microprocessors and | U1 - 02 - Understanding and introduction to Embedded system and its application .<br><br>U1 - 02 - Learning of the concept of Core of embedded systems. | CO1 To have knowledge about the basic working of a microcontroller system and its programming in assembly language. CO2 To provide experience to integrate hardware and software for microcontroller applications |

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| microcontrollers,RISC and CISC controllers. Big endian and Little endian processors,Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.<br>Characteristics and quality attributes of embedded systems:<br>Characteristics, operational and non-operational quality attributes. | U1 - 03 - Detailed study of Characteristics and quality attributes of embedded systems. | systems.<br>CO3 Understand what is microcontroller, microcomputer and embedded system.<br>CO4 Become familier with programming environment used to develop embedded systems.<br>CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices.<br>CO6 Learn debugging techniques for an embedded systems<br>CO7 Ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.<br>CO8 Ability to write the programs for microcontroller.<br>CO9 Ability to understand the role of embedded systems in industry.<br>CO10 Ability to understand the design concept of embedded systems. |
| UNIT – II<br>Embedded Systems – Application and Domain Specific:Application specific – washing machine, domain specific - automotive.<br>Embedded Hardware: Memory map, I/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.<br>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers. | U2 - 01 - Study of Embedded systems and its application .<br>U2 - 02 - Understanding the concept of Embedded Hardware anf types of memory .<br>U2 - 03 - Detailed study of the concept called peripherals . | |
| UNIT – III<br>The 8051 Microcontrollers:Microcontrollers and Embedded processors, Overview of 8051 family:8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.<br>8051 Programming in C:<br>Data Types and time delay in 8051 C, | U3 - 01 - Studying and Understanding the The 8051 Microcontrollers.<br>U3 - 02 - Learning and application of 8051 Programming in C and its logic. | |

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| I/O Programming, Logic operations, Data conversion Programs. | | |
| UNIT – IV<br>Designing Embedded System with 8051 Microcontroller:Factors to be considered in selecting a controller, why 8051 Microcontroller,<br>Designing with 8051.<br>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging. | U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller .<br><br>U4 - 02 - Learning the concept of Programming embedded systems and the structure . | |
| UNIT -V<br>Real Time Operating System (RTOS):Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.<br>Design and Development: Embedded system developmentEnvironment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry. | U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic .<br><br>U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files | |

Course: USIT403 Computer Oriented Statistical Techniques

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and | U1 - 01 - Learning the concept of tendencies and its different types of notation .<br><br>U1 - 02 - The detailed study of The | CO1 Recognize the error in the number generated by the solution.<br>CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Raphson method.<br>CO3 Apply method of interpolation and extrapolation for prediction.<br>CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.<br>CO5 Calculate mean, median and mode for individual series.<br>CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation. |

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| Measures of Central Tendency. The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation,The Range, The Mean Deviation, The SemiInterquartile Range,The 10-90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation,Properties of the Standard Deviation,Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coe ffi,Standar cient of Variation dized Variable; Standard Scores, Software and Measures of Dispersion. Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays. | Standard Deviation and Other Measures of Dispersion .<br><br>U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail. | CO7 How to apply discrete and continuous probability distributions to various businessproblems. COR Perform test of hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p values. CO9 Learn non parametric test such as the Chi Square test for independence as well as Goodness of Fit. CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software. |
| UNIT – II Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, | U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis .<br><br>U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis. | |

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| Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory. Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory. | U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory | |
| UNIT – III<br>Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, . Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R. | U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.<br>U3 - 02 - Remembering and Learning and the theory of Statistical Decision .<br>U3 - 03 - Detailed study of Statistics in R and its distribution . | |
| UNIT – IV<br>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The ChiSquare Distribution, | U4 - 01 - Understanding and Analyzing the Small Sampling Theory . | |

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| Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare. | U4 - 02 - flemembering the concept of The Chi-Square Test and its properties. | |
| UNIT -V<br>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves,Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares,The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.<br>Correlation Theory: Correlation and Regression, Linear Correlation,Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coe ffi, cient of Correlation Remarks Concerning the Correlation Coe ffi, cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas, Regression Lines and the Linear Correlation Coe ffi, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression. | U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares.<br>U5 - 02 - The detailed study of correlation and its concept of theories and regression . | |

Course: USIT404 Software Engineering

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.<br>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.<br>Software Processes: Process and Project, Component Software Processes.<br>Software Development Process Models.<br>• Waterfall Model.<br>• Prototyping.<br>• Iterative Development.<br>• Rational Unified Process.<br>• The RAD Model<br>• Time boxing Model.<br>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. | U1 - 01 - The learning and introduction to Software engineering .<br><br>U1 - 02 - Analyzing and creating the software requirements and its requirements .<br><br>U1 - 03 - Learning and understanding different types of Software Development Process Models.<br><br>U1 - 04 - Understanding the Agile software development . | CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application.<br>CO2 Describe software engineering layered technology and Process frame work.<br>CO3 A general understanding of software process models such as the waterfall and evolutionary models.<br>CO4 Understanding of software requirements and the SRS documents.<br>CO5 Understanding of the role of project management including planning, scheduling, risk management, etc.<br>CO6 Describe data models, object models, context models and behavioural models.<br>CO7 Understanding of different software architectural styles. |
| UNIT – II<br>Socio-technical system:Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers,<br>Dealing Legacy Systems.<br>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.<br>Requirements Engineering Processes: Feasibility study, Requirementselicitation and analysis, Requirements Validations, Requirements Management.<br>System Models: Models and its | U2 - 01 - Learning in detailed of the concept Socio-technical system and its Essential characteristics of socio technical systems and more<br><br>U2 - 02 - Introduction and Learning of critical system and types of it .<br><br>U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models . | |

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| types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods. | | |
| UNIT – III<br>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.<br>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.<br>Project Management<br>Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.<br>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics. | U3 - 01 - Introduction to Architectural Design and its system and styles.<br>U3 - 02 - Learning and Understanding of User Interface Design.<br>U3 - 03 - Analyzing and creating Quality Management. | |
| UNIT – IV<br>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.<br>Software Measurement: Size-Oriented Metrics, Function-OrientedMetrics, Extended Function Point Metrics Software Cost Estimation:Software Productivity, EstimationTechniques, Algorithmic Cost Modelling, Project Duration and Staffing | U4 - 01 - Understanding and learning about the Verification and Validation.<br>U4 - 02 - Analyze and creating testing components and its functions. | |
| UNIT -V<br>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis | U5 - 01 - Analyze and creating the process of improvement i.e product, quality etc. | |

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| and Modeling.<br>Process Change, The CMMI Process Improvement Framework.<br>Service Oriented Software Engineering: Services as reusable components,<br>Service Engineering, Software Development with Services.<br>Software reuse: The reuse landscape, Application frameworks,<br>Software product lines, COTS product reuse.<br>Distributed software engineering: Distributed systems issues,<br>Client–server computing, Architectural patterns for distributed<br>systems, Software as a service' | | |

Course: USIT405 Computer Graphics and Animation

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Computer Graphics:<br>Overview of Computer Graphics, Computer Graphics Application and<br>Software, Description of some graphics devices, Input Devices for<br>Operator Interaction, Active and Passive Graphics Devices, Display<br>Technologies, Storage Tube Graphics Displays, Calligraphic Refresh<br>Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays,<br>Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video<br>Basics, The Video Controller, Random-Scan Display Processor, LCD<br>displays.<br>Scan conversion – Digital Differential Analyzer (DDA) algorithm,<br>Bresenhams' Line drawing algorithm.Bresenhams' method of Circle<br>drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm,<br>Mid-point criteria, Problems of Aliasing, end-point ordering and<br>clipping lines, Scan Converting Circles, Clipping Lines algorithms–<br>Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, | U1 - 01 - Introduction to Computer graphics and its application and software description .<br><br>U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping . | CO1 To familiarize students with basic principles and techniques for computer graphics.<br>CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional transformations.<br>CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry.<br>CO4 This course will introduce students to all aspects of computer graphics |

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| Clipping Polygons,<br>problem with multiple components. | | including hardware, software and applications.<br>CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional transformations. |
| UNIT – II<br>Two-Dimensional Transformations:<br>Transformations and Matrices, Transformation Conventions, 2D<br>Transformations, Homogeneous Coordinates and Matrix<br>Representation of 2D Transformations, Translations and<br>Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined<br>Transformation, Transformation of Points, Transformation of The<br>Unit Square, Solid Body Transformations, Rotation About an<br>Arbitrary Point, Reflection through an Arbitrary Line, A Geometric<br>Interpretation of Homogeneous Coordinates, The Window-toViewport Transformations.<br>Three-Dimensional Transformations:<br>Three-Dimensional Scaling, Three-Dimensional Shearing, ThreeDimensional Rotation, Three-Dimensional Reflection, ThreeDimensional Translation, Multiple Transformation, Rotation about an<br>Arbitrary Axis in Space, Reflection through an Arbitrary Plane,<br>Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective<br>Transformations, Techniques for Generating Perspective Views,<br>Vanishing Points, the Perspective Geometry and camera models,<br>Orthographic Projections, Axonometric Projections, Oblique<br>Projections, View volumes for projections. | U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices.<br><br>U2 - 02 - Learring and creating Three-Dimensional Transformations and many of its working and objectives.<br><br>U2 - 03 - Understanding the concepts of Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections etc. | |
| UNIT – III<br>Viewing in 3D<br>Stages in 3D viewing, Canonical View Volume (CVV), Specifying an<br>Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of<br>Planar Geometric Projections, Combined transformation matrices for<br>projections and viewing, Coordinate Systems and matrices, camera | U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective. | |

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| model and viewing pyramid.<br>Light:Radiometry,Transport,Equation,Photometry<br>Color:Colorimetry,ColorSpaces,ChromaticAdaptation,<br>Color<br>Appearance | U3 - 02 - Remembering and learning light and color and its various components . | |
| UNIT – IV<br>Visible-Surface Determination:<br>Techniques for efficient Visible-Surface Algorithms, Categories of<br>algorithms, Back face removal, The z-Buffer<br>Algorithm, Scan-line<br>method, Painter's algorithms (depth sorting), Area sub-division<br>method, BSP trees, Visible-Surface Ray Tracing, comparison of the<br>methods.<br>Plane Curves and Surfaces:<br>Curve Representation, Nonparametric Curves, Parametric Curves,<br>Parametric Representation of a Circle, Parametric Representation of<br>an Ellipse, Parametric Representation of a Parabola, Parametric<br>Representation of a Hyperbola, Representation of | U4 - 01 - Understanding and Learning Visible-Surface Determination and its dilferent techniques .<br><br>U4 - 02 - Creating and Learning the planes and curves and surfaces along with its dilferent working and drawings . | |

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| Space Curves,<br>Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve fit,<br>B-spline Curve Subdivision, Parametric Cubic Curves, Quadric<br>Surfaces Bezier Surfaces | | |
| UNIT -V<br>Computer Animation<br>Principles of Animation, Key framing, Deformations, Character<br>Animation, Physics Based Animation, Procedural Techniques, Groups<br>of Objects.<br>Image Manipulation and Storage:<br>What is an Image? Digital Image file formats, Image compression<br>standard – JPEG, Image Processing - Digital Image enhancement,<br>Contrast stretching, Histogram Equalization, smoothing and median<br>Filtering | US - 01 - Learning and understanding the concept of Computer Animation in detail.<br><br>US - 02 - Creating and analyzing Image Manipulation and Storage in detail. | |

**Course Outcomes**

FYBSCIT – SEM 5

Course: USIT501 Software Project Management 2020-2021

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction to Software Project Management:Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, | U1 -01- Understanding Why is Software Project Management Important.<br><br>U1 -02- Learning the basic concept of project. | CO1 Professional terminologies of software industry.<br>CO2 Problem solving algorithms and techniques.<br>CO3 Understand the development work environment.<br>CO4 To make students realize software project management is not just theory subject to pass, instead it will help them live their professional life with ease.<br>CO5 This subject makes a |

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| Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize | U1 -03- Understanding and learning about what is management.<br><br>U1 -04- Learning about Overview of Project Planning. | student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player. |

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| Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning | | |
| UNIT – II<br>Selection of an Appropriate Project Approach:Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.<br>Software Effort Estimation:Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottomup Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb. | U2 -01- Analyzing the Appropriate Project Approach.<br>U2 -02- How to choose proper methods and technologies for software development<br>U2 -03- Analyzing the most Appropriate Process Model.<br>U2 -04- Understanding about Software Effort Estimation Techniques. | |

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| UNIT – III<br>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.<br>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm"s Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.<br>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence. | U3 -01- Learning about how to plan, when to plan and proper project schedules.<br>U3 -02- Understanding about risk management.<br>U3 -03- Analyzing the Resource Allocation.<br>U3 -04- Analyzing the Cost Schedules | |
| UNIT – IV<br>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, | U4 -01- Understanding Monitoring and Control.<br>U4 -02- Learning about how to manage contracts. | |

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| Getting the Project Back to Target, Change Control, Software Configuration Management (SCM) Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background. Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns. | U4 -03- Understanding Behaviour, Organizational Behaviour | |
| UNIT – V Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability. | U5 - Learning about how to work in teams.<br>U5 -02- Analyzing how good the software quality should be.<br>U5 -03- Learning about how the project closure should be. | |

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| Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report. | | |

Course: USIT502 Internet of Things

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Internet of Things: An Overview: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?<br>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances.<br>Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols. | U1 -01- Understanding what is Internet Of Things.<br>U1 -02- Learning Flavour of the Internet of Things.<br>U1 -03- Understanding the principles of internet.<br>U1 -04- Understanding different types of IP addresses. | CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping.<br>CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors.<br>CO3 The Internet of Things (IOT) is the next wave, world is going to witness.<br>CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and everything which you use in day-to-day life).<br>CO5 Internet of Things is a term given to the attempt of connecting objects to the internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion. |
| UNIT – II<br>Thinking About Prototyping: | U2 -01- Learning about Costs versus Ease of Prototyping. | |

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| Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware. Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. | U2 -02- Understanding what is open and closed source.<br><br>U3 -03- learning about Arduino and Raspberry Pi. | |
| UNIT – III Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained | U3 -01- Understanding how to prototype the physical design.<br><br>U3 -02- Learning the basic concept of Laser cutting.<br><br>U3 -03- Understanding the concept of Scrapping, comet polling and other protocols. | |

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| Application Protocol.<br>UNIT – II<br>Techniques for Writing Embedded Code: Memory Management, Timer Interrupts, Working with Memory, Making the Most of Your RAM, Performance and Battery Libraries,Debugging Business Models: A Short History of Business Models, Supply and Time, From Cost to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customization, Be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups. | LS -01- Understanding what is memory management.<br><br>LS -02- Learning the basic concept of Business Models.<br><br>LS -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups. | |
| UNIT – V<br>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards, Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community, Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control,Crowdsourcing, Environment, Physical Thing, | LS -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards.<br><br>LS -02- Learning about Ethics.<br><br>LS -03- Analyzing the Correctness and Maintainability, Security, Performance | |

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| Electronics, Internet Service Solutions, the Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition | | |

Course: USIT503 Advanced Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.<br>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.<br>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming. | U1 -01- Understanding what exactly .NET framework is.<br><br>U1 -02- Learning about Types, Objects, and Namespaces.<br><br>U3 - 03- Learning about values types and reference type. | CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.<br>CO2 Enable learners to use Visual Studio -an advanced design tool<br>CO3 To gain in depth learning of various concepts and features of .NET coding and developing of web applications.<br>CO4 To Provide knowledge of different State management techniques<br>CO5 To explore ADO.NET- a model for interacting with databases.<br>CO6 Using XML various security fundamentals will be explored |
| UNIT – II<br>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.<br>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, | U2 -01- Understanding the basic concept of Web form fundamentals.<br><br>U2 -02- Learning about Form controls.<br><br>U2 -03- Understanding Validation and how to Use Validation Controls. | |

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| The TreeView Control, The Menu Control. | | |
| UNIT – III<br>Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing<br>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options<br>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages, | U3 -01- Learning and understanding about the basic concept of Error Handling, Logging, and Tracing.<br><br>U3 -02- Learning State Management.<br><br>U3 -03- Learning about how to apply Themes and master pages. | |
| UNIT – IV<br>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.<br>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,<br>The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView | U4 -01- Understanding the fundamentals of ADO.NET.<br><br>U4 -02- Learning about Data Binding.<br><br>U4 -03- Learning about the basic concept of Data controls. | |
| UNIT – V<br>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.<br>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.<br>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX | U5 -01- Understanding what is XML.<br><br>U5 -02- Learning about what is Security Fundamentals.<br><br>U5 -03- Understanding Ajax, Using Partial Refreshes. | |

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| Control Toolkit. | | |
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Course: USIT505 Linux System Administration

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.<br>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files<br>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate<br>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories,Installing Software with Yum, Querying Software, Extracting Files from RPM Packages | U1 -01- Understanding about Red Hat Enterprise Linux.<br><br>U1 -02- Analyzing and Working with the Bash Shell.<br><br>U1 -03- Learning about System Administration Tasks | CO1 To familiarize students with Linux Installation.<br>CO2 Enable Students to Install RPM and use Red hat Package Management<br>CO3 To Make Students Install Samba Server and the use of Samba Server<br>CO4 To make Students Install Apache, Send Mail.<br>CO5 Write Shell Scripts in Linux. |
| UNIT – II<br>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, | U2 -01- Learning about how to configure and manage storage.<br><br>U2 -02- Understanding NetworkManager, Working with Services and Runlevels.<br><br>U2 -03- Learning about how to troubleshoot the network. | |

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| Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes<br>Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes | U2 -04- Learning the basic concept of SSH.<br><br>U2 -05- Learning about Permissions. | |
| UNIT – III<br>Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit | U3 -01- Learning about Securing Server with iptables<br><br>U3 -02- Learning how to set up a firewall. | |

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| Module, Configuring NAT<br>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files<br>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services. | | |
| UNIT – IV<br>Configuring DNS and DHCP:Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server<br>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP<br>Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL | U4 -01- Understanding how to configure DNS and DHCP.<br><br>U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd. | |

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| UNIT – V<br>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing.<br>Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures,<br>Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.<br>High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster,<br>Configuring GFS2 File Systems<br>Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File | U5 -01- Learning about Bash Shell Scripting.<br><br>U5 -02- Understanding Variables, Variables, Subshells, and Sourcing.<br><br>U5 -03- Learning High-Availability Clustering. | |

Course: USIT506 Enterprise Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Understanding Java EE: | U1 -01- Understanding what is Java EE. | CO1 Identify advance concepts of java |

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| WhatisanEnterpriseApplication? WhatisJavaenterpriseedition? JavaEETechnologies, JavaEEevolution, Glassfishserver<br>JavaEE Architecture,Serverand Containers: TypesofSystemArchitecture, JavaEEServer, JavaEEContainers.<br>Introduction to Java Servlets: TheNeedforDynamicContent, JavaServletTechnology, WhyServlets? WhatcanServletsdo?<br>Servlet API and Lifecycle: JavaServletAPI, TheServletSkeleton, TheServletLifeCycle, ASimpleWelcomeServlet<br>WorkingwithServlets: GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor.<br>Working with Databases: WhatisJDBC? JDBCArchitecture, AccessingDatabase, TheServletGUI and DatabaseExample. | U1 -02- Learning about the basic concept of Java servlets.<br><br>U2 -03- Understanding how to work with database. | programming with database connectivity.<br>CO2 Design and develop platform independent applications using a variety of component based frameworks.<br>CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.<br>CO4 The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network.<br>CO5 The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business. |
| UNIT – II<br>Request Dispatcher: Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application.<br>COOKIES: KindsofCookies, WhereCookiesAreUsed? CreatingCookiesUsingServlet, DynamicallyChangingtheColorsofAPage<br>SESSION: WhatAreSessions? LifecycleofHttpSession, SessionTrackingWithServletAPI, AServlet Session Example<br>Workingwith Files: UploadingFiles, CreatinganUploadFileApplication, DownloadingFiles, CreatingaDownloadFileApplication.<br>Workingwith Non-Blocking I/O: CreatingaNonBlockingReadApplication, CreatingTheWeb Application, CreatingJavaClass, Creating Servlets, Retrieving The File, Creating Index.jsp | U2 -01- learning the concept of Request Dispatcher.<br><br>U2 -02- Learning about cooking.<br><br>U2 -03- Learning how to work with files. | |
| UNIT – III<br>Introduction To Java ServerPages: WhyuseJava | U3 -01- Understand about Java Server pages. | |

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| ServerPages? JSPVsServlets, DisadvantagesOfJSP, LifeCycleofaJSPPage, HowdoesaJSPfunction? HowdoesJSPexecute? AboutJava ServerPages Getting Started With Java ServerPages: Comments, JSPDocument, JSPElements, JSPCalls ample, Action Elements, IncludingotherFiles, ForwardingJSPPagetoAnotherPage, PassingParametersforotherActions, Loadingajavabean. Implicit Objects, Scopeand ElExpressions: ImplicitObjects, CharacterQuotingConventions, UnifiedExpressionLanguage(UnifiedEl), ExpressionLanguage. Java Server Pages Standard Tag Libraries: WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries. | U3 -02- Learning about LifeCycle of a JSP Page.<br><br>U3 -03- Understanding about Action Element. | |
| UNIT – IV<br>Introduction To EnterpriseJavabeans: EnterpriseBeanArchitecture, BenefitsofEnterpriseBean, TypesofEnterpriseBean, AccessingEnterpriseBeans, EnterpriseBeanApplication, PackagingEnterpriseBeans<br>Workingwith Session Beans: WhentouseSessionBeans? TypesofSessionBeans, RemoteandLocalInterfaces, AccessingInterfaces, LifecycleofEnterpriseBeans, PackagingEnterpriseBeans, Exampleof StatefulSessionBean, Example ofStatelessSessionBean, Example of SingletonSessionBeans.<br>Working with Message DrivenBeans: LifecycleofaMessageDrivenBean, UsesofMessageDrivenBeans, TheMessage DrivenBeansExample.<br>Interceptors: Request andInterceptor, Defining An Interceptor, AroundInvokeMethod, ApplyingInterceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application.<br>Java Naming and Directory Interface: What is Naming Service? What is Directory Service? What is Java Naming and Directory Interface? Basic Lookup, JNDI Namespace In Java EE, Resources and JNDI, Datasource Resource Definition in Java EE. | U4 -01- Understanding Enterprise Java Bean.<br><br>U4 -02- Learning about types of Java bean<br><br>U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail. | |
| UNIT – V<br>Persistence, Object/Relational Mapping And JPA: | U5 - 01 -Introduction and learning | |

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| WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping. Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications. Writing JPA Application: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. Introduction to Hibernate: WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? WritingHibernateApplication: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication. | About Persistence, Object/Relational Mapping And JPA in detail with its meaning .<br><br>U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications .<br><br>U5 - 03 - Creating and learning of JSPS, The JPA ApplicationStructure, along with this learning how to run the program .<br><br>U5 - 04 - Learning how to write and hiber net application in details with all the information required . | |

**Course Outcomes**

**TYBSC IT – SEM 6**

Course: USIT601 Software Quality Assurance

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality. Customers, Suppliers and Processes, Total Quality | U1 - 01 - Describe fundamental concepts of software quality assurance.<br>U1 - 02 - Explore test planning and its management. | CO1 Ability to identify and apply modern software testing methods in software development<br>CO2 Understand testing strategies and defect management<br>CO3 Recognise the importance of software quality assurance<br>CO4 Know about quality |

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| Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.<br>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management. | | improvement, cost control and contribute toward efficient delivery of software solutions |
| UNIT – II<br>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, | U2 - 01 - To learn the basic testing techniques.<br>U2 - 02 - Develop knowledge of testing process and features. | |

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| Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing | | |
| UNIT – III<br>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools | U3 - 01 - To learn Boundary value analysis.<br>U3 - 02 - Develop knowledge of the Testing techniques. | |
| UNIT – IV<br>Software Verification and Validation:Introduction, Verification, Verification Workbench, Methods | U4 - 01 - Analyze Verfication and Validation.<br>U4 - 02 - Introduce V - Model and Testing during test | |

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| of Verification, Types of reviews on the basis od Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.<br>V-test Model:Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding,<br>VV Model, Critical Roles and Responsibilities | | |
| UNIT – V<br>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.<br>Special Tests:Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, | US - 01 - understanding the levels of testings. | |

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| Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing. | | |

Course: USIT602 Security in Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense. | U1 - 01 - simplify Information Security Overview<br>U1 - 02 - determine Secure Design Principles | CO1 Insight into secure design principles and defense models.<br>CO2 Knowledge about storage and database security.<br>CO3 Implement IDS, Firewalls and wireless security.<br>CO4 Skills to implement secure cloud environment for web and application security<br>CO5 Ability to implement physical security for implementing secure information environment. |
| UNIT – II Authentication and Authorization: Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. | U2 - 01 - classify Authentication and Authorization<br>U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure. | |

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| Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring | | |
| UNIT – III<br>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.<br>Network Device Security: Switch and Router Basics, Network Hardening.<br>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.<br>Wireless Network Security: Radio Frequency Security Basics, DataLink Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways. | U3 - 01 - Learn Firewall Capabilities, Firewall Design.<br>U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways. | |
| UNIT – IV<br>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).<br>Voice over IP (VoIP) and PBX Security: Background, VoIP Components,VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.<br>Operating System Security Models: Operating System | U4 - 01 - Learn Operating System Security Models.<br>U4 - 02 - Learn Intrusion Detection and Prevention Systems | |

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| Models,<br>Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security. | | |
| UNIT – V<br>Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.<br>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.<br>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets:<br>Locks and Entry Controls, Physical Intrusion Detection. | U5 - 01 - Introduce Cloud computing.<br>U5 - 02 - Analyze application Security, Remote Administration Security. | |

Course: USIT603 Business Intelligence

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Business Intelligence: Effective and timely decisions, Data, Information and knowledge, The role of mathematical models, Business Intelligence Architectures, Ethics and business intelligence<br>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system | U1 - 01 - Describe the concepts and components of Business Intelligence (BI).<br>U1 - 02 -Critically evaluate use of BI for supporting decision making in an organisation.<br>U1 - 03 - Understand and use the technologies and tools that make up BI. | CO1 Ability to use decision support system for BI Applications<br>CO2 Ability to develop and use mathematical models for data mining and data preparations<br>CO3 Know how and when to apply classification and clustering techniques for solving BI problems<br>CO4 Explore insights into important emerging applications of BI<br>CO5 Developing skills to design expert system solutions for business applications |
| UNIT – II<br>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models<br>Data mining: Definition of data mining, Representation of input data<br>Data mining process, Analysis methodologies | U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction<br>U2 - 02 - To develop knowledge of data mining.<br>U2 - 03 - Analyze Data Validation and | |

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| Data preparation: Data validation, Data transformation, Data reduction | data preparation. | |
| UNIT – III<br>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines<br>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models | U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods<br><br>U3 - 02 - Explain Clustering and classification model. | |
| UNIT – IV<br>Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices | U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model<br><br>U4 - 02 - Identify marketing models and production models. | |
| UNIT – V<br>Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management<br>Artificial Intelligence and Expert Systems:<br>Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems | U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems<br>U5 - 02 - generate knowledge of AI and other Automation techniques.<br><br>U5 - 03 - Develop Knowledge of expert system. | |

Course: USIT604 Principles of Geographic Information Systems

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>A Gentle Introduction to GIS<br>The nature of GIS: Some fundamental observations, Defining GIS,<br>GISystems, GIScience and GIApplications, Spatial data and Geoinformation.<br>The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis<br>Geographic Information and Spatial Database<br>Models and Representations of the real world<br>Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries<br>Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects<br>Organizing and Managing Spatial Data<br>The Temporal Dimension | U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).<br><br>U1 - 02 -Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | CO1 Explore mapped data, Spatial Data Types, Data Creation, Georeferencing, Spatial Analysis<br>CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis<br>CO3 Analyze spatial data, using QGIS analysis tools<br>CO4 Develop and Manage Geodatabases for real world data<br>CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others |
| UNIT – II<br>Data Management and Processing Systems<br>Hardware and Software Trends<br>Geographic Information Systems: GIS Software, GIS Architecture and | U2 - 01 -Demonstrate organizational skills in file and database management.<br><br>U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and | |

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| functionality. Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS. Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS. Spatial database functionality. | Technology | |
| UNIT – III Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data | U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. | |

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| checks and repairs, Combining data from multiple sources<br>Point Data Transformation: Interpolating discrete data,<br>Interpolating continuous data | | |
| UNIT – IV<br>Spatial Data Analysis<br>Classification of analytical GIS Capabilities<br>Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification<br>Overlay functions: Vector overlay operators, Raster overlay operators<br>Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis<br>Analysis: Network analysis, interpolation, terrain modeling<br>GIS and Application models:GPS, Open GIS Standards, GIS Applications and Advances<br>Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation | U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms.<br><br>U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems. | |
| UNIT – V<br>Data Visualization<br>GIS and Maps, The Visualization Process<br>Visualization Strategies: Present or explore?<br>The cartographic toolbox: What kind of data do I have? How can I map my data?<br>How to map? How to map qualitative data, How to map quantitative data, How to map the | U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.<br><br>U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS). | |

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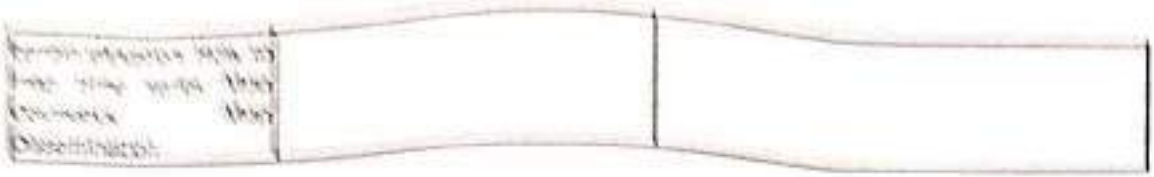

Course: USIT605 IT Service Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>IT Service Management: Introduction, What is service management?<br>What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle,<br>Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across | U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM<br>U1 - 02 - understand how ITSM can operate in an organisation to improve processes<br>U1 - 03 - understand best management practice from a technical and non-technical perspective | CO1 Ability to deal with the convergence, interoperability and design of heterogeneous networks with<br>local, access and core networks, as well as with service integration.<br>CO2 Ability to model, design, implement, manage, operate, administrate and maintain networks, services<br>and contents |

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| the life cycle.<br>Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles.<br>Service Strategy:Define the market, Develop the offerings, Develop<br>Strategic Assets, Prepare for execution.<br>Challenges, Critical Success factors and risks:Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks. | | CO3 Ability to plan networks and decision-making about services.<br>CO4 Learn about service transition and service operations.<br>CO5 Ability to apply Continual Service Improvement in an organization. |
| UNIT – II<br>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and<br>documenting business requirements and drivers, Design activities,<br>Design aspects, Subsequent design activities, Design constraints,<br>Service oriented architecture, Business Service Management, Service<br>Design Models<br>Service Design Processes:Service Catalogue Management, Service Level Management, Capacity Management, Availability Management,<br>IT Service Continuity Management, Information Security | U2 - 01 - communicate management theories and ideas in writing<br>U1 - 02 - problem solve through the lens of management theories<br><br>U1 - 03 - critically evaluate information from a variety of sources | |
| UNIT – III<br>Service Transition: Fundamentals, Service Transition Principles:<br>Principles Supporting Service Transition, Policies for Service Transition<br>Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management,<br>Service and Deployment Management, Service Validation and<br>Testing, Evaluation, Knowledge Management. | U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions<br><br>U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms and businesses.<br><br>U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems. | |

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| Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions. | | |
| UNIT – IV<br>Service Operation: Fundamentals, Service Operation Principles:<br>Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation<br>Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.<br>Challenges, Critical Success factors and risks:Challenges, | U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector.<br>U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in general.<br>U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance. | |

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| Critical<br>Success factors, Risks | | |
| UNIT – V<br>Continual Service Improvement(CSI) Principles: CSI Approach,<br>CSI and organizational change, Ownership, CSI register, External and<br>Internal drivers, Service level management, Knowledge management,<br>The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems,<br>CSI inputs and<br>outputs.<br>CSI Process: The seven-step improvement process. CSI Methods<br>nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment,<br>Service reporting, CSI and other service management processes,<br>Organising for CSI:Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence<br>and training.<br>Technology considerations: Tools to support CSI activities.<br>Implementing CSI:Critical Considerations for implementing<br>CSI,The start, Governance, CSI and organisational change, Communication Strategy and Plan | U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets.<br><br>U5 - 02 -Locate and access appropriate sources of information in order to be able to make informed decisions about effective services delivery.<br><br>U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios. | |

ACADEMIC YEAR 2019-2020

## Program: Bachelors of Science in Information Technology.

### Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

**PO1:** Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
**PO2:** Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
**PO3:** Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
**PO4:** Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
**PO6:** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
**PO7:** Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

### Programme Specific Outcome

**PSO1:** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
**PSO2:** Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
**PSO3:** Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
**PSO4:** Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
**PSO5:** Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
**PSO6:** Analyze the local and global impact of computing on individuals, organizations, and society.

## Course Outcomes

FYBSC IT – SEM 1
2019 - 2020

Course: USIT101 Imperative Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction:**<br>Types of Programming languages, History, features and application. Simple program logic, program development cycle, pseudocode statements and flowchart symbols, sentinel value to end a program, programming and user environments, evolution of programming models., desirable program characteristics. **Fundamentals**:<br>Structure of a program. Compilation and Execution of a Program, Character Set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Variable definition, symbolic constants. | U1-01 - Understand Fundamentals of Programming<br>U1-02 - Exploring C Programming<br>U1-03 - Classifying Data using Data types in C Programming | **CO1** - To develop the programming skills using fundamentals of basic c language.<br>**CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable.<br>**CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling.<br>**CO4** - To teach the basics of pre-processors available with C compiler.<br>**CO5** - To understand the procedural oriented programming concept.<br>**CO6** - To enable Learners to develop the logic of the program. |
| **UNIT II**<br><br>**Operators and Expressions:**<br>Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions.<br>**Data Input and output:**<br>Single character input and output, entering input data, scanf function, printf function, gets and puts functions, interactive programming. | U2 - 01 - Managing Input and Output Operations<br>U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions | |
| **UNIT III**<br><br>**Conditional Statements and Loops:** | U3 - 01 - Controlling the Program Order: Decision Making<br>U3 - 02 - Repeating Sequence of | |

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| Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value. | Instructions: Loops<br>U3 - 03 - Understand Group of Statements: Functions | |
| **UNIT IV**<br><br>**Program structure**: Storage classes, automatic variables, external variables, static variables, multifile programs, more library functions, Pre-processor: Features, #define and #include, **Directives and Macros Arrays:** Definition, processing, passing arrays to functions, multidimensional arrays, arrays and strings. | U4 - 01 - Arranging the Same Data Systematically: Arrays<br>U4 -02 - Learn Characters Arrays | |
| **UNIT V**<br><br>**Pointers:** Fundamentals, declarations, Pointers Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays And Pointers, Pointer Arrays, passing functions to other functions<br>**Structures and Unions:** Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers. | U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions<br>U5 - 02 - Pointing to a Location: Pointers | |

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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**Number System:**<br>Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes – ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection and correction, Universal Product Code, Code conversion.<br>**Binary Arithmetic:**<br>Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic | U1-01 Students learned the difference between Analog System and Digital System<br>U1-02 Understanding different number system and their conversions.<br>U1-03 Understanding weighted codes and non-weighted codes<br>U1-04 Analyzing Error Detection and Error Correction codes with examples<br>U1-05 Enable students to solve binary arithmetic problems | **CO1** - Course Outcomes: concepts and techniques used in digital electronics.<br>**CO2** - Have a detailed understanding of the fundamentals<br>**CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system.<br>**CO4** - Analyze different typs of digital electronic circuit using various mapping and logical tools and know the techniques to prepare simplified circuit using various mapping and mathematical methods.<br>**CO5** - Understand different types of logic gates and the relationship between logic gates.<br>**CO6** - Develop a digital logic and apply it to solve real life problems.<br>**CO7** - Understand, Analyze, design and implement combinational and sequential logic circuits.<br>**CO8** - Enable students to develop skill to build digital circuits. |
| **UNIT II:**<br><br>**Boolean Algebra and Logic Gates:** Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.<br>**Minterm, Maxterm and Karnaugh Maps:** Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, | U2-01 Understanding and Solving Boolean Algebra problems.<br>U2-02 Learning Basic Gates, Universal Gates, and other gates<br>U2-03 Understanding Minterms and Maxtrems<br>U2-04 Understanding and solving reduction techniques using Karnaugh maps.<br>U2-05 Understanding and solving reduction techniques using Quine Mc Cluskey Method. | |

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| K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method. | | |
| **UNIT III:**<br><br>**Combinational Logic Circuits:**<br>Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations<br>**Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator. | U3-01 Designing and implementing Combinational Logic Circuits<br>U3-02 Understanding Code converters design and implementations<br>U3-03 Learning different Arithmetic Circuits | |
| **UNIT IV:**<br><br>**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:**<br>Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.<br>**Sequential Circuits:**<br>Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flipflop, Race-around condition, Master – slave JK flip-flop, T flip-flop, conversion from one type of flip-flop to another, Application of flipflops. | U4-01 Designing and implementing Multiplexer and De-multiplexer<br>U4-02 Designing and implementing Encoder and Decoder<br>U4-03 Learning Sequential Circuits<br>U4-04 Designing and learning various Flipflops and their conversions | |
| **UNIT V:**<br><br>**Counters:**<br>Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.<br>**Shift Register:**<br>Introduction, parallel and shift registers, serial shifting, serial–in serial– out, serial–in parallel–out, parallel–in parallel–out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters. | U5-01 Designing and implementing Asynchronous counters<br>U5-02 Learning functions of different IC's 7490, 7492.<br>U5-03 Learning Shift Register Circuits<br>U5-04 Designing and implementing Synchronous counters<br>U5-05 Analyzing IC 7495 and learning Seven Segment Displays | |

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Course: USIT103 Operating Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| **UNIT I:**<br><br>**Introduction:** What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.<br>**Processes and Threads:** Processes, threads, interprocess communication, scheduling, IPC problems. | U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.<br>U1 - 02 - Analyze Processes & threads | **CO1** Analyze the structure and functions of operating systems.<br>**CO2** Understand role of operating system as process manager, resource manager, file system manager, memory manager and I/O manager<br>**CO3** Understand the Mutual exclusion and Deadlock detection<br>**CO4** Understand benefits of cloud and virtualization.<br>**CO5** Understand differences of three types of computing: multiprocessor, multicomputer and distributed systems |
| **UNIT – II**<br>**Memory Management:** No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation.<br>**File Systems:** Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system. | U2 - 01 - Analyze important algorithms eg. Process scheduling and memory management algorithms<br>U2 - 02 - Understand the different types of files & directories<br>U2 - 03 - Applying algorithms in OS | |
| **UNIT – III**<br>**Input-Output:** Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management,<br>**Deadlocks:** Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues. | U3 - 01 - Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock<br>U3 - 02 - Evaluate the operating system's resource management techniques, deadlock management techniques, memory management techniques. | |
| **UNIT – IV**<br><br>**Virtualization and Cloud:** History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, | U4 - 01 - Understanding the different types of hypervisors<br>U4 - 02 - Analyzing different processor systems<br>U4 - 03 - Evaluate between multiprocessors, multicomputers & distributed | |

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| Virtual appliances, virtual machines on multicore CPUs, Clouds.<br>**Multiple Processor Systems:** Multiprocessors, multicomputers, distributed systems. | system | |
| **UNIT – V**<br><br>**Case Study on LINUX and ANDROID:** History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, I/O in Linux, Linux file system, security in Linux. Android<br>**Case Study on Windows:** History of windows through Windows 10, programming windows, system structure, processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows. | U5 - 01 - Understands different types of operating systems<br>U5 - 02 - Remembering different types of functioning in different types of Microsoft Windows. | |

Course: USIT104 Discrete Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br><br>**Introduction**: Variables, The Language of Sets, The Language of Relations and Function<br>**Set Theory**: Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem.<br>**The Logic of Compound Statements**: Logical Form and Logical<br>Equivalence, Conditional Statements, Valid and Invalid Arguments. | U1 - 01 - Understands the various languages.<br>U1 - 02 - Remembering the different definitions and the Element.<br>U1 -03 - Applying and analyzing the logic of compound statements. | **CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures.<br>**CO2** Be able to apply basic counting techniques to solve combinatorial problems.<br>**CO3** Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.<br>**CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.<br>**CO5** Have substantial experience to comprehend formal logical arguments. |

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| **UNIT II:**<br>**Quantified Statements**: Predicates and Quantified Statements,<br>Statements with Multiple Quantifiers, Arguments with Quantified Statements<br>**Elementary Number Theory and Methods of Proof**: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms. | U2 - 01 - Understands the different statements.<br>U2 - 02- Remembering the different methods of proof and theorem. | |
| **UNIT III:**<br>**Sequences, Mathematical Induction, and Recursion:** Sequences, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by iteration, Second order linear homogenous recurrence relations with constant coefficients. general recursive definitions and structural induction.<br>**Functions**: Functions Defined on General Sets, One-to-One and Onto,<br>Inverse Functions, Composition of Functions, Cardinality with<br>Applications to Computability | U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion.<br>U3 -02- Learning different types of functions. | |
| **UNIT IV:**<br>**Relations**: Relations on Sets, Reflexivity, Symmetry, and Transitivity,<br>Equivalence Relations, Partial Order Relations<br>**Graphs and Trees**: Definitions and Basic Properties, Trails, Paths, and<br>Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs,<br>Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths. | U4 - 01 - Understand the various types of Relations.<br>U4 -02 - Analyzing the Graphs & trees. | |
| **UNIT V:**<br>**Counting and Probability:** Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule,Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r-Combinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events. | U5 - 01 - leaning to count the number of times an event could occur. | |



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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT I:**<br>**The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness<br>**Understanding Business Communication:** Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication. | U1 - 01 - Understanding the 7Cs of Communication skills .<br><br>U1-02- Analyzing and Applying Communication skills | **CO1** Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.<br>**CO2** Identify ethical, legal, cultural, and global issues affecting business communication.<br>**CO3** Utilize analytical and problem-solving skills appropriate to business communication.<br>**CO4** Participate in team activities that lead to the development of collaborative work skills.<br>**CO5** Select appropriate organizational formats and channels used in developing and presenting business messages.<br>**CO6** Compose and revise accurate business documents using computer technology.<br>**CO7** Communicate via electronic mail, Internet, and other technologies.<br>**CO8** Deliver an effective oral business presentation.<br>**CO9** To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments<br>**CO10** To participate in an online learning environment successfully by developing the implication-based understanding of Paraphrasing, deciphering instructions, interpreting guidelines, discussion boards & Referencing Styles.<br>**CO11** To demonstrate his/her ability to write error |

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| | | free while making an optimum use of correct Business Vocabulary & Grammar.<br>**CO12** To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.<br>**CO13** To draft effective business correspondence with brevity and clarity.<br>**CO14** To stimulate their Critical thinking by designing and developing clean and lucid writing Skills.<br>**CO15** To demonstrate his verbal and non-verbal communication ability through presentations. |
| **UNIT II:**<br><br>**Writing Business Messages and Documents:** Business writing, Business Correspondence, Instructions<br>Business Reports and Proposals, Career building and Resume writing.<br>**Developing Oral Communication Skills for Business:**<br>Effective Listening, Business Presentations and Public Speaking,Conversations, Interview | U2 - 01 - Applying and learning the writing of Business messages and documents<br><br>U2 - 02 - Understanding and remembering the development of Oral communication skills for business | |
| **UNIT III:**<br><br>**Developing Oral Communication Skills for Business:**<br>Meetings and Conferences, Group Discussions and Team<br>Presentations, Team Briefing,<br>**Understanding Specific Communication Needs:**<br>Communication across Functional Areas | U3 - 01 - Analyzing and Evaluating the development of Oral communication skills for business<br><br>U3 - 02 - Understanding and Remembering specific communication needs | |
| **UNIT IV:**<br><br>**Understanding Specific Communication Needs:**<br>Corporate Communication, Persuasive Strategies in Business<br>Communication, Ethics in Business Communication, Business<br>Communication Aids | U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs | |

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| **UNIT V:**<br><br>**Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates.<br>**Adding graphics to your presentation:** Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance. | U5 - 01 - Learning and Understanding the different ways of presentation process .<br><br>U5 - 02 - Creating and applying the graphics to your presentation . | |

**Course Outcomes**

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 2019-20

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| **UNIT - I**<br>**Object Oriented Methodology:**<br>Introduction, Advantages and Disadvantages of Procedure Oriented<br>Languages, what is Object Oriented? What is Object Oriented<br>Development? Object Oriented Themes, Benefits and Application of OOPS.<br>**Principles of OOPS:**<br>OOPS Paradigm, Basic Concepts of OOPS:<br>Objects, Classes, Data Abstraction and Data Encapsulation,<br>Inheritance, Polymorphism, Dynamic Binding, Message Passing | U1 -01- Learning about what exactly the object oriented is.<br><br>U1 -02- Understands the principles of OOPs. | CO1: Students will understand the need of object oriented programming, fundamental concepts<br>and will be able to solve computational problems using basic constructs like if-else,<br>control structures, array, strings in Java environment.<br>CO2: Student will understand how to model the real world scenario using class diagram and be<br>able to exhibit communication between objects using sequence diagram.<br>CO3: Students will be able to implement relationships between classes.<br>CO4: Students will be able to demonstrate various collection classes.<br>CO5: Students will be able to create and user interfaces and packages<br>CO6: The students will be able to demonstrate programs on exceptions, multithreading and<br>applets. |

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| **UNIT - II**<br>**Classes and Objects:**<br>Simple classes (Class specification, class members accessing), Defining member functions, passing object as an argument, Returning object from functions, friend classes, Pointer to object, Array of pointer to object.<br>**Constructors and Destructors:**<br>Introduction, Default Constructor, Parameterized Constructor and examples, Destructors | U2 -01- Understands the classes and Objects in OOPs.<br><br>U2 -02- Remembering the Constructors and Destructors. | |
| **UNIT - III**<br>**Polymorphism:**<br>Concept of function overloading, overloaded operators, overloading unary and binary operators, overloading comparison operator, overloading arithmetic assignment operator, Data Conversion between objects and basic types,<br>**Virtual Functions:**<br>Introduction and need, Pure Virtual Functions,<br>Static Functions, this Pointer, abstract classes, virtual destructors. | U3 -01- Understands the concept of overloading.<br><br>U3 -02- Analyze the Virtual functions. | |
| UNIT IV:<br>**Program development using Inheritance:** Introduction, understanding inheritance, Advantages provided by inheritance, choosing the access specifier, Derived class declaration, derived class constructors, class hierarchies, multiple inheritance, multilevel inheritance, containership, hybrid inheritance.<br>**Exception Handling:**<br>Introduction, Exception Handling Mechanism,<br>Concept of throw & catch with example | U4 -01- Understand the concept of inheritance and types of inheritance.<br><br>U4 -02- Learning the concept of Exception handling. | |
| **UNIT V:**<br>**Templates:**<br>Introduction, Function Template and examples, Class Template and examples.<br>**Working with Files:** | U5 -01- Understand the concept of Templates.<br><br>U5 -02- Working and creating various files | |

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| Introduction, File Operations, Various File Modes, File Pointer and their Manipulation | | |

Course: USIT202 Microprocessor Architecture

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT 1: Microprocessor, microcomputers, and Assembly Language:<br>Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications.<br>Microprocessor Architecture and Microcomputer System:<br>Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing,<br>Microprocessor-Based System Application.<br>8085 Microprocessor Architecture and Memory Interface:<br>Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer,<br>Memory Interfacing, Interfacing the 8155 Memory Segment,<br>Illustrative Example: Designing Memory for the MCTS Project,<br>Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer. | U1-O1 Understanding Microprocessor Concepts, Microcomputers.<br>U1-O2 Learning large computers to small chip microcontrollers.<br>U1-O3 Understanding microprocessor internal Architecture and pin configuration.<br>U1-O4 Study of Microprocessor based system applications.<br>U1-O5 Learning 8155 memory segment, memory interfacing.<br>U1-O6 Illustration of memory design for MCTS project. | **CO1**:Describe the architecture & organization of 8085 Microprocessor.<br>**CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.<br>**CO3:** Relate the addressing modes used in the instructions.<br>**CO4**. Realize the Interfacing of memory & various I/O devices with 8085 microprocessor.<br>**CO5**. Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. **CO6**. Learning different programming techniques of 8085.<br>**CO7** Understanding the concepts of Subroutines.<br>CO8 Learning Code Conversion Technique and its applications.<br>CO9 Learning various 8085 interrupts, its IO concepts and applications.<br>CO10 Studying Pentium, Pentium Pro microprocessors, Core processors and SUN SPARC procesor. |
| UNIT 2 :Interfacing of I/O Devices<br>Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.<br>Introduction to 8085 Assembly Language | U2-01 Learning interfacing of IO Devices Concepts,<br>U2-02 Distinguishing memory mapped IO and peripheral mapped IO.<br>U2-03 Programming using | |

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| Programming:<br>The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program.<br>Introduction to 8085 Instructions:<br>Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program. | 8085 assembly language. Learning<br>U2-4 Programming model and 8085 Instruction Set.<br>U2-05 Understanding various debugging techniques. | |
| UNIT-3:Programming Techniques With Additional Instructions:<br>Programming Techniques: Looping, Counting and Indexing,<br>Additional Data Transfer and 16-Bit Arithmetic Instructions,<br>Arithmetic Instruction Related to Memory, Logic Operations: Rotate,<br>Logics Operations: Compare, Dynamic Debugging.<br>Counters and Time Delays:<br>Counters and Time Delays, Illustrative Program: Hexadecimal Counter,<br>Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.<br>Stacks and Sub-Routines:<br>Stack, Subroutine, Restart, Conditional Call, Return Instructions,<br>Advanced Subroutine concepts. | U3-01 Laerning Instruction Classifications<br>U3-02Learning various assembly language programs and coding techniques.<br>U3-03 Illustartion of counters and time dalys<br>U3-04 Demonstation of stacks and subroutines.<br>U3-05 Learning advanced subroutine concepts. | |
| UNIT-4:Code Conversion, BCD Arithmetic, and 16-Bit Data Operations:<br>BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-toSeven-Segment-LED Code Conversion, Binary-to-ASCII and ASCIIto-Binary Code Conversion, BCD Addition, BCD Subtraction,<br>Introduction To Advanced Instructions and Applications,<br>Multiplication, Subtraction With Carry.<br>Software Development System and Assemblers:<br>Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers,<br>Writing Program Using Cross Assemblers.<br>Interrupts: | U4-01 Learning code conversion techniques.<br>U4-02 Application of code conversion techniques.<br>U4-03 Learning advanced instructions and its applications.<br>U4-04 Understanding Assemblers, cross assemblers.<br>U4-05 Analyzing Vectored Interrupts | |

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| The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes. | | |
| UNIT-5:The Pentium and Pentium Pro microprocessors: Introduction, Special Pentium registers, Memory management, Pentium instructions, Pentium Pro microprocessor, Special Pentium Pro features.<br>Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, i3, i5 and i7.<br>SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format | U5-01 Explaining Pentium and Pentium Pro microprocessors<br>U5-02 Learning Core microprocessors<br>U5-03 Distintive study of various core processors.<br>U5-04 Understanding SUN SPARC Microprocessors.<br>U5-05 Learning Instruction Format of SUN SPARC. | |

Course: USIT203 Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Internet and the World Wide Web:<br>What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol | U1 - 01 - Understanding and introduction of internet and its application .<br>U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators .<br>U1 - 03 - Learning and application of HTML5 , LINKS , TAGS , CSS and FORMATTING . | CO1 Understand Internet and Web Programming basic concepts.<br>CO2 Understand the front end and back end Web Applications.<br>CO3 Understand the latest web programming tools and techniques.<br>CO4 Developing static and dynamic Web Applications.<br>CO5 Integrating and blending latest web technologies for creating Web Applications. |

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| HTML5:<br>Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets. | | |
| UNIT – II<br>HTML5 Page layout and navigation:<br>Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.<br>HTML5 Tables, Forms and Media:<br>Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML | U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning .<br><br>U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more .<br><br>U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML . | |

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| multimedia basics, embedding video clips, incorporating audio on web page. | | |
| UNIT -III<br>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp<br>Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer<br>Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, | U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values .<br>U3 - 02 - Understanding and learning statements and various functions .<br>U3 - 03 - Learning and application of documents and its objects . | |

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| onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload | | |
| UNIT – IV<br>PHP:<br>Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems | U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling . | |
| UNIT – V<br>Advanced PHP and MySQL : PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail | U5 - 01 - Understanding and learning of advances PHP and MySql . | |

Course: USIT204 Numerical and Statistical Methods

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation Laws and Engineering Problems<br>Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors<br>Truncation Errors and the | U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models<br>Also to learn different types of errors that take place in problem solving . | CO1 To develop the mathematical skills of the students in the area of numerical methods.Describe and discuss the key terminology, concepts, tools and techniques used in business statistical analysis.<br>CO2 To know about various types of Errors, Calculate the error correction and get actual root of the equation.<br>CO3 Understand different methods of solution of the equations and compare them.<br>CO4 How to calculate and apply measures of location and measures |

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| Taylor Series:<br>The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty | | of dispersion – grouped and ungrouped data cases.<br>CO5 How to apply discrete and continuous probability distribution to various business problems.<br>CO6 Student will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods.<br>CO7 Solve a range of problems using the techniques covered.<br>CO8 Discuss the uses and limitations of statistical analysis. |
| UNIT – II<br>Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method.<br>Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation. | U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of different Interpolation . | |
| UNIT -III<br>Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method.<br>Numerical differentiation and Integration: Numberical differentiation, Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules.<br>Numerical solution of 1st and 2nd order differential equations:<br>Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta | U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule . | |

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| Method for 1st and 2 nd Order Differential Equations. | | |
| UNIT – IV<br>Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression<br>Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution | U4 - 01 - Understanding and learning of many types of regressions<br><br>U4-02- Understanding and learning squares , non linear regression<br><br>U4 -03 - Understanding and learning linear programming and types of solutions. | |
| UNIT – V<br>Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance.<br>Distributions: Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications. | U5-01- Detailed study of variables<br><br>U5-02 - Understanding of Probability and variance .<br><br>U5- 03 - Understanding and learning distributions<br><br>U5 - 04 - Applying and Understanding of various types of distributions and its application . | |

Course: USIT205 Green Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT - I<br>**Overview and Issues**: Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power.<br>**Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, | U1-01: To learn various toxins present in electronic products.<br>U1-02: Detailed study of Company's Carbon Footprint.<br>U1-03: To study Initiatives taken by UN. | CO1 :To learn overview and issues addressed in Green Computing.<br>CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing. |

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| WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea. | Implementation of Basel Conventions.<br>U1-04: To know the significance of WEEE Directives.<br>U1-05: To learn the steps to curb E-wastes by Asian countries. | CO3: To illustrate steps taken to increase power efficiency by reducing power consumption.<br>CO4: Explanation of methods to reduce cooling costs.<br>CO5: Addressing the power usage problems, storage problems and virtualization |
| UNIT - II<br>**Minimizing Power Usage:** Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, LowPower Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.<br>**Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Datacentre Design, Centralized Control, Design for Your Needs, Put Everything Together. | U2-01: To illustrate power problems and issues to overcome these problems.<br>U2-02: To Study virtualization and managing power issues with low cost.<br>U2-03: To explain Usage of energy efficient drives.<br>U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same<br>U2-05: Designing centralised cooling system and its impact on cooling system. | CO6: Implementation of Steps to measure the cooling costs.<br>CO7: To improve the way of work culture in offices in order to use energy efficiently.<br>CO8: To understand cooling demands and steps taken to minimze the cooling costs.<br>CO9: To learn how to green IT infrastructure in our surroundings<br>CO10: To know the role of Chief Green Officer in an organisation and fulfilment of SMART goals by set by him. |
| UNIT -III<br>**Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.<br>**Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles. | U3 -01- Learning and analyzing the Global Impact of local actions.<br>U3 -02- Learning to use electronic device instead of paper and going paperless. | |
| UNIT - IV<br>**Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, | U4 -01- Understanding the concept of why recycling is important.<br>U4 -02- Analyze the use of hardware products. | |

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| Change the mind-set, David vs. America Online<br>**Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice | | |
| UNIT - V<br>**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.<br>**Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations. | U5 -01- Learning about the use of IS to achieve environmental objectives.<br><br>U5 -02- Analyzing the data which has been gathered. | |

**Course Outcomes**

FYBSC IT – SEM 3

Course: USIT301 Python Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction: The Python Programming Language,History, features,<br>Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors,Experimental Debugging,<br>Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,<br>Variables and ExpressionsValues and Types, Variables, Variable Names and Keywords, Type conversion,Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.<br>Conditional Statements: if, if-else, nested if –else<br>Looping: for, while, nested loops<br>Control statements: Terminating loops, skipping specific conditions | U1 -01- Understand the concept of Python Programming.<br><br>U1 -02- Learning to install the python.<br><br>U1 -03- Understanding the error which occurs while executing.<br><br>U1 -04- Learning about various keywords and variables in python. | CO1 Comprehend the basics of python programming<br>CO2 Ability to implement modular approach using python<br>CO3 Efficiently implement various data structures provided by python<br>CO4 Develop applications based on object oriented concept<br>CO5 Develop application using GUI and databases |

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| UNIT – II<br>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types<br>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations. | U2 -01- Understand the concept of functions and type conversion.<br><br>U2 -02- Learning and understanding the concept of looping and counting. | |
| UNIT – III<br>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods<br>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions<br>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods<br>Files: Text Files, The File Object Attributes, Directories<br>Exceptions: Built-in Exceptions, Handling Exceptions, Exception | U3 -01- Understand how to work with list<br><br>U3 -02- Learning how to access the value in tuple<br><br>U3 -03- Learning basic tuple operations<br><br>U3 -04- Analyze the Text Files, The File Object Attributes, Directories | |
| UNIT – IV<br>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.<br>Classes and Objects: Overview of OOP | U4 -01- Understanding the concept of Regular Expressions.<br><br>U4 -02- Learning the overview of OOP<br><br>U4 -03- Learning and creating a thread | |

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| (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding<br>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue<br>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module | and synchronizing thread.<br><br>U4 -04- Creating Modules and understand the different type of module. | |
| UNIT -V<br>Creating the GUI Form and Adding Widgets:<br>Widgets: Button, Canvas,Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox.<br>Handling Standard attributes and Properties of Widgets.<br>Layout Management: Designing GUI applications with proper Layout Management features.<br>Look and Feel Customization:Enhancing Look and Feel of GUI using different appearances of widgets.<br>Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database. | U5 -01- Creating the GUI Form and Adding Widgets<br><br>U5 -02- Analyzing the Widgets such as buttons, menu, radiobutton.<br><br>U5 -03- Learning how to design GUI applications with proper layout management features. | |

Course: USIT302 Data Structures

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: Data and Information, Data Structure, Classification of Data Structures, Primitive Data | U1 -01- Understand the concept of Data Structure and classification of data structure.<br><br>U1 -02- Learning about data types, | CO1 Ability to analyze algorithms and algorithm correctness.<br>CO2 Ability to summarize searching and sorting |

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| Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. Array:Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays. | algorithms and arrays.<br><br>U1 -03- Learning about various type of notations. | techniques.<br>CO3 Ability to describe stack, queue and linked list operation.<br>CO4 Ability to gain knowledge of tree and graph concepts.<br>CO5 Ability to analyze and choose appropriate data structure and algorithm for program development.<br>CO6 Efficiently use sorting and searching algorithm and know their complexities.<br>CO7 Improve coding skills by applying most suitable data structure for storage and access.<br>CO8 Ability to use trees and graph structures for representing and using complex and non-line data organization.<br>CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures.<br>CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts.<br>CO11 Determine and demonstrate bugs in progrsm, recognize neededbasic operation with data structures.<br>CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.<br>CO13 To use appropriate algorithmic strategy for better efficiency. |
| UNIT – II<br>Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications | U2 -01- Understand types of linked lists.<br><br>U2 -02- Learning about the concept of linked list. | |

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| of<br>Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures | | |
| UNIT – III<br>Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.<br>Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue, Applications of Queues. | U3 -01- Understand the concepts of Stack Memory Representation<br><br>U3 - 02- Learning about what exactly Queue is.<br><br>U3 -03- Learning about various types of Queue. | |
| UNIT – IV<br>Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, 12<br>6<br>Binary, Indexed Sequential Searches, Binary Search.<br>Tree:Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree,<br>Heap, Memory Representation of Heap, Operation on Heap, | U4 -01- Understanding about binary trees like property, algorithms and representation.<br><br>U4 -02- Learning about Advanced Tree Structures. | |

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| Heap Sort. Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree. | | |
| UNIT -V Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees. | U5 -01- Understand about hashing techniques.<br><br>U5 -02- Learning about the introduction of graph and representation of graph. | |

Course: USIT303 Computer Networks

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I Introduction: Data communications, networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, | U1 -01- Learning about Data communications.<br><br>U1 -02- Understanding Physical Layers.<br>U1 -03- Learning about Digital and Analog transmission. | CO1 Understand the importance of computer network and communications.<br>CO2 Learn about transmission media and their characteristics<br>CO3 Learn about role of various layers of ISO OSI Model in communications<br>CO4 Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.<br>CO5 Demonstrate design issues, flow control and error control.<br>CO6 Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.<br>CO7 Knowledge about various protocols used in computer network. |

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| transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion. | | CO8 Demonstrate different routing and switching algorithms. |
| UNIT – II Bandwidth Utilization: Multiplexing and SpectrumSpreading: Multiplexing, Spread Spectrum Transmission media:Guided Media, Unguided Media Switching: Introduction, circuit switched networks, packet switching, structure of a switch. Introduction to the Data Link Layer:Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes. | U2 -01- Understanding about Bandwidth Utilization<br>U2 -02- Learning about Switching.<br>U2 -03- Learning about Data Link Layer | |
| UNIT – III Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit | U3 -01- Understand the concept of Data Link Control.<br>U3 -02- Learning about what media access control is.<br>U3 -03- Get to know about wireless LANs. | |

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| ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs. | | |
| UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6. | U4 -01- Understand the basic concept of Network Layer.<br><br>U4 -02- Get to know about Unicast Routing.<br><br>U4 -03- Learning about Next generation IP. | |
| UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system. | U5 -01- Understanding the basic concepts of Transport layer.<br><br>U5 -02- Learning Standard Client0Server Protocols | |



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| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Databases and Transactions<br>What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management<br>Data Models<br>The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.<br>Database Design,ER Diagram and Unified Modeling Language<br>Database design and ER Model:overview, ERModel, Constraints, ERDiagrams, ERDIssues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML | U1 - 01 - Understanding and learning the Introduction of Database and transaction .<br><br>U1 - 02 - Understanding and application of Data Models . .<br><br>U1 - 03 - Learning about ER diagram. | CO1 Understand the need of modelling data and then storing the data in organized manner<br>CO2 Ability to create appropriate structure to map with specific type of data.<br>CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and retrieval of data.<br>CO4 Use latest methods of storage and retrieval of data as desired by the user.<br>CO5 Develop models and management information systems as per requirements of clients. |
| UNIT – II<br>Relational database model:<br>Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).<br>Relational Algebra and Calculus<br>Relational algebra: introduction, Selection and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, | U2 -01- Understanding the basic concept of Relational database model.<br><br>U2 - 02 - Understanding the basic concept of Relational database design.<br><br>U2 - 03 - Learning and understanding calculus . | |

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| grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities | | |
| UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. | U3 - 01 - Learning the application of constraints , views and sql .<br><br>U3 - 02 - Understanding the concept of functions and values . | |
| UNIT – IV Transaction management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL,Deadlocks),Time stamping methods, optimistic methods, database recovery management. | U4 - 01 - Learning about Transaction management and Concurrency Control.<br><br>U4 -02 - Learning and Application of different methods and database recovery management | |
| UNIT -V PL-SQL: Beginning with PL / SQL,Identifiers and Keywords, Operators, Expressions, Sequences,Control Structures, Cursors and Transaction,Collections | U5 - 01 - Learning and Understanding the basic concept of PL-SQL<br><br>U5 - 02 - Application of different data types , procedures and clauses . | |

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| and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers. | | |

Course: USIT305 Applied Mathematics

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, CaleyHamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values.<br>Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic | U1 -01- Get to know about Inverse of a matrix, Properties of matrices.<br>U1 -02- Learning and Understanding about complex numbers and its different application . | CO1 Enhancing the Logic building capability.<br>CO2 Compute a given integral using the most efficient method.<br>CO3 Use integrals to formulate and solve application problems in science and engineering.<br>CO4 Matrices will help them better understand computer graphics.<br>CO5 Laplace will be helpful in understanding Digital Signal systems. |

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| functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j(=i)as an operator(Electrical circuits) | | |
| UNIT – II<br>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor,<br>Linear Equation and equation reducible to this form, Method of substitution.<br>Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution.<br>Linear Differential Equations with Constant Coefficients:Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients. | U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods .<br>U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients.<br>U2 - 03 - Understanding and application of Particular integral | |

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| UNIT – III<br>The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives,<br>Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function), | U3 - 01 - Introduction to The Laplace Transform and its different theories and methods<br><br>U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations . | |
| UNIT – IV<br>Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals.<br>Applications of integration: Areas, Volumes of solids. | U4 - 01 - Application and learning of Multiple Integrals with its different types and properties . | |
| UNIT -V<br>Beta and Gamma Functions – Definitions,Properties and Problems.<br>Duplication formula.<br>Differentiation Under the Integral Sign<br>Error Functions | U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions | |

**Course Outcomes**

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Course: USIT401 Core Java

SYBSC IT – SEM 4
2019-2020

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Introduction:History, architecture and its components,Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable,<br>Java Compiler And Interpreter, java programs, java applications,<br>main(), public, static, void, string[] args, statements, white space, case<br>sensitivity, identifiers, keywords, comments, braces and code blocks,<br>variables, variable name<br>Data types: primitive data types, Object Reference Types, Strings,<br>Auto boxing, operators and properties of operators, Arithmetic<br>operators, assignment operators, increment and decrement operator,<br>relational operator, logical operator, bitwise operator, conditional<br>operator. | U1 - 01 - Introduction to History, architecture and its components,Java Class<br><br>U1 - 02 - Understanding and Learning of Data Types and its different operators and properties . | CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.<br>CO2 Understand fundamentals of object-oriented programming in Java, including defining<br>classes, invoking methods, using class libraries, etc.<br>CO3 Be aware of the important topics and principles of software development.<br>CO4 Have the ability to write a computer program to solve specified problems.<br>CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs<br>CO6 Identify classes, objects, members of a class and relationships among them needed for a specific<br>problem<br>CO7 Write Java application programs using OOP principles and proper program structuring<br>CO8 Demonstrate the concepts of polymorphism and inheritance<br>CO9 Write Java programs to implement error handling techniques using exception handling |
| UNIT – II<br>Control Flow Statements: The If...Else If...Else Statement, The<br>Switch...Case Statement<br>Iterations: The While Loop, The Do ... While Loop, The For Loop,<br>The Foreach Loop, Labeled Statements, The Break And Continue<br>Statements, The Return | U2 - 01 - Understanding and Learning of Control Flow Statements .<br><br>U2 - 02 - Learning and application of Iterations i.e loops and statements . | |

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| Statement<br>Classes: Types of Classes, Scope Rules, Access Modifier,<br>Instantiating Objects From A Class, Initializing The Class Object And<br>Its Attributes, Class Methods, Accessing A Method, Method<br>Returning A Value, Method's Arguments, Method Overloading,<br>Variable Arguments [Varargs], Constructors, this Instance, super<br>Instance, Characteristics Of Members Of A Class, constants, this<br>instance, static fields of a class, static methods of a class, garbage<br>collection. | U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values . | |
| UNIT – III<br>Inheritance: Derived Class Objects, Inheritance and Access Control,<br>Default Base Class Constructors, this and super keywords.<br>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods,<br>Interfaces, What Is An Interface? How Is An Interface Different From<br>An Abstract Class?, Multiple Inheritance, Default Implementation,<br>Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.<br>Packages: Creating Packages, Default Package, Importing Packages,<br>Using A Package | U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces .<br>U3 - 02 - Learning and understanding the concept of creating packages and importing it . | |
| UNIT – IV<br>Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional<br>Arrays, Vectors, Adding Elements To A Vector, Accessing Vector | U4 - 01 - Detailed study of arrays and introduction and understanding its types . | |

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| Elements, Searching For Elements In A Vector, Working With The Size of The Vector. Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file | U4 - 02 - Understanding and learning of multi threading and its various properties .<br><br>U4 - 03 - Application and Understanding of exception handling . | |
| UNIT -V Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas.Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout. | U5 - 01 - Understanding and learning of event handling and its models .<br><br>U5 -02 - Learning of Abstract Window Toolkit in detail .<br><br>U5 - 03 - Detailed study of layouts . | |

Course: USIT402 Introduction to Embedded Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I Introduction: Embedded Systems and | U1 - 02 - Understanding and | CO1 To have knowledge about the basic working of a |

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| general purpose computersystems, history, classifications, applications and purpose ofembedded systems<br>Core of embedded systems: microprocessors and microcontrollers,RISC and CISC controllers, Big endian and Little endian processors,Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.<br>Characteristics and quality attributes of embedded systems:<br>Characteristics, operational and non-operational quality attributes. | introduction to Embedded system and its application .<br><br>U1 - 02 - Learning of the concept of Core of embedded systems.<br><br>U1 - 03 - Detailed study of Characteristics and quality attributes of embedded systems. | microcontroller system and its programming in assembly language.<br>CO2 To provide experience to integrate hardware and software for microcontroller applications systems.<br>CO3 Understand what is microcontroller, microcomputer and embedded system.<br>CO4 Become familier with programming environment used to develop embedded systems.<br>CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices.<br>CO6 Learn debugging techniques for an embedded systems<br>CO7 Ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.<br>CO8 Ability to write the programs for microcontroller.<br>CO9 Ability to understand the role of embedded systems in industry.<br>CO10 Ability to understand the design concept of embedded systems. |
| UNIT – II<br>Embedded Systems – Application and Domain Specific:Application specific – washing machine, domain specific - automotive.<br>Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.<br>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers. | U2 - 01 - Study of Embedded systems and its application .<br><br>U2 - 02 - Understanding the concept of Embedded Hardware anf types of memory .<br><br>U2 - 03 - Detailed study of the concept called peripherals . | |

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| UNIT – III<br>The 8051 Microcontrollers:Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.<br>8051 Programming in C:<br>Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs. | U3 - 01 - Studying and Understanding the The 8051 Microcontrollers.<br><br>U3 - 02 - Learning and application of 8051 Programming in C and its logic. | |
| UNIT – IV<br>Designing Embedded System with 8051 Microcontroller:Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.<br>Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging. | U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller .<br><br>U4 - 02 - Learning the concept of Programming embedded systems and the structure . | |
| UNIT -V<br>Real Time Operating System (RTOS):Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.<br>Design and Development: Embedded system developmentEnvironment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry. | U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic .<br><br>U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files | |

Course: USIT403 Computer Oriented Statistical Techniques

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean | U1 - 01 - Learning the concept of tendencies and its different types of notation . | CO1 Recognize the error in the number generated by the solution.<br>CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.<br>CO3 Apply method of |

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| ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and Measures of Central Tendency.<br>The Standard Deviation and Other Measures of Dispersion:<br>Dispersion, or Variation,The Range, The Mean Deviation, The SemiInterquartile Range,The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation,Properties of the Standard Deviation,Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coe ffi,Standar cient of Variation dized Variable; Standard Scores, Software and Measures of Dispersion.<br>Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays. | U1 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion .<br>U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail. | interpolation and extrapolation for prediction.<br>CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.<br>CO5 Calculate mean, median and mode for individual series.<br>CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation.<br>CO7 How to apply discrete and continuous probability distributions to various businessproblems.<br>CO8 Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.<br>CO9 Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.<br>CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software. |
| UNIT – II<br>Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, | U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . | |

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| Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory, , Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory. | U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis.<br>U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory | |
| UNIT – III Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special | U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.<br>U3 - 02 - Remembering and Learning and the theory of Statistical Decision . | |

S.I.E.S. (N.A.M.) SIR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

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| Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample<br>Di ffTests Involving Binomial Distributions erences, .<br>Statistics in R: mean, median, mode, Normal Distribution , Binomial<br>Distribution, Frequency Distribution in R. | U3 - 03 - Detailed study of Statistics in R and its distribution . | |
| UNIT – IV<br>Small Sampling Theory: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The ChiSquare Distribution, Confidence Intervals for Sigma , Degrees of<br>Freedom, The F Distribution.<br>The Chi-Square Test: Observed and Theoretical Frequencies,<br>Definition of chi-square, Significance Tests, The Chi-Square Test for<br>Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare. | U4 - 01 - Understanding and Analyzing the Small Sampling Theory .<br><br>U4 - 02 - Remembering the concept of The Chi-Square Test and its properties . | |
| UNIT -V<br>Curve Fitting and the Method of Least Squares: Relationship<br>Between Variables, Curve Fitting, Equations of Approximating<br>Curves,Freehand Method of Curve Fitting, The Straight Line, The<br>Method of Least Squares,The Least-Squares Line, Nonlinear<br>Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.<br>Correlation Theory: Correlation and Regression, Linear<br>Correlation,Measures of Correlation, The Least-Squares Regression<br>Lines, Standard Error of Estimate, | U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares .<br><br>U5 - 02 - The detailed study of correlation and its concept of theories and regression . | |

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| Explained and Unexplained Variation, Coe ffi, cient of Correlation Remarks Concerning the Correlation Coe ffi, cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas, Regression Lines and the Linear Correlation Coe ffi, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression. | | |

Course: USIT404 Software Engineering

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.<br>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.<br>Software Processes: Process and Project, Component Software Processes.<br>Software Development Process Models.<br>• Waterfall Model.<br>• Prototyping.<br>• Iterative Development.<br>• Rational Unified Process.<br>• The RAD Model<br>• Time boxing Model.<br>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. | U1 - 01 - The learning and Introduction to Software engineering .<br><br>U1 - 02 - Analyzing and creating the software requirements and its requirements .<br><br>U1 - 03 - Learning and understanding different types of Software Development Process Models.<br><br>U1 - 04 - Understanding the Agile software development . | CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application.<br>CO2 Describe software engineering layered technology and Process frame work.<br>CO3 A general understanding of software process models such as the waterfall and evolutionary models.<br>CO4 Understanding of software requirements and the SRS documents.<br>CO5 Understanding of the role of project management including planning, scheduling, risk management, etc.<br>CO6 Describe data models, object models, context models and behavioural models.<br>CO7 Understanding of different software architectural styles. |

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| UNIT – II<br>Socio-technical system:Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers,<br>Dealing Legacy Systems.<br>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety<br>and Security of Software systems.<br>Requirements Engineering Processes: Feasibility study, Requirementselicitation and analysis, Requirements Validations,<br>Requirements Management.<br>System Models: Models and its types, Context Models, Behavioural<br>Models, Data Models, Object Models, Structured Methods. | U2 - 01 - Learning in detailed of the concept Socio-technical system and its Essential characteristics of socio technical systems and more<br><br>U2 - 02 - Introduction and Learning of critical system and types of it .<br><br>U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models . | |
| UNIT – III<br>Architectural Design: Architectural Design Decisions, System<br>Organisation, Modular Decomposition Styles, Control Styles,<br>Reference Architectures.<br>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface<br>Evaluation.<br>Project Management<br>Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management.<br>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software<br>Measurement and Metrics. | U3 - 01 - Introduction to Architectural Design and its system and styles .<br><br>U3 - 02 - Learning and Understanding of User Interface Design .<br><br>U3 - 03 - Analyzing and creating Quality Management . | |

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| UNIT – IV<br>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.<br>Software Measurement: Size-Oriented Metrics, Function-OrientedMetrics, Extended Function Point Metrics<br>Software Cost Estimation:Software Productivity, EstimationTechniques, Algorithmic Cost Modelling, Project Duration and Staffing | U4 - 01 - Understanding and learning about the Verification and Validation.<br><br>U4 - 02 - Analyze and creating testing components and its functions . | |
| UNIT -V<br>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.<br>Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.<br>Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.<br>Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service | U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc . | |

Course: USIT405 Computer Graphics and Animation

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| UNIT – I<br>Introduction to Computer Graphics:<br>Overview of Computer Graphics, Computer Graphics Application and<br>Software, Description of some graphics devices, Input Devices for<br>Operator Interaction, Active and Passive Graphics Devices, Display<br>Technologies, Storage Tube Graphics Displays, Calligraphic Refresh<br>Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays,<br>Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video<br>Basics, The Video Controller, Random-Scan Display Processor, LCD<br>displays.<br>Scan conversion – Digital Differential Analyzer (DDA) algorithm,<br>Bresenhams' Line drawing algorithm.Bresenhams' method of Circle<br>drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm,<br>Mid-point criteria, Problems of Aliasing, end-point ordering and<br>clipping lines, Scan Converting Circles, Clipping Lines algorithms–<br>Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons,<br>problem with multiple components. | U1 - 01 - Introduction to Computer graphics and its application and software description .<br><br>U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping . | CO1 To familiarize students with basic principles and techniques for computer graphics.<br>CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional transformations.<br>CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry.<br>CO4 This course will introduce students to all aspects of computer graphics including hardware, software and applications.<br>CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional transformations. |
| UNIT – II<br>Two-Dimensional Transformations:<br>Transformations and Matrices, Transformation Conventions, 2D<br>Transformations, Homogeneous Coordinates and Matrix<br>Representation of 2D Transformations, Translations and<br>Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined<br>Transformation, Transformation of Points, Transformation of The<br>Unit Square, Solid Body Transformations, Rotation About an<br>Arbitrary Point, Reflection through an Arbitrary Line, | U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices . | |

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| A Geometric<br>Interpretation of Homogeneous Coordinates, The Window-toViewport Transformations.<br>Three-Dimensional Transformations:<br>Three-Dimensional Scaling, Three-Dimensional Shearing, ThreeDimensional Rotation, Three-Dimensional Reflection, ThreeDimensional Translation, Multiple Transformation, Rotation about an<br>Arbitrary Axis in Space, Reflection through an Arbitrary Plane,<br>Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective<br>Transformations, Techniques for Generating Perspective Views,<br>Vanishing Points, the Perspective Geometry and camera models,<br>Orthographic Projections, Axonometric Projections, Oblique<br>Projections, View volumes for projections. | U2 - 02 - Learning and creating Three-Dimensional Transformations and many of its working and objectives .<br><br>U2 - 03 - Understanding the concepts of Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections etc . | |
| UNIT – III<br>Viewing in 3D<br>Stages in 3D viewing, Canonical View Volume (CVV), Specifying an<br>Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of<br>Planar Geometric Projections, Combined transformation matrices for<br>projections and viewing, Coordinate Systems and matrices, camera<br>model and viewing pyramid.<br>Light:Radiometry,Transport,Equation,Photometry<br>Color:Colorimetry,ColorSpaces,ChromaticAdaptation, Color<br>Appearance | U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective .<br><br>U3 - 02 - Remembering and learning light and color and its various components . | |
| UNIT – IV<br>Visible-Surface Determination:<br>Techniques for efficient Visible-Surface Algorithms, Categories of<br>algorithms, Back face removal, The z-Buffer Algorithm, Scan-line<br>method, Painter's algorithms (depth sorting), Area sub-division<br>method, BSP trees, Visible-Surface Ray Tracing, comparison of the<br>methods.<br>Plane Curves and Surfaces:<br>Curve Representation, Nonparametric Curves, Parametric Curves,<br>Parametric Representation of a Circle, Parametric Representation of<br>an Ellipse, Parametric Representation of a Parabola, | U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques .<br><br>U4 - 02 - Creating and Learning the planes and curves and surfaces along with its different working and drawings . | |

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| Parametric Representation of a Hyperbola, Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces | | |
| UNIT -V<br>Computer Animation:<br>Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects.<br>Image Manipulation and Storage:<br>What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering | U5 - 01 - Learning and understanding the concept of Computer Animation in detail .<br><br>U5 - 02 - Creating and analyzing Image Manipulation and Storage in detail . | |

**Course Outcomes**

FYBSC IT – SEM 5 2019-2020

Course: USIT501 Software Project Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Software Project Management:Introduction, Why is Software Project Management Important? What is a Project? | U1 -01- Understanding Why is Software Project Management Important. | CO1 Professional terminologies of software industry.<br>CO2 Problem solving algorithms and techniques.<br>CO3 Understand the development work environment<br>CO4 To make students realize software project management is |

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| Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step | U1 -02- Learning the basic concept of project.<br><br>U1 -03- Understanding and learning about what is management.<br><br>U1 -04- Learning about Overview of Project Planning. | not just theory subject to pass, instead it will help them live their professional life with ease.<br>CO5 This subject makes a student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player. |

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| 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning | | |
| UNIT – II<br>Selection of an Appropriate Project Approach:Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.<br>Software Effort Estimation:Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottomup Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht | U2 -01- Analyzing the Appropriate Project Approach.<br><br>U2 -02- How to choose proper methods and technologies for software development<br><br>U2 -03- Analyzing the most Appropriate Process Model.<br><br>U2 -04- Understanding about Software Effort Estimation Techniques. | |

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| Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb. | | |
| UNIT – III<br>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.<br>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm"s Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.<br>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost. | U3 -01- Learning about how to plan, when to plan and proper project schedules.<br>U3 -02- Understanding about risk management.<br>U3 -03- Analyzing the Resource Allocation.<br>U3 -04- Analyzing the Cost Schedules | |

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| Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence. | | |
| UNIT – IV<br>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM).<br>Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.<br>Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns. | U4 -01- Understanding Monitoring and Control.<br>U4 -02- Learning about how to manage contracts.<br>U4 -03- Understanding Behaviour, Organizational Behaviour | |
| UNIT – V<br>Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.<br>Software Quality: Introduction, The Place of | U5 - Learning about how to work in teams.<br>U5 -02- Analyzing how good the software quality should be.<br>U5 -03- Learning about how the project closure should be. | |

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| Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.<br>Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report. | | |

Course: USIT502 Internet of Things

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>The Internet of Things: An Overview: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?<br>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances. | U1 -01- Understanding what is Internet Of Things.<br>U1 -02- Learning Flavour of the Internet of Things.<br>U1 -03- Understanding the principles of internet.<br>U1 -04- Understanding different types of IP addresses. | CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping.<br>CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors.<br>CO3 The Internet of Things (IOT) is the next wave, world is going to witness.<br>CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and |

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| Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols. | | everything which you use in day-to-day life).<br>CO5 Internet of Things is a term given to the attempt of connecting objects to the internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion. |
| UNIT – II<br>Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community.<br>Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. | U2 -01- Learning about Costs versus Ease of Prototyping.<br><br>U2 -02- Understanding what is open and closed source.<br><br>U3 -03- learning about Arduino and Raspberry Pi. | |
| UNIT – III<br>Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, | U3 -01- Understanding how to prototype the physical design.<br><br>U3 -02- Learning the basic concept of Laser | |

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| Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol. | cutting.<br><br>U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols. | |
| UNIT – IV Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries,Debugging. Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups. | U4 -01- Understanding what is memory management.<br><br>U4 -02- Learning the basic concept of Business Model.<br><br>U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups. | |

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| UNIT – V<br>Moving to Manufacture: What Are You Producing? Designing Kits,<br>Designing Printed circuit boards, Software Choices, The Design<br>Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and<br>Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance,<br>User Community.<br>Ethics: Characterizing the Internet of Things, Privacy, Control,<br>Disrupting<br>Control,Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part<br>of the Solution, Cautious Optimism, The Open Internet of Things<br>Definition. | U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards.<br><br>U5 -02- Learning about Ethics.<br><br>U5 -03- Analyzing the Correctness and Maintainability, Security, Performance | |

Course: USIT503 Advanced Web Programming

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class<br>Library.<br>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.<br>Types, Objects, and Namespaces: The Basics About Classes,<br>Building a Basic Class, Value Types and Reference Types,<br>Understanding Namespaces and Assemblies, Advanced Class | U1 -01- Understanding what exactly .NET framework is.<br><br>U1 -02- Learning about Types, Objects, and Namespaces.<br><br>U3 - 03- Learning about values types and reference type. | CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.<br>CO2 Enable learners to use Visual Studio -an advanced design tool<br>CO3 To gain in-depth learning of various concepts and features of .NET coding and developing of web<br>applications.<br>CO4 To Provide knowledge of different State management techniques<br>CO5 To explore ADO.NET- a model for interacting with databases. |

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| Programming. | | CO6 Using XML various security fundamentals will be explored |
| UNIT – II<br>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.<br>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control. | U2 -01- Understanding the basic concept of Web form fundamentals.<br><br>U2 -02- Learning about Form controls.<br><br>U2 -03- Understanding Validation and how to Use Validation Controls. | |
| UNIT – III<br>Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing<br>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options<br>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages, | U3 -01- Learning and understanding about the basic concept of Error Handling, Logging, and Tracing.<br><br>U3 -02- Learning State Management.<br><br>U3 -03- Learning about how to apply Themes and master pages. | |
| UNIT – IV<br>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data | U4 -01- Understanding the fundamentals of ADO.NET.<br><br>U4 -02- Learning about Data Binding.<br><br>U4 -03- Learning about the basic concept of Data controls. | |

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| Access, Using Disconnected Data Access.<br>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,<br>The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView | | |
| UNIT – V<br>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.<br>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.<br>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit. | U5 -01- Understanding what is XML.<br><br>U5 -02- Learning about what is Security Fundamentals.<br><br>U5 -03- Understanding Ajax, Using Partial Refreshes. | |

Course: USIT505 Linux System Administration

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.<br>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files<br>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing | U1 -01- Understanding about Red Hat Enterprise Linux.<br><br>U1 -02- Analyzing and Working with the Bash Shell.<br><br>U1 -03- Learning about System Administration Tasks | CO1 To familiarize students with Linux Installation.<br>CO2 Enable Students to Install RPM and use Red hat Package Management<br>CO3 To Make Students Install Samba Server and the use of Samba Server<br>CO4 To make Students Install Apache, Send Mail.<br>CO5 Write Shell Scripts in Linux. |

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| Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate<br>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories,Installing Software with Yum, Querying Software, Extracting Files from RPM Packages | | |
| UNIT – II<br>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes<br>Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access | U2 -01- Learning about how to configure and manage storage.<br>U2 -02- Understanding NetworkManager, Working with Services and Runlevels.<br>U2 -03- Learning about how to troubleshoot the network.<br>U2 -04- Learning the basic concept of SSH.<br>U2 -05- Learning about Permissions. | |

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| Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes | | |
| UNIT – III<br>Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT<br>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files<br>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, | U3 -01- Learning about Securing Server with iptables<br><br>U3 -02- Learning how to set up a firewall. | |

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| Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services. | | |
| UNIT – IV<br>Configuring DNS and DHCP:Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server<br>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP<br>Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL | U4 -01- Understanding how to configure DNS and DHCP.<br><br>U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd. | |
| UNIT – V<br>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing,<br>Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures,<br>Using if...then...else, Using case, Using while, Using until, Using for, | U5 -01- Learning about Bash Shell Scripting.<br><br>U5 -02- Understanding Variables, Variables, Subshells, and Sourcing.<br><br>U5 -03- Learning High-Availability Clustering. | |

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| Configuring booting with GRUB. High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File | | |

Course: USIT506 Enterprise Java

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Understanding Java EE: WhatisanEnterpriseApplication? Whatisjavaenterpriseedition? JavaEETechnologies, JavaEEevolution, Glassfishserver<br>JavaEE Architecture,Serverand Containers: TypesofSystemArchitecture, JavaEEServer, JavaEEContainers.<br>Introduction to Java Servlets: TheNeedforDynamicContent, JavaServletTechnology, WhyServlets? WhatcanServletsdo?<br>Servlet API and Lifecycle: JavaServletAPI, TheServletSkeleton, | U1 -01- Understanding what is Java EE.<br>U1 -02- Learning about the basic concept of Java servlets.<br>U2 -03- Understanding how to work with database. | CO1 Identify advance concepts of java programming with database connectivity.<br>CO2 Design and develop platform independent applications using a variety of component based frameworks.<br>CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications. |

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| TheServletLifeCycle, ASimpleWelcomeServlet WorkingwithServlets: GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor. Working with Databases: WhatIsJDBC? JDBCArchitecture, AccessingDatabase, TheServletGUI and DatabaseExample. | | CO4 The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network.<br>CO5 The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business. |
| UNIT – II<br>Request Dispatcher: Resquestdispatcher Interface, Methods of Requestdispatcher, Requestdispatcher Application. COOKIES: KindsofCookies, WhereCookiesAreUsed? CreatingCookiesUsingServlet, DynamicallyChangingtheColorsofAPage SESSION: WhatAreSessions? LifecycleofHttpSession, SessionTrackingWithServletAPI, AServlet Session Example Workingwith Files: UploadingFiles, CreatinganUploadFileApplication, DownloadingFiles, CreatingaDownloadFileApplication. Workingwith Non-Blocking I/O: CreatingaNonBlockingReadApplication, CreatingTheWeb Application, CreatingJavaClass, Creating Servlets, Retrieving The File, Creating index.jsp | U2 -01- learning the concept of Request Dispatcher.<br>U2 -02- Learning about cooking.<br>U2 -03- Learning how to work with files. | |
| UNIT – III<br>Introduction To Java ServerPages: WhyuseJava ServerPages? DisadvantagesOfJSP, JSPv\sServlets, LifeCycleofaJSPPage, HowdoesaJSPfunction? HowdoesJSPexecute? AboutJava ServerPages Getting Started With Java ServerPages: Comments, JSPDocument, JSPElements, JSPGUIExample. Action Elements: IncludingotherFiles, ForwardingJSPPagetoAnotherPage. | U3 -01- Understand about Java Server pages.<br>U3 -02- Learning about LifeCycle of a JSP Page.<br>U3 -03- Understanding about Action Element. | |

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| PassingParametersforotherActions,<br>LoadingaJavabean.<br>Implicit Objects, Scopeand ElExpressions:<br>ImplicitObjects,<br>CharacterQuotingConventions,<br>UnifiedExpressionLanguage[UnifiedEl],<br>ExpressionLanguage.<br>Java Server Pages Standard Tag Libraries:<br>WhatiswronginusingJSPScriptletTags?<br>HowJSTLFixesJSPScriptlet'sShortcomings?<br>DisadvantagesOfJSTL,<br>TagLibraries. | | |
| UNIT – IV<br>Introduction To EnterpriseJavabeans:<br>EnterpriseBeanArchitecture,<br>BenefitsofEnterpriseBean, TypesofEnterpriseBean,<br>AccessingEnterpriseBeans,<br>EnterpriseBeanApplication,<br>PackagingEnterpriseBeans<br>Workingwith Session Beans:<br>WhentouseSessionBeans?<br>TypesofSessionBeans, RemoteandLocalInterfaces,<br>AccessingInterfaces, LifecycleofEnterpriseBeans,<br>PackagingEnterpriseBeans, Exampleof<br>StatefulSessionBean, Example<br>ofStatelessSessionBean, Example of<br>SingletonSessionBeans.<br>Working with Message DrivenBeans:<br>LifecycleofaMessageDrivenBean,<br>UsesofMessageDrivenBeans,<br>TheMessage DrivenBeansExample.<br>Interceptors: Request andInterceptor, Defining An<br>Interceptor,<br>AroundInvokeMethod, ApplyingInterceptor,<br>Adding An Interceptor<br>To An Enterprise Bean, Build and Run the Web<br>Application.<br>Java Naming and Directory Interface: What is<br>Naming Service?<br>What is Directory Service? What is Java Naming<br>and Directory<br>interface? Basic Lookup, JNDI Namespace in Java<br>EE, Resources and<br>JNDI, Datasource Resource Definition in Java EE. | U4 -01- Understanding Enterprise Java Bean.<br><br>U4 -02- Learning about types of Java bean<br><br>U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail . | |
| UNIT – V<br>Persistence, Object/Relational Mapping And JPA:<br>WhatisPersistence? PersistenceinJava,<br>CurrentPersistenceStandardsinJava,<br>WhyanotherPersistenceStandards?<br>Object/RelationalMapping,<br>Introduction to JavaPersistence API:<br>TheJavaPersistenceAPI,<br>JPA,ORM,DatabaseandtheApplication, | U5 - 01 -Introduction and learning about Persistence, Object/Relational Mapping And JPA in detail with its meaning .<br><br>U5 - 02 - Understanding and learning of JavaPersistence API | |

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| ArchitectureofJPA,<br>HowJPAWorks? JPA Specifications.<br>Writing JPA Application:<br>ApplicationRequirementSpecifications,<br>SoftwareRequirements,<br>TheApplicationDevelopmentApproach,<br>CreatingDatabaseandTablesinMysql,<br>creatingaWebApplication,<br>AddingtheRequiredLibraryFiles,<br>creatingaJavabeanClass,<br>CreatingPersistenceUnit[Persistence.Xml],<br>CreatingJSPS,<br>TheJPAApplicationStructure,<br>RunningtheJPAApplication.<br>Introduction to Hibernate: WhatisHibernate?<br>WhyHibernate?<br>Hibernate,DatabaseandTheApplication,<br>ComponentsofHibernate,<br>ArchitectureofHibernate, HowHibernateWorks?<br>WritingHibernateApplication:<br>ApplicationRequirementSpecifications,<br>SoftwareRequirements,<br>TheApplicationDevelopmentApproach,<br>CreatingDatabaseandTablesinMysql,<br>creatingaWebApplication,<br>AddingtheRequiredLibraryFiles,<br>creatingaJavabeanClass,<br>CreatingHibernateConfigurationFile,<br>AddingaMappingClass,<br>CreatingJSPS, RunningTheHibernateApplication. | with its objective and specifications .<br><br>U5 - 03 - Creating and learning of JSPS,<br>The JPA ApplicationStructure, along with this learning how to run the program .<br><br>U5 - 04 - Learning how to write and hiber net application in details with all the information required . | |

**Course Outcomes**

TYBSC IT – SEM 6
2019-2020

Course: USIT601 Software Quality Assurance

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core | U1 - 01 - Describe fundamental concepts of software quality assurance.<br>U1 - 02 - Explore test planning and its management. | CO1 Ability to identify and apply modern software testing methods in software development<br>CO2 Understand testing strategies and defect |

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| Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.<br>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management. | | management<br>CO3 Recognise the importance of software quality assurance<br>CO4 Know about quality improvement, cost control and contribute toward efficient delivery of software solutions |
| UNIT – II<br>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software | U2 - 01 - To learn the basic testing techniques.<br>U2 - 02 - Develop knowledge of testing process and features. | |

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| Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing | | |
| UNIT – III<br>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path | U3 - 01 - To learn Boundary value analysis.<br>U3 - 02 - Develop knowledge of the Testing techniques. | |

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| Testing, Guidelines and Observations,<br>Data Flow Testing: Define/Use Testing, Slice-Based Testing,<br>Program Slicing Tools. | | |
| UNIT – IV<br>Software Verification and Validation:Introduction,<br>Verification,<br>Verification Workbench, Methods of Verification, Types of reviews<br>on the basis od Stage Phase, Entities involved in verification, Reviews<br>in testing lifecycle, Coverage in Verification, Concerns of<br>Verification, Validation, Validation Workbench, Levels of Validation,<br>Coverage in Validation, Acceptance Testing, Management of<br>Verification and Validation, Software development verification and<br>validation activities.<br>V-test Model:Introduction, V-model for software, testing during<br>Proposal stage, Testing during requirement stage, Testing during test<br>planning phase, Testing during design phase, Testing during coding,<br>VV Model, Critical Roles and Responsibilities | U4 - 01 - Analyze Verfication and Validation.<br>U4 - 02 - Introduce V - Model and Testing during test | |
| UNIT – V<br>Levels of Testing: Introduction, Proposal Testing, Requirement<br>Testing, Design Testing, Code Review, Unit Testing, Module Testing,<br>Integration Testing, Big-Bang Testing, Sandwich Testing, Critical<br>Path First, Sub System Testing, System Testing, Testing Stages.<br>Special Tests:Introduction, GUI testing, Compatibility Testing,<br>Security Testing, Performance Testing, Volume Testing, Stress<br>Testing, Recovery Testing, Installation Testing, Requirement Testing,<br>Regression Testing, Error Handling | U5 - 01 - understanding the levels of testings. | |

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| Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing,<br>Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph,<br>Generating tests on the basis of Combinatorial Designs, State Graph,<br>Risk Associated with New Technologies, Process maturity level of<br>Technology, Testing Adequacy of Control in New technology usage,<br>Object Oriented Application Testing, Testing of Internal Controls,<br>COTS Testing, Client Server Testing, Web Application Testing,<br>Mobile Application Testing, eBusiness eCommerce Testing, Agile<br>Development Testing, Data Warehousing Testing. | | |

Course: USIT602 Security in Computing

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security<br>Investment, Security Methodology, How to Build a Security Program,<br>The Impossible Job, The Weakest Link, Strategy and Tactics,<br>Business Processes vs. Technical Controls.<br>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.<br>Secure Design Principles: The CIA Triad and Other Models, Defense<br>Models, Zones of Trust, Best | U1 - 01 - simplify Information Security Overview<br>U1 - 02 - determine Secure Design Principles | CO1 Insight into secure design principles and defense models.<br>CO2 Knowledge about storage and database security.<br>CO3 Implement IDS, Firewalls and wireless security.<br>CO4 Skills to implement secure cloud environment for web and application security<br>CO5 Ability to implement physical security for implementing secure information environment. |

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| Practices for Network Defense. | | |
| UNIT – II<br>Authentication and Authorization: Authentication, Authorization<br>Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.<br>Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.<br>Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring | U2 - 01 - classify Authentication and Authorization<br>U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure. | |
| UNIT – III<br>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.<br>Network Device Security: Switch and Router Basics, Network Hardening.<br>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.<br>Wireless Network Security: Radio Frequency Security Basics, DataLink Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure | U3 - 01 - Learn Firewall Capabilities, Firewall Design.<br>U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways. | |

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| Gateways. | | |
| UNIT – IV<br>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).<br>Voice over IP (VoIP) and PBX Security: Background, VoIP Components,VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.<br>Operating System Security Models: Operating System Models,<br>Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security. | U4 - 01 - Learn Operating System Security Models.<br>U4 - 02 - Learn Intrusion Detection and Prevention Systems | |
| UNIT – V<br>Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.<br>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.<br>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets:<br>Locks and Entry Controls, Physical Intrusion Detection. | U5 - 01 - Introduce Cloud computing.<br>U5 - 02 - Analyze application Security, Remote Administration Security. | |

Course: USIT603 Business Intelligence

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
|---|---|---|
| UNIT – I<br>Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence | U1 - 01 - Describe the concepts and components of Business Intelligence (BI).<br>U1 - 02 -Critically evaluate use of BI for supporting decision making in an | CO1 Ability to use decision support system for BI Applications<br>CO2 Ability to develop and use mathematical models for data mining and data preparations |

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| architectures, Ethics and business intelligence<br>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system | organisation.<br><br>U1 - 03 - Understand and use the technologies and tools that make up BI. | CO3 Know how and when to apply classification and clustering techniques for solving BI problems<br>CO4 Explore insights into important emerging applications of BI<br>CO5 Developing skills to design expert system solutions for business applications |
| UNIT – II<br>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models<br>Data mining: Definition of data mining, Representation of input data ,<br>Data mining process, Analysis methodologies<br>Data preparation: Data validation, Data transformation, Data reduction | U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction<br><br>U2 - 02 - To develop knowledge of data mining.<br><br>U2 - 03 - Analyze Data Validation and data preparation. | |
| UNIT – III<br>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks,<br>Support vector machines<br>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models | U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods<br><br>U3 - 02 - Explain Clustering and classification model. | |
| UNIT – IV<br>Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization,<br>Optimization models for logistics planning, Revenue management systems. Data envelopment analysis: Efficiency measures, Efficient frontier,<br>The CCR model, Identification of good operating practices | U4 - 01 -study relational marketing, sales force<br>management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model<br><br>U4 - 02 - Identify marketing models and production models. | |
| UNIT – V<br>Knowledge Management: Introduction to Knowledge Management,<br>Organizational Learning and Transformation, Knowledge | U5 - 01- To be well-versed with Organizational<br>Learning and Transformation, Knowledge<br>Management Activities, Artificial intelligence Versus Natural Intelligence, | |

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| Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management<br>Artificial Intelligence and Expert Systems:<br>Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems | basic structure and development of expert systems<br>U5 - 02 - generate knowledge of AI and other Automation techniques.<br>U5 - 03 - Develop Knowledge of expert system. | |

Course: USIT604 Principles of Geographic Information Systems

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I<br>A Gentle Introduction to GIS<br>The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.<br>The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis<br>Geographic Information and Spatial Database Models and Representations of the real world<br>Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, | U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).<br>U1 - 02 -Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | CO1 Explore mapped data, Spatial Data Types, Data Creation, Georeferencing, Spatial Analysis<br>CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis<br>CO3 Analyze spatial data, using QGIS analysis tools<br>CO4 Develop and Manage Geodatabases for real world data<br>CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others |

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| Boundaries<br>Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects<br>Organizing and Managing Spatial Data<br>The Temporal Dimension | | |
| UNIT – II<br>Data Management and Processing Systems<br>Hardware and Software Trends<br>Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)<br>Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.<br>Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database.<br>GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality. | U2 - 01 -Demonstrate organizational skills in file and database management.<br><br>U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology. | |
| UNIT – III<br>Spatial Referencing and Positioning<br>Spatial Referencing: | U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions.<br>U3 - 02 -Demonstrate proficiency in | |

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| Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations<br>Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology<br>Data Entry and Preparation<br>Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere<br>Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency<br>Data Preparation: Data checks and repairs, Combining data from multiple sources<br>Point Data Transformation: Interpolating discrete data, Interpolating continuous data | the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. | |
| UNIT – IV<br>Spatial Data Analysis<br>Classification of analytical GIS Capabilities<br>Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification<br>Overlay functions: Vector overlay operators, Raster overlay operators<br>Neighbourhood functions: Proximity computations, | U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms.<br><br>U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems. | |

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| Computation of diffusion, Flow computation, Raster based surface analysis Analysis: Network analysis, interpolation, terrain modeling GIS and Application models:GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation | | |
| UNIT – V Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox: What kind of data do I have? How can I map my data? How to map? How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination | U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.<br><br>U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS). | |

Course: USIT605 IT Service Management

| UNIT NO & NAME | UNIT OUTCOMES | COURSE OUTCOMES |
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| UNIT – I IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, | U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM<br>U1 - 02 - understand how ITSM can operate in an organisation to improve processes<br>U1 - 03 - understand best management practice from a technical and non-technical perspective | CO1 Ability to deal with the convergence, interoperability and design of heterogeneous networks with local, access and core networks, as well as with service integration.<br>CO2 Ability to model, design, implement, manage, operate, |

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| Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle.<br>Service Strategy Principles: Value creation, Service Assets, Service<br>Provider Service Structures, Service Strategy Principles.<br>Service Strategy:Define the market, Develop the offerings, Develop<br>Strategic Assets, Prepare for execution.<br>Challenges, Critical Success factors and risks:Complexity, Coordination and Control, Preserving value, Effectiveness in<br>measurement, Risks. | | administrate and maintain networks, services<br>and contents<br>CO3 Ability to plan networks and decision-making about services.<br>CO4 Learn about service transition and service operations.<br>CO5 Ability to apply Continual Service Improvement in an organization. |
| UNIT – II<br>Service Design: Fundamentals, Service Design Principles: Goals,<br>Balanced Design, Identifying Service requirements, identifying and<br>documenting business requirements and drivers, Design activities,<br>Design aspects, Subsequent design activities, Design constraints,<br>Service oriented architecture, Business Service Management, Service<br>Design Models<br>Service Design Processes:Service Catalogue Management, Service<br>Level Management, Capacity Management, Availability Management,<br>IT Service Continuity Management, Information Security | U2 - 01 - communicate management theories and ideas in writing<br>U1 - 02 - problem solve through the lens of management theories<br><br>U1 - 03 - critically evaluate information from a variety of sources | |
| UNIT – III<br>Service Transition: Fundamentals, Service Transition Principles:<br>Principles Supporting Service Transition, Policies for Service Transition | U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions<br><br>U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms | |

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| Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management. Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions. | and businesses.<br><br>U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems. | |
| UNIT – IV<br>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks | U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector.<br>U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in general.<br>U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance. | |
| UNIT – V<br>Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and | U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets.<br><br>U5 - 02 -Locate and access appropriate sources of information in order to be able to | |

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| Internal drivers, Service level management, Knowledge management,<br>The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.<br>CSI Process: The seven-step improvement process. CSI Methods<br>nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment,<br>Service reporting, CSI and other service management processes,<br>Organising for CSI:Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence<br>and training.<br>Technology considerations: Tools to support CSI activities.<br>Implementing CSI:Critical Considerations for implementing<br>CSI,The start, Governance, CSI and organisational change, Communication Strategy and Plan | make informed decisions about effective services delivery.<br><br>U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios. | |

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