Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's 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 1. Meaning and importance of Mass Communication. 2. Forms of COmmunication: Intra Personal Communication, Interpersonal Communication, Group Communication, Mass Communication: Electronic, Satellite, Interactive, Digital Communication etc. 3. 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 2. Learning of various mass communication models. 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. CO2- To study the evolution of mass media as an important social institution. CO3- To understand the development of the mass communication models. CO4- To develop a critical understanding of Mass Media. CO5- To understand the concept of New Media and Media convergence and its implications.
Module II: History of Mass Communication: 1. From Oral to Communication (Kirtan, Davandi, Powada, Nagara) 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. 2. To learn various tools of mass communication. 3. Understanding the importance and nature of Audiences.	
Module III: Major Forms of Mass Media 1. Traditional and Folk Media 2. Print: Books, Newspapers, Magazines 3. Broadcast: Television, Radio 4. Films 5. Internet	1.To understand the historical, ethical and current legal framework in which mass communication has evolved in a global society. 2. Helping students to understand more clearly with the help of case studies. 3. Showing the contribution of various religion reformers in saving their valuable literature.	
Module IV: Impact of Mass Media on Society: 1.a. Social Impact (with social reformers who have successfully used mass communication) b. Political impact (with political leaders who have successfully used mass communication) c. Economic Impact (With how economic changes were brought about by mass communication)	1. Understanding media and its convergence; how new mass media is a back bone to society. 2. To understand how the new mass media allows a huge increase in the volume of communication. 3. In- depth understanding of social media on mass communication.	

d. Development Impact (With how the government has successfully used in mass communication)
2. Impact of mass media on:
    a.   Education,
    b.   Children
    c.   Women
    d.   Culture
    e.   Youth
    f. Development.		

Module V: The New Media and Media Convergence: 1. Elements and features of new media, Technologies used in new media, 2. Major Challenges to new media Acquisition- personal, social and national, 3. Future prospects.	1. Creating awareness in the masses due to the emergence of technology. 2. Technology leads to cultural diffusion, helping students to observe and discuss in the classroom. 3. Understanding how mass media is used for various purposes, how it leads to change in lifestyle, and adopting developments through technologies.	

Faculty Name - Ms. Jyothika Naidu

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: Current Affairs

FYBAMMC SEM-I

Unit No. & Name	Unit Outcomes	Course Outcomes
Module I: Current National stories: 1. Three political stories of national importance. 2. Political Leaders: newsmakers of the season (Brief profile of any three) 3. One dominating economic / business news 4. One dominating environment news stories 5. One story of current importance from any other genre.	1. To learn about political stories of national importance. 2. To also know in detail the contributions of political leaders and their history. 3. To know the environment more nearly covering genres of news.	CO1- To provide learners with an overview on current developments in various fields. CO2- To generate interest among the learners about burning issues covered in the media. CO3-To equip them with a basic understanding of politics, economics, environment and technology so that students can grasp the relevance of related news. CO4- Twenty minutes of newspaper reading and discussion is mandatory in every lecture.

Module II: Polity and Governance: 1. Ministries of Government of India: Autonomous Government bodies 2. Ministry of Home Affairs: Enforcement Organisations, Internal Security, Police 3. Communal tensions: Review of latest episodes of communal tensions. 4. Tensions in J&K: Background, Political players, Update on the current situation 5. Review of any three Central Government projects and Policies.	1. To introduce and understand the government of India. 2. In-depth information about Home Ministry and its Ministerial Team. 3. Covering all the aspects of communalism and communal violence/ tensions. 4. To know more about Jammu and Kashmir and its issues. 5. Understanding in-depth about Governmental schemes, projects and policies.	
Module III: International Affairs: 1. Security Council: Structure and role 2. Issues that currently engage the SC 3. Role of United Nations General Assembly, Other main organs of the UNO. 4. Issues that currently engage the UNO 5. Four conflicts/ issues of international importance.	1. To learn about United Nations Systems. 2. To highlight the key functions and roles of United Nations General Assembly. 3. To discuss and understand international issues and conflicts.	
Module IV: Maharashtra Issues: 1. Political parties reach and challenge political leaders. 2. An update on the current political dynamics of Maharashtra 3. News relating to the marginalized and displaced tribes. 4. The latest news on floods and drought, unemployment, health issues, etc 5. Update two ongoing state projects	1. To learn in detail about the history of polity in Maharashtra. 2. To also understand past and current situations of politics and their political leaders. 3. Introducing students to the marginalized and displaced Tribes. 4. Talking about developmental projects of the state.	
Module V: Technology 1. Mobile Application for Journalists: Mobile apps help in content creation, Examples of Mobile apps used by journalists worldwide 2. Artificial Intelligence and Content Automation Tools: Introduction to AI and data science, Introduction to Content Automation tools, Examples of content automation tools in content creation. 3. Augmented Reality and Virtual Reality in Media: Introduction to Augmented Reality, Introduction to Virtual Reality, Examples of Augmented Reality games and apps, Examples of Virtual Reality news websites worldwide. 4. Digital Gaming Industry:	1. To highlight the use of mobile applications and strategies to capture the attention of readers. 2. To understand the cusp of rapid transformation with digital media. 3. To learn some of the content automation tools and its handlings. 4. Introducing students to Virtual Reality and Augmented Reality. 5. To learn and discuss digital gaming and how it leads to market growth.	

Introduction to Digital Gaming Industry 5. Digital Gaming in India: Overview of Indian digital gaming		

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course : Effective Communication-I

FYBAMMC SEM-I

Unit No. & Name	Unit Outcomes	Course Outcomes
Module I: Introduction to Communication 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. 2. Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication Advantages of verbal communication- Significance of Non-verbal Communication. 3. Oral Communication and Media: Anchoring, voice, modulation, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion. 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 2. To understand the process and types of communication 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. 2. To equip or enhance students with structural and analytical reading, writing and thinking skills. 3. To introduce key concepts of communications.
Module II: Reading- English, Hindi or Marathi 1. Types of Reading: Types of reading -skimming and scanning Reading- examples newspaper/ Magazine article, TV, feature and documentary, radio bulletins, advertising copy,press release in English, Hindi or Marathi. Recognizing aspects of language particularly in media. Importance of spelling. 2. Various aspects of language: Recognizing various aspects of language particularly	1. Understanding reading and its types. 2. Understanding languages and their aspects when communicating through various platforms. 3. To get deeper and broader knowledge about grammar aspects.	

Unit No. & Name	Unit Outcomes	Course Outcomes
related to media, Vocabulary 100 media words. 3. Grammar and Usage: Grammatical structure- spelling, structure of sentences, Active/ Passive voice, tenses, Idioms, Phrases, proper usage of homophones, homonyms etc.		
Module III: Thinking and Presentation 1. Thinking: Types of thinking (rational, logical, critical, lateral, etc.) Errors in thinking, Partialism, Time scale, Egocentricity, Prejudices, adversary Thinking. 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. 2. Understanding types and errors of thinking. 3. To understand presentations and the tips on how to deliver and communicate effectively.	
Module IV: Translation 1. Introduction to Translation: Concept, importance, need for translation, challenges in translation, problems and importance of Information and Technology in translation. 2. Interpretation: Meaning, Difference between interpretation and translation. 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. 2. Understanding the difference between interpretation and translation. 3. To understand the translator's perspective for effectively communicating in the media.	

Faculty Name - Mr. Ajay Chauhan

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course : Foundation Course-I

FYBAMMC

SEM-I

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Overview of India Society: Understand the Multi-cultural diversity of Indian Society through its demographic composition. Population distribution according to religion, caste, and gender Appreciate the concept of Linguistic diversity in relation to the Indian situation	1. To understand the cultural and religion wise composition. 2. To learn the classification of Indian Languages. 3. To understand the regional variations in India.	CO- 1 To introduce students to the overview of the Indian Society. CO-2 To help them understand the constitution of India. 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.

Understand regional variations according to rural, urban and tribal characteristics Understanding the concept of diversity as difference.		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. Concept of Disparity-I Understand the concept of disparity as arising out of stratification and inequality. Explore the disparities arising out of gender with special reference to violence against women, female foeticide (declining sex ratio), and portrayal of women in Media, 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. 2. To learn about social stratification, its characteristics and its types. 3. To understand the class system. 4. To understand the declining sex ratio in India. 5. To learn about the status and portrayal of women in each era.	
Unit-III. Concept Disparity-II Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof, Understand inter-group conflicts arising out of communalism Examine the causes and effects of conflicts arising out of regionalism and linguistic differences.	1. To understand the inequalities of the caste system. 2. To learn about the causes of Communalism in India. 3. To learn about the remedial actions to overcome communalism, linguism, regionalism.	
Unit-IV. The Indian Constitution; The Structure of the Constitution- the Preamble, Main Body and Schedules Fundamental Duties of the Indian Citizen Tolerance, Peace and Communal harmony as crucial values in strengthening the social fabric of Indian society Basic features of the Constitution..	1. To understand the meaning of Preamble and its Characteristics. 2. To learn the structure of the Indian Constitution. 3. To learn about the significance of the Fundamental Duties, its advantages and disadvantages.	
Unit-V. Significant Aspects of Political Processes: The party system in Indian Politics Local self-government in Urban and Rural areas The 73rd & 74th Amendments and their implications for inclusive politics Role and significance of women in politics.	1. To learn about the multi-party system of Indian politics and its evolution. 2. To understand the working of the local self-government. 3. To learn the important features of the Amendments.	

Faculty Name - Ms. Jyothika Naidu

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: History of Media

FYBAMMC SEM-I

Unit No. & Name	Unit Outcomes	Course Outcomes
Module-I Introduction: Evolution of Press in India- 1. Newspaper- The Rise of the Voice of India during British Rule. 2. India's Freedom Struggle and role of Media. 3. Independence and Rise of Newspapers, Newspapers- A Social Aspect for Freedom Struggle, Press Acts of India. 4. Press during the Emergency Period.	1. To learn about the pointers in History of Newspapers in India. 2. To understand about the factors that added to the boom of newspapers in India. 3. To learn the role of the press in India's struggle for freedom. 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. CO2- TO enable the learner to understand the major developments in Media History. CO3- To understand the history and role of professionals in shaping communications. CO4- To understand the values thats shaped and continues to influence Indian Mass Media. CO5- Learner will develop the ability to think and analyze about Media. 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: History of Indian Language Press in India- 1. Rise of Hindi Language Newspapers (detailed report on Vernacular Press in India referring to Newspapers). 2. Regional press and its popularity of Indian Regional Languages in various regions. 3. Vernacular Press Act,1876.	1. To learn about the diversity and growth of Indian Language Newspapers. 2. To understand the effect of the vernacular press act on Indian Publishers. 3. To learn the difference between English newspapers and Language Newspapers.	
Module-III Documentaries and Films: History of DOcumentaries and Films- 1. Genesis of Documentaries and Short Films (Screening of a few documentaries is essential- like Hindustan Hamara, Zalala, The Vanishing Tribe). 2. Role of Documentarians- P.V.Pathy, D.G.Tendulkar, K.S.Hirlekar, Paul Zils and Fali Billimoria, Anand Patwardhan. 3. Evolution of Film Making in India- Brief History, Photography to Moving Films. 4. Origin of Hindi Cinema. 5. Origin of Short films to what it is today, Role of YouTube and WhatsApp.	1. To learn about different types of Documentaries. 2. To learn how to make documentaries. 3. To understand about Indian Documentary and the struggle for Indian Independence. 4. To learn about the New Media and their roles in Movie making.	

6. Great Masters of World Cinema.		

Module-IV Broadcasting:
History of Radio and Television in India:
1. Radio and Television as Mass Media.
2. Radio and Television Broadcasting-
   a. The beginning of Radio and Television Shows.
   b. A New Era in Broadcasting in India.
   c. Satellite Television and Privatization in Broadcasting.
   d. Advertising in India.
3. Internet Protocol Television.
	1. To study the history of Prasar Bharti Act.
	2. To study the functions and objectives of Radio.
	3. To study the Business model of cable TV industry.
	4. To understand the key recommendations of TRAI.	

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

Faculty Name - Mrs. Akansha Joshi

Program: Bachelor's 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
Introduction to Visual Communication:
1. History and Development of Visuals
2. Need and Importance of Visual Communication
3. Visual Communication as a process and as an Expression, Language and Visual Communication
4. Visible Concepts:
   a. Plans and Organizational Charts
   b. Maps
   c. Chronologies
5. Invisible Concept:
   a. Generalization Theories
   b. Feelings or attitudes
	1. To understand communication and the aspects.
	2. To introduce students to VISUAL AIDS and the history of visuals.
	3. Understanding visual communication in detail with various connections.
	4. To learn about visible and invisible concepts.
		CO1- To provide students with tools that would help them visualize and communicate.
		CO2- Understanding Visual Communication as part of Mass Communication.
		CO3- To acquire basic knowledge to be able to carry out a project in the field of visual communication.
		CO4- To acquire basic knowledge in theories and languages of Visual Communication.
		CO5- The ability to understand and analyze visual communication from a critical perspective.

Module	Objectives	

Module II: Theories of Visual Communication
1. Sensual Theories
   a. Gestalt
   b. Construction
   c. Ecological
2. Perceptual Theories
   a. Semitics
   b. Cognitive
	1. To extend the knowledge of the students by discussing theories and case studies.
	2. To make them understand how visual cortex work to create unified perception.
	3. Knowing about complexity and multifaceted cognitive processes.	

Module III: Impact of Colors
Colors and Design in Visual Communication
   a. Color Theory
   b. Psychological Implications of color
   c. Colors and Visual Pleasure
   d. Elements of Design
	1. To understand theories related to color for visuals.
	2. Understanding the psychological influence of color on perception.
	3. Understanding in detail visual plans and designs.	

Module IV: Channels of Visual Communication
Tools/ Mediums of Visual communication:
   a. Painting and Photography
   b. Film and Television, Documentaries, Script Writing an Visualization
   c. Film and Television, Documentaries, Script Writing an Visualization
   d. Comics and cartoons, Digital Images, Animation and VFX
   e. News Papers, Advertisements, Photojournalism
   f. Folk and Performing Arts, Theatre
	1. Understanding of various tools of visual communication.
	2. Understanding various styles and types of visual communications.
	3. To strategize visuals for mass appeals.
	4. To understand the perception and structure of each platform.	

Module V: Language and Culture in the age of Social Media
Visual Communication in the Age of Social Media:
   a. Ethics
   b. Impact of Language and Culture, Images and Messages, Signs and Symbols (GIF, etc.)
   c. Audience Behavior
   d. Citizen Journalism, Going Viral
   e. Visual Stereotyping in Social Media
	1. To adapt to new changes with the advent of technologies.
	2. Understanding the ethics and audience behavior.
	3. Understanding the role of stereotyping in social media.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's 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: 1. Introduction to Advertising- Evolution, Importance, Features, Benefits, Limitation, Effects and 5 M's of Advertising. 2. Types Of Advertising- Consumer, Industrial, Retail, Classified, Corporate, Public Service, Generic, National, Global, International, Social (CSR) and Advocacy. 3. Ethics and Laws in Advertising- Puffery, Subliminal, Weasel claim, Surrogate, Shocking ads, Controversial, Comparative, Advertising code of ethics, Regulatory bodies, Laws and regulations. 4. Social, Cultural and Economic impact of Advertising- Women and advertising, Children and advertising, Senior citizen and advertising, Pop culture and advertising. 5. Theories- Stimulus theory, AIDA, Hierarchy, Means-Ends Theory.	1. To understand the evolution of advertising 2. To relate with the advantages & disadvantages to consumers, traders manufactures and society as a whole. 3. To understand advertising laws and ethics 4. To understand various types of advertising	CO1- To provide the students with basic understanding of advertising, growth, importance and types. CO2- To understand effective advertising campaigns, tools, models etc. CO3- To comprehend the role of advertising, various departments, careers and creativity. CO4- To provide students with various advertising trends, and future.
Module-II Integrated Marketing Communication and Tools: 1. IMC- Emergence, Role, Tools, Communication process, The IMC Planning Process. 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. 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. 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.	1. To comprehend the concept of IMC 2. To understand the role and various tools of IMC 3. To be able to understand the difference between print media & Outdoor media 4. To get basic knowledge about Radio & Television as a means of mass communication and advertising	

5. Sales Promotion and Direct Marketing- Growth and Types of Sales Promotion, Advantages and Disadvantages, Growth of Direct marketing and its tools.		
Module-III 1. Introduction to Creativity-Importance of Creative process, Creative strategy development determining message theme, Big idea, Positioning strategies, Types of Appeals. 2. Role of different elements in ads-Logo, Jingle, Company signature, Slogan Tagline, Illustration, Creating Radio commercial- words, sounds, clarity, coherenced, etc. 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 2. To make students comprehend the different elements in an advertisement 3.	
Module-IV Types of Advertising Agency, Department, Careers and Latest Trends in Advertising. 1. Types of Advertising Agency- Full service, Creative Boutique, Media buying agency, In-house agency, Specialized agencies and others. 2. Various departments in an agency- Account handling, Production, Art, Copy, Media, Public relation, Human resources, Finance and others. 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 2. To be able to know the various departments in an ad agency 3. To understand the latest trends in career in advertising industry	

Faculty Name - Ms. Namrata Singh

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: Content Writing

FYBAMMC SEM-II

Unit No. & Name	Unit Outcomes	Course Outcomes
Module-I Foundation:	1. To learn and revise English	CO1- To provide students with

1. Grammar Refresher- With special emphasis on use of punctuation, preposition, capital letters and lower case. 2. Vocabulary building- Meaning, usage of words, acronyms. 3. Common errors- Homophones and common errors in English usage. 4. Essentials of Good writing- With emphasis on writing with clarity, logic and structure. 5. Phrases and Idioms- Creative usage of phrases and idioms.	grammar. 2. To practice vocabulary building in order to understand its aspects and significance. 3. Learning about common errors while communicating in the English language and also understanding the requirements for good writing. 4. In-depth knowledge of creativity exposure in creating phrases and idioms.	tools that would help them communicate effectively. CO2- Understanding crisp writing as part of Mass communication. CO3- The ability to draw the essence of situations and develop clarity of thought.
Module-II Editing Skills 1. Redundant words- Identifying redundant words and phrases and eliminating these. 2. Editing sentences- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors. 3. Editing captions- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors. 4. Editing Headlines- Editing redundant words/phrases and replacing wrong words/punctuation/grammatical errors. 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. 2. To boost students to write and edit captions that are catchy and attractive. 3. To learn to edit headlines with proper words, and grammar, also replacing words that are simple and clear in meaning. 4. To learn how to structure a story and editing tips for creating a flow and tightening the copy or the story.	
Module-III Writing Tips and Techniques 1. Writing tickers/scrolls- For Television news. 2. Writing Social Media media post- Twitter and for other social networks. 3. Writing briefs/snippets- News briefs, Lifestyle and Entertainment snippets. 4. Caption writing- Picture stories, etc. 5. Writing Headlines- News headlines and features headlines	1. To understand how to write tickers for the television medium. 2. Understanding writing techniques like captions, hashtags and content for social media posts and other networks. 3. Understanding in detail writing methods for writing headlines and content briefs along with its softwares and tools.	
Module-IV Presentation Tools and Techniques 1. Powerpoint Presentation: Uses of Powerpoint Tools Powerpoint to Pdf Powerpoint to self animated presentation Auto-timing of powerpoint presentation 2. Infographic: Colour selection	1. Understanding PowerPoint presentations, their related terms and tools. 2. Understanding in detail infographics and their impact while making presentations. 3. Tips on how to make a presentation convincing to listeners and viewers. 4. To learn terms and concepts	

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

Faculty Name - Ms. Namrata Singh

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: Effective Communication-II

FYBAMMC SEM-II

Unit No. & Name	Unit Outcomes	Course Outcomes
Module-I Writing 1. Report Writing: Report Writing (English, Hindi or Marathi) General report and News report writing-Basics and Format (Headlines, Sub-headline, Various type of Report) 2. Organizational Writing: (English, Hindi or Marathi) Internal communication, E-mail- E-mail Etiquette, Overcoming Problems in E-mail Communication, Stakeholder communication,	1. To learn about report writing and its various elements. 2. Understanding in-depth headlines and their features. 3. To make students understand the need to communicate with internal and external publics of the organization company through types of organizational writing. 4. Understanding publicity in detail.	Co1- To make the students aware of the use of language in media and organization. CO2- To equip or enhance students with structural and analytical reading, writing and thinking skills. CO3- To introduce key concepts of communication.

Unit No. & Name	Unit Outcomes	Course Outcomes
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. 3. Writing for Publicity Materials: (English, Hindi or Marathi) Headline, Sub-headline, Body copy, Slogan, Jingle, Radio spot.		
Module-II Editing Editing: (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 (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. 2. To understand how editing is different from medium to medium. 3. To elaborate on grammar aspects for communicating effectively.	
Module-III Paraphrasing and Summarizing 1. Paraphrasing- Meaning, How to use paraphrase in communication, Paraphrase in plagiarism, Translation 2. Summarization- Summarizing content, the points and sub-points and the logical connection between the points.	1. To understand paraphrase in writing communication. 2. The role of plagiarism while paraphrasing and translations. 3. Understanding summarisation.	
Module-IV Interpretation of Technical Data 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: Bachelor's of Arts in Multimedia & Mass Communication

Course: Foundation Course-II

FYBAMMC SEM-II

Unit No. & Name	Unit Outcomes	Course Outcomes

Unit-I 1. Globalisation and Indian Society: Understanding the concepts of Liberalization, privatization & globalization; Growth of Information technology and communication and its impact manifested in everyday life; Impact of globalization on industry-changes in employment and increasing migration; Changes in agrarian sector due to globalization; Rise in Corporate farming and increase in farmer's suicides.	1. To study the elements of liberalisation, its advantages and disadvantages. 2. To study the impact of Globalization on Indian Inductries. 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. CO-3: To acquaint them with the socio-political problems of India. CO-4: To understand stress and conflicts. CO-5: To manage stress and conflicts in contemporary society. CO-6: To learn about Contemporary Societal Challenges
Unit-II 2. Human Rights: Concept of Human Rights- Origin and Evolution of the concept; The Universal Declaration of Human Rights; Human Rights constituents with special reference to Fundamental Rights stated in the Constitution	1. To study the basic characteristics of Human Rights. 2. To understand the evolution of Human rights. 3. To study the classification of the provisions of UDHR.	
Unit-III 3. Ecology: Importance of Environment studies in the current developmental context; Understanding concepts of Environment, Ecology and their interconnectedness; Environment as natural capital and connection to quality of human life; Environmental Degradation- causes and impact on human life; Sustainable development- concept and components; poverty and environment.	1. To study the concept and disciplines of Ecology. 2. To study the structure of Ecosystem and causes for the environmental degradedation. 3. To learns about Sustainable development and the global need for the Sustainable development.r	
Unit-IV 4. Understanding Stress and Conflict: Causes of stress and conflict in individuals and society; Agents of socialization and the role played by them in developing the individual; Significance of values, ethics and prejudices in developing the individual.	1. To learn about the levels of Stress. 2. To study about the types of Organizational conflict. 3. To understand the measures for resolving aggression and violence in socirty.	
Unit-V 5. Managing Stress and Conflict in Contemporary Society:	1. To learn the assumptions & limitations in Hierarchy of Needs Theory. 2. To study the need for peace and harmony in India.	

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

Faculty Name - Ms. Jyothika Naidu

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: Introduction to Journalism

FYBAMMC SEM-II

Unit No. & Name	Unit Outcomes	Course Outcomes
Module-I History of Journalism in India: Changing face of Journalism from Guttenberg to New Media. Journalism in India- Earliest Publications, The rise of Nationalist Press, Post 1947 The Emergency 1975, Post Emergency Post Liberalization of the Economy boom in Magazines, Niche Journalism How Technology Advancement has helped Media New Media with special reference to Rise the citizen Journalism.	1. To learn the history and eras of journalism along with challenges. 2. To understand the new media and technology advances. 3. To briefly understand the news transmission and gathering process. 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-II News and its Process: Definitions of News, The News Process from the Event to the Reader What makes a good story? Anatomy of a news story Types of Beats: Crime, Environmental, Entertainment, Educational, Agricultural, Sports, etc.	1. To get knowledge about news and the process of gathering news. 2. Elements required for a good news story. 3. Understanding the beats and parts of a news story in detail.	
Module-III Principles and Format: What makes a Great Journalist- Objectivity, Accuracy, Without fear or favour, Balance Proximity Difference between a PR and a Journalist Criteria for Newsworthiness	1. Understanding the avenues to explore in journalism. 2. To learn about journalists/ reporters and their practices on various platforms. 3. Understanding the types of news. 4. To make students understand the difference between PR and	

Unit No. & Name	Unit Outcomes	Course Outcomes
Hard News/Soft News and blend of the two News Reports, Features Editorials	journalism.	
Module-IV 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. 2. To encourage students to participate in grabbing opportunities related to the field.	
Module-V Covering an Event (Flip Class) Background Research Finding a News Angle Capturing the Right Pictures for a Photo Feature Writing Headline, Captions and Lead.	1. To make students understand the importance of a piece of information to convert it into the news. 2. The unbiasedness and impartiality objectives must be cleared among the students. 3. To make understanding students to cover news from all angles and also the format in writing news.	

Faculty Name - Ms. Jyothika Naidu

Program: Bachelor's of Arts in Multimedia & Mass Communication

Course: Media, Gender & Culture

FYBAMMC SEM-II

Unit No. & Name	Unit Outcomes	Course Outcomes
Module-I I. Introduction to Cultural Studies: 1. Introduction to subject, Evolution of culture, Need of cultural studies, Features and Significance of cultural studies. 2. Concepts related to culture-Acculturation, enculturation, Discussion on ethnocentrism, cultural relativism, cultural shock, 3. Theories: Stuart Hall: encoding and decoding, Techno culture and risk – Ulrich Beck,, Media- commodification, John Fiske- Culture & Industry. Feminism & Post Feminism.	1. To understand the evolution of culture and significance of Cultural studies and media. 2. Brief learning on the concepts related to culture. 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. CO2- To understand the association between the media, gender and culture in the society. CO3- To stress on the changing perspectives of media, gender and culture in the globalized era.
Module-II II. Culture & Media: 1.Discussion of Meme, Representation, articulation, popular culture, Power,	1. To understand and discuss social constructionism and its terms. . 2. To understand culture from various aspects such as politics, religion- technology and media.	

cyber culture, Media and its impact on the culture. 2. Debate on Impact of media on culture. 3. Culture industry and communication - with reference, to film, TV, social media, Discussion on social media, advertisements etc., 4. Recent trends in Culture consumption: Changing values, Ideologies and its relevance in the Contemporary Society. 5. Construction of culture- social, economic, political, Construction of culture - religion and technology	3. Understanding how power is an integral element of culture and features. 4. To learn recent trends in culture consumption.	
Module-III III. Gender & Media Culture: 1. The influence of the media on views of gender (theme, under representation, Stereotypes, Women & Men, Stereotypes Images, Roles, etc) 2. Role of social construction of gender, Changing Attitudes and Behavior for empowerment of Women: Movements of Change.. 3.Gender equality and media, Hegemonic masculinity in media. 4. Hegemonic Masculinity in Media. 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. 2. To discuss and have better understanding on gender equality with reference to the media. 3. To relate the gender challenges on various platforms.	
Module-IV IV. Globalization & Media Culture: 1. Activity, Digital Media culture, Recent Trends. 2. Media and Globalization, Global economic flows, global cultural flows, homogenization & fragmentation, Glocalization, creolization, globalization & power., Case study, Presentation. 3. Media Imperialism. 4. Consumer Culture & Media in the Era of Globalization. 5. Globalisation and Local culture- Issues and Perspectives, Impact of global culture and its relevance in media and gender.	1. To know about current trends of globalization. 2. To discuss case studies and concepts relation to global culture. 3. Understanding about consumer culture and its evolution. 4. Elaborating the aspects related to issues and impact of cultures along importance in media and gender.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: Introduction to Public Relations

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I a. Definition of Public Relations (PR) i. Nature ii. Scope iii. Stakeholders b. Evolution of PR. With a special focus on India	1. To study briefly about Public relations. 2. To study the scope and benefits of Public relations. 3. To study how PR helps to build Corporate reputation.	CO-1 To prepare students for effective & ethical public communication on behalf of organisations. CO2- To help students acquire basic skills in the practical aspectsof Media Relations & Crisis Management. CO3- To equip students with basic skills to write & develop Press Release& other PR communication. CO4- To design a PR campaign.
Unit-II PR, Propaganda, Public Opinion, and Publicity	1. To study Public relations and propaganda. 2. To study the publicity measurement.	
Unit-III PR and Marketing PR and Advertising, PR and Branding	1. To study PR marketing, advertising. 2. To study branding through various examples.	
Unit-IV Objectives, Functions of PR, Skills needed to be a PR Professional.	1. To study about crisis communication. 2. To study the objectives of Public relations. 3. To study the functions of Public relations. 4. To study the qualities of a good PR person.	
Unit-V a. In-house PR and PR consultancy: Advantages and Disadvantages b. Internal and External PR: With a focus on Corporate Communications	1. To study the agency business and pitch. 2. To study the cost of PR activities and hiring a PR agency. 3. To study the external relationship of a PR.	

Unit-VI Corporate Image Management	1. To study about corporate identity. 2. To study about the types of Corporate identity. 3. To study the reasons for Image Management.	
Unit-VII PR Tools: I. Media Tools: a. Press Release b. Press conference c. Others II. Non Media: a. Seminars b. Exhibitions/ trade fairs c. Sponsorships d. Others III. Content Development in PR: a. Development of profile: Company/ Individual b. Drafting a Pitch note/ Proposal c. Writing for Social Media	1. To study the formats of Press Releases. 2. To study content writing in PR. 3. To learn about Media briefing.	
Unit-VIII New age PR: Digital PR (To be Taught with contemporary cases)	1. To study the factors about new media. 2. To study about digital tools. 3. To study the use of new media through case studies.	
Unit-IX PR process with emphasis on developing a PR campaign	1. To study PR Campaign planning. 2. To study the effectiveness of the PR campaign. 3. To study the aim and objectives of the campaign.	
Unit-X Crisis communication (With Case Studies) a. Preparing a crisis plan b. Handling Crisis	1. To study briefly about the crisis in any company. 2. To understand the crisis communication team. 3. To study about the Collateral materials.	
Unit-XI Social Responsibility and PR (With Case Studies)	1. To study briefly about the CSR activities. 2. To study the barriers to the CSR. 3. To study the relation between CSR and Public relations.	
Unit-XII Ethics in PR: Code of conduct (With Case Studies)	1. To study the code of ethics. 2. To study the public relations society of America. 3. To study the code of professional standards for the practice of PR.	

Faculty Name - Ms. Meenakshi Nadar

Program: Bachelor's in Mass Media:

Course: Introduction to Creative Writing

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Section- I **Unit-I** A brief Introduction to Creative Writing Aspects of Creativity in Literature, Media, Public Speeches, Presentations, Interviews 1. Formal structure of the short story: a. Theme b. Plot c. Character d. Point of view e. Setting Analyse some short stories preferably contemporary on the basics of each of these formal aspects.	1. Brief introduction to creative writing in literature. 2. Understanding various aspects of writing a story. 3. Analyzing plot of stories through various examples.	**CO1-** To design a PR campaign. CO2- To develop further and build upon the writing and analytical skills acquired in Semesters I & II CO3- To acquaint students with basic concepts in literary writing. CO4- To prepare students to write for the media.
Unit-II Formal aspects of Poetry: a. Theme b. Diction c. Tone d. Imagery e. Symbolism 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. 2. Briefly understanding the figures of speech to give literary effects to poems.	
Unit-III Formal aspects of Drama a. Theme b. Plot c. Character d. Dialogue 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. 2. Different play/drama writings were analyzed for brief understanding.	
Unit-IV Publication Aspects: a. Understanding the intended readership b. Revising, editing and proofreading c. Exploring the market for a suitable publisher	1. To understand the working of a publication. 2. Focusing on making a proper manuscript. 3. Learning literary rights as per law.	

Unit No. & Name	Unit Outcomes	Course Outcomes
d. Preparing the manuscript as hard and soft copy e. Intellectual property rights f. The financial aspects of publication		
Unit-V Scripting, Screenplay and dialogue writing focusing on: a. radio b. television c. short film/ documentary/ and film These are to be discussed with special reference to a. the storyboard b. the two-column scripts c. interactive scripts d. narration scripts in the screenplay format	1. To understand writing for the entertainment and advertising industry. 2. Discussion on writings for various scripts.	
Unit-VI Writing for the Internet, with special reference to: a. alerts b. blogs c. news on the net	1. To learn and understand content writing for the Internet.	

Faculty Name - Ms. Kenali Jajal

Program: Bachelor's in Mass Media:

Course: Introduction to Cultural Studies

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction to Cultural Studies: a. Evolution, Need and Significance of Cultural Studies: Key concepts in Cultural Studies-Representation, Materialism, Non-Reductionism, Articulation, Power, Popular Culture, Texts and Readers, Subjectivity and identity b. Theories and its relevance in Media: Diffusionism- Kroeber Cultural Materialism- Raymond Williams Functionalism- Malinowski, and R. Brown	To introduce to the students to various cultures, concepts and its need in the society. 2. Understanding cultural theories and elements on human behaviour of Culture (values, customs, beliefs and attitude) 3. To learn Indian as well as Global cultures.	CO-1 To create awareness on cultural theories and its relevance in media CO2- To discuss the importance of cultural studies and its role in mass media. CO3- To understand the cultural concepts and its impact on the media

Social interaction- G. H Mead and Cooley Popular and Mass Culture, Circuit of Culture, Encoding and Decoding- Stuart Hall Culture and Industry- John Fiske		
Unit-II a. Construction of Culture Social Economic Political Religion Technology b. Re-presentation and media culture: Language Gender Race Class Ethnicity Kinship and terminology	1. To understand how to construct aspects of the culture and its impact on society. 2. To get in-depth knowledge about socialization and exchange of cultures at various places in the community. 3. To create awareness among students how media representations create a real mirror that reflects society and culture.	
Unit-III Globalisation and Cultural Studies: a. Popular Culture- Trends, Transformation and its Impact of Society b. Commodification of Culture and its Impact on Lifestyle c. Changing Values, Ideologies and its Relevance in Contemporary Society d. Global Economic Flow, Global Cultural Flows, Homogenization and Fragmentation, Glocalization, Creolization, Globalization and Power e. Digital Media Culture	1. To explore the globalization, media and learning of cultures. 2. To understand the changes in culture; results changes in lifestyle of the masses. 3. To introduce Digital Media culture and media multitasking.	
Unit-IV Cultural Expressions and Media: a. Oral Traditions- Folklore b. Fashions and Fad c. Cuisine d. Festivals e. Sports f. Art and Architecture	1. To understand how mass media is powerful for directing people's values and rules. 2. To discuss in-depth the changes in the Contemporary Era. 3. To broaden the knowledge about changes throughout being the constant factor.	

Faculty Name - Mr. Hitesh Gadhia

Program: Bachelor's in Mass Media:

Course: Understanding Cinema

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Module 1: Introduction to Cinema as a Medium, Language of Cinema, Cinema Narratives, Evolution of Cinema covering Hollywood as well as Indian Cinema from the early beginnings to its status today	1. To understand cinema and its transformation. 2. Broadening knowledge to know various historical, technical and cultural language in films. 3.In-depth knowledge on Hollywood and Indian Cinema.	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. CO2- The students should get to study the similarities and differences between various movie cultures. CO3- The students should get to study Indian cinema through its similarities and differences with both Indian & Western traditions of art and culture.
Unit-II Module 2: 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 2. To study and understand the important movements across globe 3. To critically analyze and appreciate cinema as an art.	
Unit-III Module 3: In the Indian Context: Contribution and Impact of Regional Cinema	1. To trace the history and development in regional cinema. 2. "Entertainment" an important contribution by regional cinema 3. To cut geographical, social and cross- cultural barriers of Cinema of India.	
Unit-IV Module 4: In the Indian Context: Contribution and Impact of Regional Cinema	1. To highlight the various cultures and deal with local issues. 2. To grasp how much the film industry in India has influenced each other behaviors and thoughts 3. To connect the Indian Diaspora	
Unit-V Module 5: Basic Introduction to the TECHNOLOGY used in Cinema Introduction to few important TECHNIQUES employed by different filmmakers. Introduction to the BUSINESS with prevailing practices in the production and marketing of films. NOTE: A special mention to be made to the contribution and role of Digital technologies in the Modern Film making Process.	1. The flexibility and immediacy in film making techniques. 2. An in-depth insight about Digital Movies, technologies used in virtual reality 3. Marketing budgeting and Film promotion important aspects in film making.	

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-VI Module 6: 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) 2. To learn the production stages in films. 3. Encourages students with some departments in real career opportunities.	

Faculty Name - Mr. Amir Ahmed

Program: Bachelor's in Mass Media:

Course: Introduction to Media Studies

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I a. Relevance of Media Studies in Contemporary Times b. Historical perspectives to Media Studies	1. Learning media and its forms of communication and the representation of knowledge through various channels. 2. To learn and understand the moral compass the mass media holds on society. 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 CO2- To introduce students to the study of contemporary forms of mediated communication CO3- To introduces students to a variety of analytical perspectives and theories related to media CO4 - To understand the impact of media on individual attitude, values, behavior and geopolitics CO5- To study the impact of new media technologies and pop culture in the field of advertising CO6- To understand the impact of globalization on media
Unit-II The Mid- 20th Century Media Evolution Theory: a. Agency Setting b. Uses and Gratification c. Two-Step How d. McLuhan- Medium is the message e. Foucault- Power & Authority f. Propaganda Model	1. To study the democratic society as an instrument for public opinions. 2. Understanding various theories by theorists for the welfare of mass media and society. 3. To get in-depth knowledge about professionalism in the field of news and news	
Unit-III Media and Globalisation: a. Division and contradiction in the Global Information infrastructure b. Racist Ideologies and the Media (Stuart Hall) c. Media and Diaspora	1. Understanding the new technologies transforming the world of media. 2. To study the technological era- a boon to society across the globe. 3. To learn various theories in relation to the media and its future.	

d. New Media Theory e. Cognitive Theory		
Unit-IV Media and its Commercial Impact: a. Advertising Magazine Culture and the new man b. Trends in Media c. Feminist Strategies of Detection d. Media Power and Political Culture	1. To learn that media and corporate are closely related. 2. To explore the currents in the media. 3. To understand and discuss a comparative study on media and political culture and impact on audiences.	
Unit-V Constituents of Media: a. Language b. Religion c. Discourse d.Technology	1. Students get in-depth knowledge about social changes and its impact on change in language. 2. To learn about mythologies and how transmitted through various forms of media.. 3. To understand how media are the extensions of human perceptions.	
Unit-VI Challenges to Contemporary Media: a. Media and Consumerism b. Intellectual Property and New Media c. Young People as consumers of Advertising Art	1. To understand and get an overview of challenges faced by the media industry. 2. Students get knowledge about media and consumerism and impact on masses. 3. To foster an environment in creativity and innovation.	

Faculty Name - Mr. Sohrabh Vakharia

Program: Bachelor's in Mass Media:

Course: Advanced Computers

SYBMM SEM-III

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Basics of Online Marketing Building an online marketing foundation Planning and Building the Website Content Marketing Blogging Social Media Marketing Web Analytics Search Engine Optimization/ How Google Works Online Advertising/ Search Engine Marketing. (Google Adwords) Email Marketing/ Webinar Online Public Relation	1. Learning eMarketing and its importance. 2. To understand how Google Search Engine Works and its types. 3. Learn ORM, SEO, Affiliate Marketing, and Content Marketing. 4. Learning Blogging, Blog SEO, Podcast, and Vodcast. 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. CO2- To train them with the software knowledge required in the above-mentioned Industries.

Managing Multitasking Web Marketing		
Unit-II Basics of Animation Understanding Animation (Adobe Flash may be used) Working with FIlls and Outline, Layers and Pen tool Understanding Layers and Symbols Working with Text and Mask Layers Creating Frame by Frame Animation Motion Tweening and Motion Editor Classic tweening and Shape Tweening Working with Sound and Video and Publishing a Movie	1. Understand Adobe WorkSpace. 2. Create an Animation using Adobe Flash. 3. Explore all Flash Tools. 4. Making Butterfly Animation. 5. To understand Motions Graphics, Sound, and Video.	
Unit-III HTML 5 with CSS Introduction to the Web Introduction to HTML5 Formatting Text Using Tags Creating Hyperlinks and Anchors Introduction to CSS3 Formatting Using Style Sheets Displaying Graphics and CSS3 Animation resting Navigation Aids and Division BasedLayout Creating Tables HTML forms HTML Audio and Video	1. To understand WWW (World Wide Web), Domain, and How to register a Domain name? 2. Learn HTML Structure, HTML List, Anchor Tag, and Table Tag. 3. Student will learn Align page, Cell Spacing, Width of Table, and Adding Images. 4. Learning to ad video and Audio to the website. 5. Understanding JavaScript, Syntax and JavaScripts function.	
Unit-IV Web Designing Getting Started with Web Designing (Dreamweaver CS 6 may be used) Working with Lists, Tables, Links and Frames Forms, CSS, Behaviors and Snippets Working with Multimedia Objects Testing a Website Working with Dynamic Websites	1. To understanding Dreamweaver Welcome Screen and Workspace. 2. Learning PHP, Cold Fusion, Active Server Page, Java EE, and ASP.NET. 3. Creating HTML Page.	
Unit-V Introduction to Adobe Audition Working with Audio Editing Working with Multi- track Editor and Recording Audio Working with Audio Effect Introduction to Digital Video Editing Starting with Adobe Premiere Pro CS6 Capturing Clips and USing Tools Video Editing Animating, Effects, Transitions and Exporting Video	1. To learning Recording Audio, Editing the Audio and Audio Mixing with the help of Audion. 2. To understanding Adobe Premier Pro. 3. Learning capturing footage, Capturing DV or HDV Video. 4. Editing video and audio and effects plug-ins.	

Working with Audio Creating Titles and Superimposing Previewing and Rendering Output		
Unit-VI Basics of 3D Animations Overview Working with Objects Transforming and Grouping Shapes and Modifiers Compound Objects Low Poly Modelling Creating Models with Nurbs Patch Modelling and Surface Tool Modifying Objects Integration of Various Modelling Techniques Creation of Morph Targets.	1. Understanding Animation Production. 2. Understanding 3D Max, Maya, NewTek LightWave 3D, Cinema 4D, and SideFX Houdini 3D Animation Software. 3. Understanding the Vision of Digital India initiative.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: Organizational Behavior

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Nature of Organisational Behaviour: Definition of Organisation and Types Concept of OB and its scope Models of Organisational Behaviour	1. To study about organization, its meaning and types. 2. To study the fundamental concepts of Organizational behavior. 3. To study the goals of Organizational behavior.	CO1- To impart knowledge of the basic concepts and facets of organisational behaviour. CO2- To highlight the role of psychological factors & process at work. CO3- To foster management skills among students.
Unit-II Organizational Structure and its Environment: Organisation and its environment Formal Organisation: Design and Structure Divisions of work and task interdependence	1. To study the elements of Organizational structure. 2. To study the factors influencing Organizational structure. 3. To study the employee behviour with respect to Organizational structure.	
Unit-III Organization Culture: Sources of Organisational Culture Types of Organisational Culture Manifestation and Managing Organisational Culture	1. To study the characteristics of Organizational culture. 2. To study the functions of Organizational culture. 3. To study the effects and changing of Organizational culture.	

Workforce diversity- Gender, Ethnic and Community issues and personality factors		
Unit-IV Motivation: Theories of Motivation- Need and Process Theory Application of Motivation Theories	1. To study the application of the motivation theories. 2. To study the relationship between different theories of motivation and global implications.	
Unit-V Group Dynamics in Organisation: Concepts of group and types if group Group norms and Group cohesion Concept of teamwork	1. To study the stages of Group development. 2. To study about the properties of the group. 3. To study about the types of team and the creative effective teams.	
Unit-VI Decision making: Decision making- definition and process Group Think, risky shift and Polarisation Techniques for improving decision making- MIS (Management Information System)	1. To study the varieties of Organizational decisions. 2. To study group decision making, its advantages and disadvantages. 3. To study different techniques of group decision making.	
Unit-VII Leadership: Importance and Characteristics of control Qualities of an Effective Leader Leadership Style and effective Communication	1. To study the various theories of leadership. 2. To study about charismatic and transformational leadership. 3. To study women and leadership.	
Unit-VIII Dynamics of Stress: Concept Causes and Effect Coping Strategies	1. To study the nature of Stress. 2. To study the organizational inside and outside stressors. 3. To study stress in dual-career families.	

Faculty Name - Ms. Kenali Jajal

Program: Bachelor's in Mass Media:

Course: Introduction to Advertising

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I A brief history of Advertising and the Current Status of Advertising The Basic Characteristics of Advertising The Limitations of Advertising Effects of Advertising on the Economy, on Society The Ethical Issues in Advertising The Criticism of Advertising	1. To understand advertising and current trends. 2. To study the impact of advertising on economy, society and masses. 3. To introduce students to learn and understand Ethical issues and Criticism of Advertising.	CO-1 To introduce Students to the basic steps in advertising CO2- To help students understand the creations of an ad campaign CO3- To understand the structure of an Ad Agency
Unit-II The Advertising Agency Structure of an Ad Agency The Role of an Ad Agency The various Departments of an Ad Agency, Account Planning, Research, Art Dept. (Elements of Copywriting and Visualisation-Layout) Media Dept. and Production Dept. The Functions of each Department (in brief)	1. To introduce students in the real world of Advertising Agencies 2. To understand the structure of an Advertising Agency 3. To learn the functioning of each departments of an Advertiisng Agency in brevity	
Unit-III The Role of Advertising in the Marketing Mix The Communication Process The Steps Involved in Creating an Advertising Strategy (The Marketing Brief, Pre-Campaign Research, Copy Brief and Media Brief) Post-Campaign Research	1. To learn and understand the role of advertising in Marketing Mix. 2. To study steps involved in creating an Advertising Strategy. 3. To study and gain knowledge on Campaign Research (Pre, During campaign and Post)	
Unit-IV Concepts: IMC- Dagmar- USP-AIDA	1. To study about IMC and concepts overview 2. To study IMC and its importance in mass media 3. To study various models, theories related to marketing and consumer decision- making process.	
Unit-V The need for Research Copy Research, Pre Testing, Post Testing, Concept Testing, Product Research, Media Research	1. To learn about research and its need. 2. To understand various techniques used in Copy Research 3. To understand media and its platforms for effective advertising through Media Research	
Unit-VI	1. To study Advertising budget and	

Unit No. & Name	Unit Outcomes	Course Outcomes
The Advertising Budget How the Agency earns its income The Relationship between the Client- Agency- Media- Consumers.	its related concepts. 2. To understand revenue generation techniques of an Agency. 3. To understand internal and external stakeholders relationships	

Faculty Name - Ms. Shilpi Dey

Program: Bachelor's in Mass Media:

Course: Introduction to Journalism

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Changing the face of Journalism from Guttenberg to New Media	1. To learn the history of journalism 2. To study various aspects in journalism 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.
Unit-II Journalism in India: Earliest Publications The Rise of Nationalist Press Post-1947 The Emergency 1975 Post Emergency Post Liberalization of the Economy Boom in Magazines Niche Journalism How Technology Advancement has helped Media?	1. To understand practise of journalism in India 2. To understand in depth the hurdles faced by journalist during Indira Gandhi governance 3. To learn the advancement in technology and its impact on media	
Unit-III New Media with special reference to rising the Citizen Journalism	1. To understand Citizen journalism and its key concepts 2. Discussing how citizen journalism has changed journalism 3. Factors rising citizen journalism	
Unit-IV Definition of News; Hard News/ Soft News and Blend of the two	1. To understand news and its importance in society 2. To learn various types of news 3. To also learn and discuss the on-going scenario as case studies and examples	
Unit-V The news process from the event to the reader	1. Understanding news and its definitions 2. To understand its importance in masses and its sustainability 3. Understanding its process from	

	event to how it reaches the reader	
Unit-VI Criteria for newsworthiness	1. To understand news value 2. To study how source credibility also matters 3. To study in depth newsworthiness and its related concepts	
Unit-VII News Reports; Features; Editorials	1. To learn news reports 2. To learn its features 3. To study about editorials and its role	
Unit-VIII Components of a News Story Finding a New Angle Writing a Lead Types of Lead Inverted Pyramid Format	1. To study what is a news story 2. To learn how to investigate and new angles to the story 3. To learn leads in news story and its types	
Unit-IX Role of Journalism with special emphasis on its Role to Educate: Interpretation Transmission of Values Development Entertainment	1. To learn and introduce in the world of journalism 2. To learn its responsibilities towards educating and other aspects to the society 3. To understand its impact on society	
Unit-X Principles of Journalism Objectivity Accuracy Without fear or favor Balance	1. To study journalism and its core values 2. To learn principles in journalism to be followed strictly 3. learning about regulatory videos in Press	
Unit-XI The basic difference in Writing for Print, Television, and Online Journalism	1. To learn in detail online journalism 2. To learn how journalism can be carried on various platforms 3. To learn and understand difference in writing for different media platform	
Unit-XII Jobs in Journalism	1. To understand and Media industry 2. To study the scope and areas of work in print media, broadcast, Corporate Communication (PR and NGOs) . 3. To excel skills as a journalist	
Unit-XIII		

Latest trends and issues in journalism	1. To understand the practise of journalism and its difference in older days 2. The issues faced by the journalist in practicing journalism 3. To understand how to follow trends and its changes and impact on society	
Unit-XIV Short notes on Press Council of Media Students Audit Bureau of Circulation	1. To study the regulatory bodies of Press in journalism 2. To learn PCI and its regulations for Press, news agencies and journalists 3. To learn ABC (Audit Bureau of Circulations) and its functions.	

Faculty Name - Mr. Amir Ahmed

Program: Bachelor's in Mass Media:

Course: Mass Media Research

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Relevance, Scope of Mass Media Research, and Role of Research in the Media	1. To study what is research and its concepts 2. To study the scope and relevance of mass media 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 CO2- To understand the scope and techniques of media research, their utility and limitations
Unit-II Steps involved in the Research Process	1. To revise an initial research plan. 2. To study the steps/ procedure in a systematic research 3. To produce high quality written work for a competitive market.	
Unit-III Qualitative and Quantitative Research	1. To learn the techniques used in data gathering in research. 2. To explore facts, ideas, etc in research by using Qualitative research 3. To quantify the problem by gathering numericals i.e. Quantitative research and its levels.	
Unit-IV	1. Discovering Research problem 2. To learn errors in Research	

Discovery of Research Problem; Identifying Dependent and Independent Variables, Developing Hypothesis	process 3. Deeper understanding and importance of hypothesis in research	
Unit-V Concept, Types, and Uses of Research Designs: Exploratory Descriptive Casual	1. To understand research design and its key concepts. 2. To study the types of research design. 3. To evaluate the uses of research design in a research.	
Unit-VI Data- Collection Methodology: a. Primary Data- Collection Methods: i. Depth Interviews ii. Focus Group iii. Surveys iv. Observations v. Experimentations b. Secondary Data Collection Methods c. Literature Review	1. To understand in-depth the data collection methods (primary & secondary methods) 2. To learn its implication while practicing research. 3. To understand and learn extensive literature surveys.	
Unit-VII Designing Questionnaire and Measurement Techniques: a. Types and Basics of Questionnaire b. Projective Techniques c. Attitude Measurement Scales	1. To study the criteria for designing a questionnaire. 2. To study the process of designing questionnaire 3. To study the measurement techniques. .	
Unit-VIII Sampling Process	1. To understand sample, sample size and concepts. 2. To learn the purpose of sampling 3. To get knowledge about the sampling methods (probability and non-probability)	
Unit-IX Data Tabulation and Research Report Format	1. To study the essential parts of a table 2. To learn about proper format of presentation and analysis 3. To understand the research report format	
Unit-X Application of Research in Mass Media	1. To understand the research phases in media 2. To learn the research procedures 3. Understanding the topic relevance and validity in research methods.	

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

Faculty Name - Ms. Sheetal Gogri

Program: Bachelor's in Mass Media:

Course: Print, Production, and Photography

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I **Photography** Basic Photography: 1. History of Photography 2. Loading the film and shooting 3. Operation of a film and shooting 4. Care and maintenance of camera equipment	1. To learn photography and its history 2. To understand in detail films, shooting and their mechanisms 3. To learn the camera and its equipment.	CO1- To help students understand the principles and practice of photography. CO2- To enable students to enjoy photography as an art.
Unit-II Basic Principles: 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. 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 2. To learn various sources of lights 3. To learn various types of camera and lenses	
Unit-III	1. To learn about photosensitive materials	

Unit No. & Name	Unit Outcomes	Course Outcomes
1.. Photosensitive material, Celluloid, Film & ISO, Types of Film, Colour film - C41 process. Exposure: 1. Mechanism of aperture, shutter and ISO 2. Correct exposure Concepts of composition Digital Capture Various types of Digital Capture and Image Total Sessions: 35 of 50 minutes each	2. To study various types of films and its process 3. To learn exposure and its importance in handling camera	
Unit-IV **Print Production** Major landmarks in history and development of 'print technology' Basic print: processes, contact, projection, composition, inprinter, special effect printer, Print machines, and image carriers + Letterpress, offset, silkscreen, digital print DTP Future trends in print technology Awareness of Photo-editing Softwares (Possibilities and Limitations)	1. To learn about print technology and its basics 2. To learn machinery used in prints and its types 3. To understand the future trends in print technology	
Unit-V Softwares: Adobe Photoshop, Adobe Lightroom, Colour Correction, Processing, High Dynamic Range, Illustrator. Total sessions: 13 of 50 minutes each	1. To introducing students in the world of softwares 2. Understanding each practically 3. Making students job and industry ready with practical knowledge of software.	

Faculty Name - Mr. Hitesh Gadhia

Program: Bachelor's in Mass Media:

Course: Radio and Television

SYBMM SEM-IV

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction	1. Learning about the history of Radio and Television.	CO1- To acquaint students with the working of two powerful media i.e.

A Short History of Radio and Television in India All India Radio Doordarshan Prasar Bharti main points Convergence trends	2. Understanding the working of the stations. 3. Key actions of Prasar Bharati that marked a change in Broadcasting.	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 Introduction to Sound for both TV and Radio Types of Sound: Natural, Ambient, Recorded The Studio Setup The Sound Equipment: Mixer, Control Panel Tape Recording Digital Recording Outdoor Recording Types of Microphones The Editing Suite	1. Learning the use and importance of foley sounds in the creating audio and video creative. 2. To understand the requirements of important elements for setting up a Studio.	
Unit-III Introduction to Visuals The Power and Influence of Visuals The Video- camera: types of shots, camera positions, shot sequences, shot length Lighting: The importance of lighting Television setup: The TV studio, the difference between Studio and on-location shoots	1. Learning various camera angles and shots, for narration of a story. 2. Importance of lighting for creating visualization.	
Unit-IV Introduction to Radio Formats: broad guidelines- classifications News Documentary Feature Talk Show Music shows Radio Drama Sports broadcasting	1. Learning various radio show formats by listening to radio programmes.	
Unit-V Introduction to Television Programming: broad guidelines- classifications News Documentary Feature	1. To understand different television programmes. 2. Understanding the categories and formats of the programming.	

Unit No. & Name	Unit Outcomes	Course Outcomes
Talk Shows TV serials and soaps Sports Reality Animation		
Unit-VI Different Roles Community Radio- role and Importance Contribution of All India Radio The Satellite and Direct to Home Challenge	1. Learning about community radio in detail and its importance in shaping society. 2. To understand satellite transmission of the channels on television.	
Unit-VII Other Requirements Storyboard Online editing Educational TV with reference to Jamia- milia, etc. virtual classrooms	1. Learning about online platforms with respect to education. 2. Understanding various educational television channels of the central university.	
Unit-VIII Broadcast Production Pre- Production Production Post- Production	1. Learning various stages of production of any programme.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: Brand Building

TYBMM SEM-V

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Brand: Definition, Importance of branding, Difference between brand & product, Process of Branding.	1. To learn and understand brand and its related concepts 2. To study importance of branding and its process 3. To distinguish between a brand and a product.	CO1- To study the concept of Brands CO2- To study the process of building brands CO3- To study its importance to the consumer and advertisers
Unit-II Brand Identity: Core Identity, Extended Identity, Brand Identity Traps.	1. To understand the concept of brand identity. 2. to be aware of the various mistakes a brand makes due to which a brand can be trapped in its own identity.	
Unit-III Brand Positioning:	**1.** To understand the concept of positioning and its various types	

Definition, Importance of Brand Positioning, Perceptual Mapping.		
Unit-IV Brand Personality: Importance of creating Brand Personality, Attributes that affect Brand Personality, Factors that affect Brand Personality. Brand Personality Models-Relationship Model, Self-expressive Model, Functional Benefit Model The Big Five, User Imagery	**1.** To understand the role of building brand personality and its impact on consumer behavior 2.to understand the visual imagery and the difference brand personality can create between brands that sell similar products.	
Unit-V Brand Leverage: User Extension, Brand Extension, Moving Brand up/down, Co-branding.	1.To understand the extension & expansion strategies a brand undertakes.	
Unit-VI Brand Strategies: 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. 2.various types of branding strategies with examples.	
Unit-VII Brand Repositioning: 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. 2. Case studies gives insights on the reasons for the change and process	
Unit-VIII Brand Equity: 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. 2. Equity evaluating models	
Unit-IX Brand Equity Management Models: Brand Equity Ten, Y&R (BAV), Equi Trend, Interbrand.	1.To understand how good will a brand is generated and maintained. 2. Equity evaluating mode	
Unit-X	1. To understand how corporate	

Unit No. & Name	Unit Outcomes	Course Outcomes
Brand Building Imperative: Coordination across the organization, coordination across media, coordination strategy & tactics across markets.	brand share business.\ 2. To coordinate brand building activities across diverse media options like events, sponsorship, PR and promotions.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: Consumer Behavior

TYBMM SEM-V

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

Tricomponent, Changing attitude in Consumer Behavior.		
Unit-IV Social & Cultural Aspects of Marketing & its impact on Consumer Behavior. Social Stratification- class, age, gender, family Group- Reference group Culture- Subculture Changing Indian Core Values.	1. To study the value and lifestyle segmentation. 2. The basic characteristics of socail class. 3. To study the classification of groups. 4. To study the reasons for the popularity of reference groups. 5. To study the family life cycle, & family purchase decision.	
Unit-V Consumer Decision Making Process & Opinion Leadership Diffusion & Adoption	1. To study the characteristics of opinion leaders. 2. To study the types of consumer decisions. 3. To study the category of innovation. 4. To study the adoption process.	

Faculty Name - Ms. Meenakshi Nadar

Program: Bachelor's in Mass Media:

Course: Advertising in Contemporary Society

TYBMM SEM-V

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Change in the Environment: Policy Post-Independence, Policy 1990 Onwards.	1. To study about surrogate advertising. 2. To study the objectives and missions of the regulatory bodies. 3. To study the rules and restrictions implemented on the advertisements.	CO1- To understand the environment in Contemporary Society CO2- To understand Liberalisation and its impact on the economy CO3- To study contemporary advertising and society
Unit-II Study of Environment Post-independence and Post 1991 Liberation Policy: Effects of Liberation on- Economy, Business, Employment, Advertising, Lifestyle.	1. To study the measures initiated as a part of the liberalization and globalization. 2. To study about globalization on Indian economy. 3. To study the objectives of Privatization.	
Unit-III	1. To study the growth of Global	

International & Global Advertising & Marketing: The Environmental Analysis of all Foreign Countries, The use of this Analysis in Marketing & Advertising.	commerce. 2. To study the challenges of Global advertising. 3. To study the impact of culture on Globalization. 4. To study the elements of culture. 5. To study the promotions for International markets.	
Unit-IV Social Marketing: 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. 2. To study the additional marketing P's. 3. To study the effects of social marketing.	
Unit-V Advertising: 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. 2. To study the negative impacts of Advertising. 3. To study the positive and negative impact of advertising on the economy.	
Unit-VI Types of Advertising: 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. 2. To study the different categories of financial advertising. 3. To study the categories of consumer advertising.	
Unit-VII Internet: Digital Marketing	1. To study the tools of digital marketing. 2. To study the advantages & disadnavtages of Internet marketing.	

Faculty Name - Ms. Avina Taneja

Program: Bachelor's in Mass Media:

Course: CopyWriting

TYBMM SEM-V

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction to Copywriting:	1. To understand the role and importance of copywriting. 2. Various responsibility of a	CO1- To familiarize the students with the concept of copywriting as selling through

Basics of Copywriting, Responsibility of Copywriter.	copywriter	writing CO2- To learn the process of creating original, strategic, compelling copy for various media CO3- To train students to generate, develop and express ideas effectively CO4- To learn the rudimentary techniques of advertising - headline and body copywriting.
Unit-II Creative Thinking: How to inculcate a 'creative thinking attitude', Left brain thinking; Right brain thinking, Conscious mind; unconscious mind, Role of Heuristics and assumptions in creative thinking, Five steps of the creative process.	1. Developing critical thinking for learning creative writing. 2. Understanding the psychology of the brain and its role in developing the skills for writing.	
Unit-III 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.)	1. Learning idea generation techniques through various prompts which helps in structuring the content.	
Unit-IV Transcreativity: Introduction, Purpose	1. To understand in successfully adding the same emotions and contextual relevance in the new language as the original source.	
Unit-V Briefs: Marketing Brief, Creative Brief.	1. Learning about the structure and formats of the briefs. 2. Understanding the client brief for proper execution of the content.	
Unit-VI Writing persuasive copy: The CAN Elements (connectedness, appropriates & novelty), 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.	
Unit-VII Writing copy for various Media:	1. Learning to write copy for various advertising and marketing	

Print: Headlines, sub-headlines, captions, body copy, and slogans. Television: Storyboard, Storyboarding techniques, Balance between words and visuals, Power of silence, formats of TV's Outdoor posters Radio Digital: email, web pages.	media. 2. To add various elements to balance a copy and convey the marketing message.	
Unit-VIII Writing copy for various audiences: Children, Youth, Women, Senior Citizens & Executives.	1. Understanding the thought process of different categories of audiences. 2. Learning to persuade the audience through the copy.	
Unit-IX How to write copy for: Direct mailers, Classified, Press releases, B2B, Advertorial, and Infomercial.	1. To learn writing the copy for personal medium and mass medium.	
Unit-X Various types of Advertising appeals and execution styles: Rational appeals, Emotional appeal Humor, Fear, Sex appeal, and Various advertising execution techniques.	1. Understanding various writing appeals to connect a chord with the specific audience through storytelling.	
Unit-XI The techniques Evaluation of an Ad Campaign: Evaluate the ad in terms of its efficacy, i.e. to what extent the campaign has achieved its set objectives, 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. 2. Learning about campaign objectives. 3. Learning the final output of an advertising copy.	

Faculty Name - Ms. Avina Taneja

Program: Bachelor's in Mass Media:

Course: Media Planning & Buying

TYBMM SEM-V

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I	1. Learning the concepts of Media planning.	CO1- To develop knowledge of various characteristics of media.

Introduction to Media Planning & Selection: An overview of Media Planning, Basic terms & concepts, Function of Media Planning, Role of Media Planner, Media Brief, Media Audit, NCCS Grid.	2. Key role of a Media planner.	CO2- To understand procedures, requirements, and techniques of media planning and buying. CO3- To learn the various media mix and its implementation CO4- To understand budget allocation for a Media plan
Unit-II Sources of Media Research: Nielsen Clear Decision, Broadcast Audience Research Council, Audit Bureau of Circulation, RAM, Comscore- Digital	1. Understanding the individual reach of media through various measurement bodies.	
Unit-III Media Planning Process: Situation analysis & Marketing Strategy plan, Setting Media Objectives, Determining Media Strategy, Selecting Broad Media Classes, Selecting media within classes, Budget & Media Buying, and Evaluation.	1. To learn the step by step process for selection of media. 2. Understanding different strategies taken for an effective selection of media.	
Unit-IV Criteria for selecting Media Vehicles: Reach, Frequency, GRPS/GVT Ratings, TVT Ratings, Cost efficiency, CPT, CPR, Waste Circulation, Pass-along Circulation.	1. Calculating the revenue expenditure spent on each media cycle and execution of the budget on the right media.	
Unit-V Selecting suitable Media options & Media Buying Newspapers, magazines, Television, Radio, Outdoor and OOH, Cinema Advertising, and Digital Advertising.	1. Learning about various media and different mediums for advertising. 2. Understanding the pros and cons of each medium.	
Unit-VI Communication MIx: Events, Sponsorship, Merchandising, Point of Purchase, In film advertising, Mobile advertising, Word of Mouth, Ambient advertising.	1. Learning about the IMC and its tools. 2. To study innovative ways for advertising and marketing of the product.	
Unit-VII Negotiation Skills in Media Buying: Negotiation Strategies, Laws of Persuasion.	1. To study the negotiation skills for proper buying of media. 2. To study the various laws for learning consumers perspective in	

Unit No. & Name	Unit Outcomes	Course Outcomes
	making a purchase.	
Unit-VIII Digital Media Planning: SEO, SEM, Email Marketing, Targeting/Remarketing, Mobile Advertising, Display Advertising ads and its formats, Video advertising & its formats, Social Media types.	1. To study about online platforms and available spaces used for advertising. 2. Understanding various advertising formats with respect to social media and video advertising.	
Unit-IX Digital Media Buying: An Overview on Paid, Owned & Earned Media, Direct Buys for Websites, Programmatic Buying (DSP & RTB) Cost per Conversion, Advertising via Premium Publishers, Advertising via Networks & Exchanges, Affiliate Network, The Local Publishing Market.	1. To study the difference between the owned, paid and earned media. 2. Understand in detail about Affiliate marketing. 3. To Learn the buying process for Online platforms.	

Faculty Name - Ms. Sheetal Gogri

Program: Bachelor's in Mass Media:

Course: Advertising Design

TYBMM SEM-V

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Basic depts.: i. Account Dept: Client handling/ Servicing/ Strategy planning/ Creative brief. ii. Media Dept: Media research/ Media planning/ Media booking, buying. Creative Dept: Idea generation/ Brainstorming/ Mind-mapping/ Ad-CW duo/ Illustrator/ Graphic designer/ Storyboarding/ Web tree iv. Production Dept: In house or outsource. Production Print: Hoardings/ Brochures/ Packaging etc Video: Storyboard/ Casting/ Location/ Costume/ Editing/ Dubbing	1. To study about the agency and its departments who handles an advertising campaign of a brand. 2. To study about the production stage of the campaign. 3. To study the idea generation process for any creative.	CO1- To make students understand the process of planning & production of advertisement CO2- To highlight the importance of visual communication CO3- To provide practical training in the field of advertising

Photography: In-house or location/ Model/ Costume/ Shoot/ Editing		
Unit-II **Understanding Design: Design as a language of emotions/ Communication.** a. Introducing students to: Elements of design (as vocabulary). i. Point/ Line/ Shape/ Tone/ Colour/ Texture b. Introducing to students to: Principles of Design: (grammar of design Language) i. Proportion/ Contrast/ Harmony/ Balance/ Rhythm/ Unity c. Introducing students to the Rules: Gestalt principles i. Proximity/ Closure/ Similarity/ Continuation/ Figure & ground	1. To learn about the elements of designing. 2. To study the Gestalt principle which helps to create perspective through designs.	
Unit-III Introduction to Negative space & its use: Creative use/ Finding shape within/ Adding a meaning.	1. To learn how negative space in a figure-ground creative and give new shapes and vision and adding meaning to the brand.	
Unit-IV **Introduction to Optical illusions:** a. Influence of surrounding shapes on shape & size b. Influence of surrounding colour/tone on object colour & tone c. Appearance of space & depth/ form	1. To learn the shapes and symbol from our surroundings. 2. To study the effects and beauty of colurs from the nature and using it in the creative.	
Unit-V **Introduction to Word expression: (Expressive words)** a. How word meaning is expressed through the appearance of word/ visual impact.	1. Understanding different fonts and typaces of an ad-copy. 2. Learning meaning and tone form the typography.	

b. Calligraphy & graceful typography.		
Unit-VI **Logo unit: Understanding Logo as a company face/ Brand identity/ Character/ Class** a. Elements of Logo: Shape/ Typeface/ Treatment/ Colours/ Symbol or symbolism used to fulfill the impression. b. Tagline: typeface/ alignment/ placement etc.	1. To study different types of logos and its meaning. 2. To learn the alignment of the elements of an ad-copy to make it persuasive for the target audience.	
Unit-VII **Introduction to Layout:** Choosing right format/ right canvas/ Optical center/ Equilibrium a. Types of Layout: All text/ Text dominant/ Picture dominant/ Picture window 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. 2. Learning about the types of layout used in creating copies. 3. Understanding the process of creating layouts.	
Unit-VIII **Use of picture (visual) as means to select Target audience** a. Choosing a picture i. Expression of Problem (Hair-fall, toothache etc) ii. Expression of benefit (Glowing face, fitness etc) iii. Irresistible presentation of product (Watch/Car etc) class	1. To understand the right use of visuals for justifying the copy message. 2. To learn the presentation of the products to persuade the audience with the visuals. 3. Understanding the writing tone as per target audience.	

iv. Dramatization (Cold drinks/ Mentos etc) v. Association of ideas b. Headline size/ break/ highlight/ two tone head c. Subhead size/ style d. Body copy type: Descriptive/ pointer/ bulleted v. Association of ideas b. Headline size/ break/ highlight/ two tone head c. Subhead size/ style d. Body copy type: Descriptive/ pointer/ bulleted		
Unit-IX **Introduction to Typography** & Text treatment: a. Classification of typefaces & combinations. b. Size/Weight/posture etc.	1. To study about the typeface and various fonts used in a copy.	
Unit-X **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.	
Unit-XI **Introduction to Art direction for diff media**: Role of an Art Director a. Diff in design for Magazine Ad & N Paper Ad (Considering Factors: paper Q/ Printing Q/ Life/ reading habits etc	1. Understanding the use of minimum and maximum words to write the advertising message. 2. To learn and understand in writing persuasive copy based on different media and different platforms. 3. Learning the pros and cons of various medium.	

b. Outdoor & indoor ad: Time available for reading/ spotting frequency etc c. Transit ad: Psychology & mindset of the TA/ State of mind at the spot etc d. TVC/ Radio: Advantage of Music/ Voice modulation etc, Demonstration on TV e. Web ad: Advantage of pop up/ Keyword SEO etc f. Direct mailers: Advantage of prior knowledge/ prior relation etc		
Unit-XII **Campaign planning:** Rest of the lectures in guiding the students through developing the campaign Introduction to the process of Idea generation (Brainstorming/ Mind-mapping) a. Understanding Brand (Brand building) b. Understanding TA's favorite place, shows, reading (Media research/ planning) c. Understanding buying motives/ habits/ influences (Consumer behaviour) d. Understanding product/ Market (demo-psycho)/ Client/ deriving message/ Creative brief e. Arriving at a **Big idea**/Copy platform (Copywriting) considering all the factors above. f. Layout stages & final design	1. To study the execution of an advertising campaigns through various existing ad-campaign examples. 2. Learning various important stages in advertising campaigns.	
Unit-XIII		

Corporate stationery & Brand manual (Logo design philosophy		
Unit-XIV Ad Campaign (system work)		

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: Agency Management

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Advertising Agencies: Their Role, Functions, Organization and Importance.	1. To study the evolution of Advertising Agency. 2. To study the role & Functions and services offered by the Agency. 3. To study the types of advertising agencies.	CO1- To acquaint the students with concepts, techniques for developing an effective advertising campaign. CO2- To familiarize students with the different aspects of running an ad agency CO3- To inculcate competencies to undertake professional work in the field of advertising.
Unit-II Client Servicing: The Client-Agency Relationship, 3 P's of service, The Gaps Model of service quality, Stages in the client-agency relationship, How Agencies Get Clients, Why Agencies Lose Clients, Evaluation criteria in choosing Ad Agency, The roles of advertising Account executives.	1. To study the characteristics of services. 2. To study the stages & principles in client-agency relationship. 3. To study the factors influence the success or failure of an advertising agency.	
Unit-III Account Planning: Role of account planning in advertising, Role of Account Planner, Account Planning Process.	1. To study about the account planning process. 2. To study the attributes of an account planner. 3. To study the 5M of advertising programme.	
Unit-IV Advertising campaign management: Means-End chaining and the	1. To study the campaign development process. 2. To study the digital advertising	

method of Laddering as Guides to creative advertising formulation, Digital Advertising Strategy/ Campaigns	strategies and campaigns. 3. Briefly learning through the specimens of Digital Advertising Campaigns.	
Unit-V Ad Film making: Converting StoryBoard to TVC, Editing and Post Production.	1. To study the process of converting storyboard into TVC. 2. To study the complete process of Ad-film making.	
Unit-VI Marketing Plan of the Client: The Marketing Brief, Marketing Audit, Marketing objectives, Marketing problems and Opportunities Review, STP, Executing the Plan, Evaluating the Plan.	1. To study about marketing strategy. 2. To study the process of developing marketing plan. 3. To study the constraints in strategy implementation.	
Unit-VII The Response Process: Traditional Response Hierarchy Models: AIDA, Sales-Oriented Objectives, Communications Objectives, DAGMAR- An Approach to Setting Objectives.	1. To study the objectives of communication and advertising. 2. To study the stages of buying behavior. 3. To study about IMC and its tools.	
Unit-VIII Setting up an Agency: Business Plan Introduction, Various Stages in Setting up a New Agency	1. To study the nature of agency business. 2. To study the component of business environment. 3. To study a business plan for advertising agency.	
Unit-IX Agency Compensation: Various Methods of Agency Remunerations.	1. To study about the expenditure heads of agency. 2. To study the financial planning of leading ad agencies. 3. To study the AAAA regulation	
Unit-X Growing the Agency: The Pitch-Request for Proposal, Speculative Pitches, Pitch Process, References, Image & Reputation, PR.	1. To study the agency business management and development. 2. To study the customer relationship management. 3. To understand the prospecting for new businesses.	
Unit-XI Sales Promotion Management: The Scope & Role of Sales Promotion, Reasons for the Increase in Sales Promotion, The Psychological Theories behind Sales Promotion, Consumer Franchise-Building vs Non Franchise-Building Promotions, Designing Loyalty,	1. To study the advantages and limitations of sales promotion. 2. To study pull and push strategy. 3. To study about CFB promotion and Non-CFB promotion.	

Continuous & Frequency Programs, Objectives of Trade-Oriented Sales Promotion, Techniques of Trade-Oriented Sales Promotion, Objectives of Consumer-Oriented Sales Promotion, Techniques of Consumer-Oriented Sales Promotion.	

Faculty Name - Mrs. Manisha Sayani

Program: Bachelor's in Mass Media:

Course: The Principles and Practices of Direct Marketing

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction to Direct Marketing: Meaning & Introduction to Marketing, Traditional versus Direct Marketing Techniques.	1. To understand Direct marketing in depth. 2. To understand Traditional techniques 3. Analyzing real- world strategies for marketing.	CO1- To understand the concept and importance of Direct Marketing CO2- To understand the various techniques of direct marketing and its advantages
Unit-II Basics of Direct & Interactive Marketing: Meaning, Definitions, Importance of Direct Marketing, Advantages & Disadvantages of Direct Marketing, Approaches of Direct Marketing, Reasons for the Growth of Direct Marketing, 3 Tasks of Direct & Interactive Marketing, customer acquisition, development & retention.	1. To introduce the basic and key concepts used in Direct Marketing 2. To understand and identify the tasks relevant in Direct Marketing. 3. To create potential consumers for the brand.	
Unit-III Customer Relationship Management: What is Customer Relationship Management, Importance of CRM, Planning & Developing CRM, Customizing Products to different needs, Studying the customers mix & Managing the key customers, Relationship Marketing- Customer Loyalty	1. To understand CRM how it is useful in decision making of a customer. 2. To give students an insight about features and functionality of CRM. 3. To study how to manifest and engage customers loyalty towards product and brand.	
Unit-IV Database Management: Meaning, Importance, Functions of Database sources & uses of E-databases,	1. Introducing and evaluating new concepts used in Database Management. 2. To understand the process of	

Techniques of Managing Database-Internal/External, Steps in developing a database, Advantages & Disadvantages of Database Management.	Data management 3. To get insight on advantages and disadvantages of Database management.	
Unit-V Direct Marketing Strategies: Meaning of Marketing Strategies-Why it is needed, Internal & External Analysis, Objectives of Strategies, Creating a Direct Marketing Budget. Direct Marketing Research & Testing: What is customer Lifetime value (LTV), Factors affecting lifetime value, How we use LTV, LTV- sums (3 methods-Present/Historical & Discounted), Using LTV analysis to compare the effectiveness of various marketing strategies.Direct Marketing Analysis: List Selection, Prospecting, Market Segmentation, Product Customization, Response Modeling & Experimentation, Mail order, Lead generation, Circulation, Relationship/Loyalty programs, Store traffic/Site traffic generation, Fund raising, Pre-selling, selling (Cross selling, Up selling), & Post-selling.	1. To understand the importance of strategies in using DIrect marketing as a tool for communication and marketing. 2. How to analysis the results, feedback, and so on, creating and maintaining loyalty through loyalty programs. 3. Students will understand Customer life cycle and how it helps in research and its calculations.	
Unit-VI Direct Marketing as an Integral Part of Integrated Marketing Communication: Meaning, Introduction of IMC, Role of IMC in Marketing Process, Relationship of IMC with Direct MArketing, Importance of IMC, Tools of IMC-Advantages, Sales, Promotion, Publicity, Personal Selling, etc, Person to person, Group Selling, Direct Mail, Direct response Television (DR-TV), Direct Response Print Advertising, Catalogues, Inserts, Videos, E-mail, Trade shows.	1. To introduce IMC and its concepts. 2. It helps in expanding the knowledge for advertising industry along with various campaigns of brand 3. It also helps to understand and compare direct marketing being an Integral part of IMC.	
Unit-VII Future of Direct Marketing Scenario: Growth of Direct Marketing in Future, Indian &	1. To make students ready for future scope of Direct marketing with practical reality 2. Understanding not only Indian	

Global Perspective in Direct Marketing	markets but Global	
Unit-VIII Direct Marketing Case Study: Product offering, re-generation, database management & methodology. (Shampoo, Gym, Pre - School.)	1. To discuss few case studies according to the topics covered 2. To study the methods involved in creating and maintaining the database and how to manage it along with re-generation.	

Faculty Name - Ms. Shilpi Dey

Program: Bachelor's in Mass Media:

Course: Advertising & Marketing Research

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes

Unit-I
Fundamentals of research:
  a. Research (definitions), importance and objectives of research.
  b. Terms and concepts in research such as variables, qualitative and quantitative
  c. Literature Review and its role in research
  d. Stages in Research process
	1. To study the basic concepts of research.
	2. To learn the process of research.
	3. To study the importance and objectives of a research in detail.
		CO1- To inculcate the analytical abilities and research skills among the students.
		CO2- To understand research methodologies – Qualitative vs Quantitative
		CO3- To discuss the foundations of Research and audience analysis that is imperative to successful advertising.
		CO4- To understand the scope and techniques of Advertising and Marketing research, and their utility.

Unit-II
Hypothesis:
  a. Hypothesis
  b. Hypothesis: Why is it important in research? the types of hypothesis
	1. To learn the importance of hypothesis.
	2. To learn the formation of the hypothesis through research questions.
	3. To study various other types of hypothesis and its uses in the research.	

Unit-III
Research Design:
  a. Meaning, definitions, objectives, importance, purpose/scope of research design.
  b. Types of research design: Descriptive, Exploratory and Causal.
	1. To learn how research design works as blueprint for a research.
	2. Learning types of research design.	

Unit-IV
Sampling:
   a. Introduction of sampling, meanings and definitions.
   b. Sampling process
   c. Methods of sampling:
 	
   Non- Probability Sampling (Convenient, Judgment, Quota, Snow ball)
   Probability Sampling (Simple, Random, Systematic, Stratified, Cluster and Multi Stage)
	1. T study different ways through which research samples are collected.
	2. To lurcn methods of sampling.	

Unit-V
Data Collection:
   a. Data Collection meaning, why is it important in research?
   b. Types of Data and Sources: Primary and Secondary Data Sources.
   c. Methods of Collection of Primary Data: Observation, Experimental, Interview method (Personal Interview, Focused Group and In-depth Interviews), Survey, Survey Instrument- Questionnaire Designing, Scaling Techniques (Likert scale, Semantic Differential Scale, Staple Scale and Constant Sum Scale)
   d. Projective Techniques- Association, Completion, Construction and Expressive
	1. To understand the basic idea on data collection.
	2. Understanding the types of date collection.	

Unit-VI
Report Writing:
   a. Essential of a good report
   b. Content of report
   c. Steps in writing a report
   d. Footnotes and bibliography
	1. Larning Basic format of research report writing.	

Unit-VII Advertising Research: a. Introduction to Advertising Research	1. Learning about advertising research in details. 2. To study different other types of copy testing. 3. Learning various other steps in	

b. Copy Research- Concept, Name and Slogan testing c. Copy Testing Measures and Methods: Free Association, Direct Questioning, Direct Mail Tests, Statement Comparison tests, Qualitative Interviews and Focus Groups. d. Pretesting: Meaning and definitions, Importance Types of Pretesting: i. Print Pretesting- Consumer Jury test, Portfolio test, Paired Comparison test, Order- of- Merit test, Mock Magazine test and Direct Mail test ii. Broad Casting Pretesting- Trailer tests, Theatre tests, Live Telecast tests and Clutter tests. iii. Challenges to Pre-testing: Meaning iv. Post testing- Recall tests, Recognition test, Triple Association test, Sales Results tests and Enquires test. Neuroscience in Advertising Research a. Neuroscience: A New Perspective b. When to use Neuroscience Physiological Rating Scales a. Pupil Metric Devices b. Eye-movement Camera c. Galvanometer d. Voice Pitch analysis e. Brain Pattern Analysis	pre-testing. 4. Briefly understanding the concept of Neuro science and its applications.	
Unit-VIII Marketing Research: a. Advertising Research introduction b. New product Research c. Branding Research d. Pricing Research e. Packaging Research f. Product Testing	1. Learning different marketing process in details.	

Faculty Name - Ms. Meenakshi Nadar

Program: Bachelor's in Mass Media:

Course: Contemporary Issues

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Ecology and its related concerns: Climate Change & Global warming-causes,consequences & remedial measures. Deforestation- causes, consequences & remedial measures; Coastal Regulatory Zone- need & importance,CRZ Act. Sustainable Development- concept, need & significance. Movements related to Environmental Protection.	1. To study about the Ecological system. 2. To study the Hippo effect. 3. To study renewable and non-renewable resources and its types.	CO1- To understand and analyse some of the present day environmental, political, economic and social concerns and issues . CO2- To highlight the importance of human rights and its implementation in India. CO3- To understand the present day problems and challenges and its implications on development.
Unit-II (a) Human Rights: UDHAR & its significance, CRC & CEDAW, DRD (b) Legislative Measures with reference to India: Women: Constitutional Rights & legal Safeguards, Domestic & Family Violence Act 2012, Sexual Harassment Act at the workplace 2013 The Criminal Law Act of 2013 Child: Protection of children from Sexual Offence Act-2012 (POSCO). Child Labor Act with new amendments, Juvenile Justice (Care & Protection of Children Act) 2000. Education: Right to Education act, 2009. Health: National Health policy of 2015, Transplatation of Human Organs act of 2011, Prenatal Diagnostic technique regulation and prevention of misuse amendemnet rules of 2003, prohibition of sale of cigarettes and other tobacco products around educational institution 2004.	1. To study human rights. 2. To study the principle of Substantive equality. 3. To study the POSCO act. 4. To study the objectives of health policy.	

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-III Political Concerns & Challenges: Crime & Politics, Corruption-Causes & remedial measures, RTI Act, LokPal Bill, WhistleBlowers Protection Act, 2011 Anti-State Violence- Naxalism & its impact; Insurgery with reference to North East- Issues involved, ULFA, Nagas, Manipur issue, AFSPA & its impact. Terrorism- causes, consequences & remedial measures.	1. To study the analysis of Lok sabha election. 2. To study the top corruption scams in India. 3. To study the salient features of Jan Lokpal Bill. 4. To study the role of NNc, NFA and NFG.	
Unit-IV Economic Development & Challenges: The Role of MIDC in the Economic Development of Maharashtra, Special Economic Zone- Its Role & Significance in Maharashtra. Food Security Act, 2013; Agrarian Issues: Rural Indebtedness, Farmers Suicides and its Implications.	1. To study the contribution of MIDC in economic sectors. 2. To study about the Mid day meal rule, 2015 3. To study the benefits of the farmers.	
Unit-V Social Development & Challenges: Tribal Issues: Marginalisation of the Tribals, Forest Rights Act, Land Acquisition Act; Police Reforms- Problems faced by Police and the Need for Reforms; Illegal Immigration from Bangladesh- Challenges & Impact; Developmental Issues- Displacement & Rehabilitation.	1/ to study the causes of the trial movement and its tpe. 2. To study the categorization of the tribal movements. 3. To study the controversy over Land Acquisition Bill.	

Faculty Name - Mr. Sohrab Vakharia

Program: Bachelor's in Mass Media:

Course: Digital Media

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction to Digital Media: Understanding Digital media, Principles, Keys Concepts, Evolution of the Internet, Traditional v Digital.	1. Introduction to Digital media and its key concepts 2. To learn about its evolution and principles. 3. To differ traditional media and digital media.	CO1- Understand digital marketing platform CO2- Understand the key goals and stages of digital campaigns CO3- Understand the of use key digital marketing tools CO4- Learn to develop digital

		marketing plans
Unit-II Search Engine Optimization (SEO): 1. What are Search Engines: Types of Search Engines, How Search Engines work and how they rank websites based upon a search term? 2. Introduction To SEO and what is involves: 3. What is the importance of searching for websites? What are the areas of operation for Search Engine Optimization Professionals? How do you search for the right keywords that will bring in the most traffic? 4. What is On- Page Optimization?: 5. Keyword Research with Google Keyword Planner, Page Naming (URL Structuring) and Folder Naming, What are Meta Tags, Redirection Tags. 6. What is Off- Page Optimization?: 7. What are Backlinks?, How to Get Backlinks? What is Google Pagerank? How to Increase the Page Rank? 8. Search Engine's Algorithms: What are Search Engines Algorithms? How Algorithms Work? Page Rank Technology, Why a Search penalizes a website, Google Panda Update.	1. To understand SEO (On-page and Off- page) in detail 2. Importance of websites and keywords 3. To study the algorithms and its mechanisms.	
Unit-III Social Media: 1.Introduction: Definition of Social Media, Types of Social Media, How Social Media is affecting Google Search, Integrating social media into websites and blogs. 2. Using Facebook: What can You do with Facebook, Facebook Features, Facebook Fan Pages, Facebook Pages. How to	1. To introduce students to the social world and medium of communication. 2. Learning various platforms of social media and its tools used in evaluating campaigns analysis. 3. To understand blogging and create blogs, as a tool for communication to the online audiences.	

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

Unit No. & Name	Unit Outcomes	Course Outcomes
1. Cyber Crime and Challenges of the new media	3. To create an awareness in students related to pros and cons of new media.	
Unit-VIII Cyber Laws: 1. Information Technology Act 2. Copyrights and its importance 3. Ethics 4. Digital Security	1. To learn about cyber laws 2. Case studies related to each law so as to better understand the real world. 3. Ethics in Digital Media.	

Faculty Name - Mr. Nilesh Rughani

Program: Bachelor's in Mass Media:

Course: Financial Management for Marketing & Advertising

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I Introduction of Financial Management: 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. 2. To study the objective of financial management. 3. To study the relationship between finance function and production function. 4. To study the emerging role of Finance Manager in India.	CO1- To provide a brief over view of the basic concepts, goals functions and types of finance available for new and existing business and marketing units. CO2- To enable the understanding of the need for financial planning through Budgets and their benefits. CO3- To enable students to evaluate the financial implications of marketing decisions through simple analytical tools.
Unit-II Financial Planning and Budgets: 1. Financial Planning for a Marketing Unit through budgets, Pro Forma Financial Statements and Spreadsheets. 2. Budgeting, Types of Budgeting, Functional Budgets, Master budget, Zero based budget, Sales Budget, Cash Budget (Application from Sales Budget and Cash Budget only) 3. Elements of Marketing Budgets, Advertising Agency Budget, Budgeting for Films, Broadcast Print and Electronic Media.	1. To learn in detail business plan and financial plan along with its techniques. 2. To learn Budegtary Control and its steps 3. To study various budgeting types (Sales & Cash) and elements involved in marketing budgets 4. To slove problems/ sums in class to get the origanisational finance more clear.	

Unit-III Working Capital Estimation: 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 2. Capital Financing approaches and factors influencing Working Capital 3. To study and practise during lectures various methods of calculating Working Capital	
Unit-IV Financial Statements and Ratio Analysis: 1. Vertical Financial Statements, Financial Decision making using Financial Statement Analysis. 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 2. To study Ratio analysis of the operations of an enterprise. 3. To solve Illustrations in class during for better understanding (Theory and Applications)	
Unit-V Introduction of Costing 1. Costing- Types of Cost- their Relevance in Marketing Decision making. 2. Classification of costs- Traceability, Functionality and Level of Activity. 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. 2. To classify cost into three (3) different parameters. 3. Estimating Profit/ Loss on the basis on analysis of cost volume 4. Solving sums boosts students calculations techniques and better , understanding of topics and subject.	

Faculty Name - Mr. Sham Mane

Program: Bachelor's in Mass Media:

Course: Advertising Ethics and Legal Environment

TYBMM SEM-VI

Unit No. & Name	Unit Outcomes	Course Outcomes
Unit-I	1. To understand the legal	CO1- To acquaint students to the

Legal Environment: Importance & relationship between Self-Regulation, Ethics & the law; Constitutional Laws- Fundamental Rights; Personal Laws- Criminal & Civil Laws ; Corporate Laws; Consumer Laws; Laws pertaining to Media; Laws of Defamation & Contempt of court with respect to cases specific to media.	environment and its regulation. 2. To learn about the basic fundamental human rights. 3. To study about various laws in detail, learning with examples.	Legal Environment in contemporary India highlighting the relevance of the same with reference to Advertising media. CO2- To emphasise & reiterate the need to have ethical practices in the field of advertising media both in India & internationally. CO3- To appreciate the role of advertising in contemporary consumerism, the need for consumer awareness & consumer protection. CO4- Advertising as a profession today & how to protect it the future of advertising a. The socio – economic criticisms b. Why Advertising needs to be socially responsible? c. The need for Critiques in Advertising CO5- The syllabus has been redesigned to include advertising in both traditional & New Media.
Unit-II Government Policies & Cyber Laws: Government Policies governing advertisements; The role of Prasar Bharati for advertisements in Public Broadcast Services; Cyber laws including Section 66 Laws pertaining to advertising in cyberspace; Net Neutrality & its relevance in Media ,Right to Information Act.	1. Learning about cyber law and cyber securities. 2. To study about broadcasting body in detail and its role in smooth running of broadcasting. 3. Understanding the Internet cyberspace and RTI act.	
Unit-III Laws pertaining to Media: Contract between Advertiser & Agency; Drugs & Cosmetic Act; Drugs & Magical Remedies; Drugs Price Control Act; Emblems & Names Act Intellectual Property Rights- Copyright Act, Trade Mark Act, Patents Act	1. To study media laws and the format of media agency contract. 2. Understanding government laws for drugs and magical remedies. 3. Brief study about the citizenship, title and emblem.	
Unit-IV Ethics in Advertising: Ethics & Philosophy of Ethics;	1. To study about ethics to be followed in advertising. 2. Learning about the perspective	

Ethics in Advertising & Stereotyping: Religious, Racial, Ethnic, Cultural Minorities, Senior Citizens, Children, Women, LGBT. Advertising of Controversial products, Surrogate & Subliminal Advertising, Political Advertising, Manipulation of Advertising Research. Bodies maintaining Code of Ethics- ASCI, AAAI, BCCC, IBF, Censor board for Films, Press Council	related to certain category of advertising. 3. Understanding about certain government and non-government bodies maintaining codes of ethics.	
Unit-V Unfair Trade Practices & the Competition Act 2002: Unfair Trade Practices & Restrictive Trade Practices to Consumers; Unfair Trade Practices & Restrictive to other organizations in the industry; The role of the Commission of the Competition Act 2002 in resolving cases of Unfair & Restrictive Trade Practices.	1. To study about the unfair selling of products to the customers and the action can be taken on the manufacturer.	
Unit-VI Consumer Protection: Government initiatives including Standardization, Consumer Law & Non-Government Initiatives: Consumerism; Standardization Bodies- AGMARK, BIS, FSSAI, FPO, ISO, FDA, CMMI, Six Sigma & CE. Standardization marks- ISI, AGMARK, BIS- Hallmark, Silkmark, Woolmark, Cotton, Forever mark; Laws- Essential Commodities Act 1955, Consumer Protection Act 1986, Standards of Weights & Measures Act, Prevention of Food Adulteration Act 14. Other Initiatives: Public Distribution System, CGSI, CFPB, CERC, Grahak Panchayat, Customer Care Centres.	1. To study about consumer protection on buying an appropriate product with various signs and symbols as an indication for making a purchase. 2. Government initiatives to support the citizens with respect to foodgrains. 3. To learn about customers care centres.	

Unit-VII Advertising & Society: Creating Artificial Needs, Idealizing the 'Good Life', Encouraging instant gratification & a throwaway society, Creating unrealistic Ideal Characteristics, Manipulation by Advertising. Advertising & Social Responsibility : A study of Vance Packard-The Hidden Persuaders (1957), A study of Jean Kilbourne- Can't buy My Love, A study of Naomi Klein- No Logo, A study of Naomi Wolf- The Beauty Myth, A study of Noam Chomsky- Understanding Power.	1. To study on how advertising influence customers thought process.	

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.

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

Course: USIT101 Imperative Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1-01 - Understand Fundamentals of	**CO1** - To develop the programming

Introduction: 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**: 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.	Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	skills using fundamentals of basic c language. **CO2** - To understand the fundamentals of programming such as condition, iterative execution, variable. **CO3** - To impart the knowledge about pointers which is the backbone of effective memory handling. **CO4** - To teach the basics of pre-processors available with C compiler. **CO5** - To understand the procedural oriented programming concept. **CO6** - To enable Learners to develop the logic of the program.
UNIT II **Operators and Expressions:** Arithmetic operators, unary operators, relational and logical operators, assignment operators, assignment operators, the conditional operator, library functions. **Data Input and output:** 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 U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions	

UNIT III **Conditional Statements and Loops:** 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.	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of Instructions: Loops U3 - 03 - Understand Group of Statements: Functions	
UNIT IV **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 U4 -02 - Learn Characters Arrays	
UNIT V **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 **Structures and Unions:** Structure Variables, Initialization, Structure Assignment, Nested	U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions U5 - 02 - Pointing to a Location: Pointers	

Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers.		

Course: USIT102 Digital Electronics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Number System:** 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. **Binary Arithmetic:** 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 U1-02 Understanding different number system and their conversions. U1-03 Understanding weighted codes and non-weighted codes U1-04 Analyzing Error Detection and Error Correction codes with examples U1-05 Enable students to solve binary arithmetic problems	**CO1** - Course Outcomes: concepts and techniques used in digital electronics. **CO2** - Have a detailed understanding of the fundamentals **CO3** - Understand and Convert different type of codes and number systems which are used in digital communication and computer system. **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. **CO5** - Understand different types of logic gates and the relationship between logic gates. **CO6** - Develop a digital logic and apply it to solve real life problems. **CO7** - Understand, Analyze, design and

		implement combinational and sequential logic circuits. **CO8** - Enable students to develop skill to build digital circuits.
UNIT II: **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. **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. U2-02 Learning Basic Gates, Universal Gates, and Other gates U2-03 Understanding Minterms and Maxtrems U2-04 Understanding and solving reduction techniques using Karnaugh maps. U2-05 Understanding and solving reduction techniques using Quine Mc Cluskey Method.	
UNIT III: **Combinational Logic Circuits:** Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations **Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.	U3-01 Designing and implementing Combinational Logic Circuits U3-02 UndestandingCode converters design and implementations U3-03 Learning different Arithmetic Circuits	
UNIT IV:	U4-01 Designing and implementing	

Multiplexer, Demultiplexer, ALU, Encoder and Decoder: Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders. **Sequential Circuits:** 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.	Multiplexer and De-multiplexer U4-02 Designing and implementing Encoder and Decoder U4-03 Learning Sequential Circuits U4-04 Designing and learning various Flipflops and their conversions	
UNIT V: **Counters:** 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. **Shift Register:** 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 U5-02 Learning functions of different IC's 7490, 7492. U5-03 Learning Shift Register Circuits U5-04 Designing and implementing Synchronous counters U5-05 Analyzing IC 7495 and learning Seven Segment Displays	

Course: USIT103 Operating Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Introduction:** What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.	U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc. U1 - 02 - Analyze	**CO1** Analyze the structure and functions of operating systems. **CO2** Understand role of operating system as process manager, resource manager, file system manager,

Processes and Threads: Processes, threads, interprocess communication, scheduling, IPC problems.	Processes & threads	memory manager and I/O manager **CO3** Understand the Mutual exclusion and Deadlock detection **CO4** Understand benefits of cloud and virtualization. **CO5** Understand differences of three types of computing: multiprocessor, multicomputer and distributed systems
UNIT – II **Memory Management:** No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation. **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 U2 - 02 - Understand the different types of files & directories U2 - 03 - Applying algorithms in OS	
UNIT – III **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, **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 U3 - 02 - Evaluate the operating system's resource management techniques, deadlock management techniques, memory management techniques.	
UNIT – IV **Virtualization and Cloud:** History, requirements for virtualization, type 1 and 2 hypervisors, techniques for	U4 - 01 - Understanding the different types of hypervisors U4 - 02 - Analyzing different processor	

efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems**: Multiprocessors, multicomputers, distributed systems.	systems U4 - 03 - Evaluate between multiprocessors, multicomputers & distributed system	
UNIT – V **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 **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 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: **Introduction**: Variables, The Language of Sets, The Language of Relations and Function **Set Theory**: Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem. **The Logic of Compound Statements**: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments.	U1 - 01 - Understands the various languages. U1 - 02 - Remembering the different definitions and the Element. 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. **CO2** Be able to apply basic counting techniques to solve combinatorial problems. **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. **CO4** Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic. **CO5** Have substantial experience to comprehend formal logical arguments.
UNIT II: **Quantified Statements**: Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements **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. U2 - 02- Remembering the different methods of proof and theorem.	
UNIT III: **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. **Functions**: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions, Cardinality with Applications to Computability	U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion. U3 -02- Learning different types of functions.	
UNIT IV:	U4 - 01 - Understand	

	the various types of Relations. U4 -02 - Analyzing the Graphs & trees.	
Relations: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations **Graphs and Trees**: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs, Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths.	the various types of Relations. U4 -02 - Analyzing the Graphs & trees.	
UNIT V: **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: USIT105 Communication Skills

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **The Seven Cs of Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness **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 . U1-02- Analyzing and Applying Communication skills	**CO1** Apply business communication strategies and principles to prepare effective communication for domestic and international business situations. **CO2** Identify ethical, legal, cultural, and global issues affecting business communication. **CO3** Utilize analytical and problem-solving skills appropriate to business communication. **CO4** Participate in team activities that lead to the development of

		collaborative work skills. **CO5** Select appropriate organizational formats and channels used in developing and presenting business messages. **CO6** Compose and revise accurate business documents using computer technology. **CO7** Communicate via electronic mail, Internet, and other technologies. **CO8** Deliver an effective oral business presentation. **CO9** To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments **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. **CO11** To demonstrate his/her ability to write error free while making an optimum use of correct Business Vocabulary & Grammar. **CO12** To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a

		process in an organization. **CO13** To draft effective business correspondence with brevity and clarity. **CO14** To stimulate their Critical thinking by designing and developing clean and lucid writing Skills. **CO15** To demonstrate his verbal and non-verbal communication ability through presentations.
UNIT II: **Writing Business Messages and Documents:** Business writing, Business Correspondence, Instructions Business Reports and Proposals, Career building and Resume writing. **Developing Oral Communication Skills for Business:** Effective Listening, Business Presentations and Public Speaking,Conversations, Interview	U2 - 01 - Applying and learning the writing of Business messages and documents U2 - 02 - Understanding and remembering the development of Oral communication skills for business	
UNIT III: **Developing Oral Communication Skills for Business:** Meetings and Conferences, Group Discussions and Team Presentations, Team Briefing, **Understanding Specific Communication Needs:** Communication across Functional Areas	U3 - 01 - Analyzing and Evaluating the development of Oral communication skills for business U3 - 02 - Understanding and Remembering specific communication needs	
UNIT IV: **Understanding Specific Communication Needs:** Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids	U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs	

UNIT V:	U5 - 01 - Learning and Understanding the different ways of presentation process .	
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. **Adding graphics to your presentation:** Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance.	U5 - 02 - Creating and applying the graphics to your presentation .	

Course Outcomes

FYBSC IT – SEM 2
Course: USIT201 Object oriented Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I **Object Oriented Methodology:** 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. **Principles of OOPS:**	U1 -01- Learning about what exactly the object oriented is. 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. 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.
OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing		CO3: Students will be able to implement relationships between classes. CO4: Students will be able to demonstrate various collection classes. CO5: Students will be able to create and user interfaces and packages CO6: The students will be able to demonstrate programs on exceptions, multithreading and applets.
UNIT - II **Classes and Objects:** 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. **Constructors and Destructors:** Introduction, Default Constructor, Parameterized Constructor and examples, Destructors	U2 -01- Understands the classes and Objects in OOPs. U2 -02- Remembering the Constructors and Destructors.	
UNIT - III **Polymorphism:** 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, **Virtual Functions:** Introduction and need, Pure Virtual Functions,	U3 -01- Understands the concept of overloading. U3 -02- Analyze the Virtual functions.	

Static Functions, this Pointer, abstract classes, virtual destructors.		
UNIT IV: **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. **Exception Handling:** Introduction, Exception Handling Mechanism, Concept of throw & catch with example	U4 -01- Understand the concept of inheritance and types of inheritance. U4 -02- Learning the concept of Exception handling.	
UNIT V: **Templates:** Introduction, Function Template and examples, Class Template and examples. **Working with Files:** Introduction, File Operations, Various File Modes, File Pointer and their Manipulation	U5 -01- Understand the concept of Templates. 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: Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications. 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. 8085 Microprocessor Architecture and Memory Interface: Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer, Memory Interfacing, Interfacing the 8155 Memory Segment, Illustrative Example: Designing Memory for the MCTS Project, Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer.	U1-O1 Understanding Microprocessor Concepts, Microcomputers. U1-O2 Learning large computers to small chip microcontrollers. U1-O3 Understanding microprocessor internal Architecture and pin configuration. U1-O4 Study of Microprocessor based system applications. U1-O5 Learning 8155 memory segment, memory interfacing. U1-O6 Illustration of memory design for MCTS project.	CO1: Describe the architecture & organization of 8085 Microprocessor. CO2: Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming. CO3: Relate the addressing modes used in the instructions. CO4. Realize the Interfacing of memory & various I/O devices with 8085 microprocessor. 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. CO7 Understanding the concepts of Subroutines. CO8 Learning Code Conversion Technique and its applications. CO9 Learning various 8085 interrupts, its IO concepts and applications. CO10 Studying Pentium, Pentium Pro microprocessors, Core processors and SUN SPARC procesor.
UNIT 2 :Interfacing of I/O Devices Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits. Introduction to 8085 Assembly Language Programming: The 8085 Programming Model,	U2-01 Learning interfacing of IO Devices Concepts, U2-02 Distinguishing memory mapped IO and peripheral mapped IO. U2-03 Programming using 8085 assembly language. U2-4 Learning	

Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program. Introduction to 8085 Instructions: Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.	Programming model and 8085 Instruction Set. U2-05 Understanding various debugging techniques.	
UNIT-3:Programming Techniques With Additional Instructions: 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. Counters and Time Delays: 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. Stacks and Sub-Routines: Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts.	U3-01 Laerning Instruction Classifications U3-02Learning various assembly language programs and coding techniques. U3-03 Illustartion of counters and time dalys U3-04 Demonstation of stacks and subroutines. U3-05 Learning advanced subroutine concepts.	
UNIT-4:Code Conversion, BCD Arithmetic, and 16-Bit Data Operations: BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-	U4-01 Learning code conversion techniques. U4-02 Application of code conversion techniques.	

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. Software Development System and Assemblers: Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers. Interrupts: The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.	U4-03 Learning advanced instructions and its applications. U4-04 Understanding Assemblers, cross assemblers. 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. Core 2 and later Microprocessors: Introduction, Pentium II software changes, Pentium IV and Core 2, i3, i5 and i7. SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format	U5-01 Explaining Pentium and Pentium Pro microprocessors U5-02 Learning Core microprocessors U5-03 Distintive study of various core processors. U5-04 Understanding SUN SPARC Microprocessors. U5-05 Learning Instruction Format of SUN SPARC.	

Course: USIT203 Web Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Internet and the World Wide Web: 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 HTML5: 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 . U1 - 02 - Understanding and introduction of the world wide web and its evolution,resources,servers and navigators . U1 - 03 - Learning and application of HTML5 , LINKS , TAGS , CSS and FORMATTING .	CO1 Understand Internet and Web Programming basic concepts. CO2 Understand the front end and back end Web Applications. CO3 Understand the latest web programming tools and techniques. CO4 Developing static and dynamic Web Applications. CO5 Integrating and blending latest web technologies for creating Web Applications.
UNIT – II HTML5 Page layout and	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags ,	

navigation: 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. HTML5 Tables, Forms and Media: 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	semantic layouts, formatting and positioning . U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more . U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML .	

web page.		
UNIT -III 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 Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events,	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	

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 PHP: 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 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 Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation 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	U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models 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. CO2 To know about various types of Errors, Calculate the error correction and get actual root of the equation. CO3 Understand different methods of solution of the equations and compare them. CO4 How to calculate and apply measures of location and measures of dispersion – grouped and ungrouped data cases. CO5 How to apply discrete and continuous probability distribution to various business problems. 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. CO7 Solve a range of problems using the techniques covered. CO8 Discuss the uses and limitations of statistical analysis.
UNIT – II Solutions of Algebraic and Transcendental Equations: The	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of	

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.	different Interpolation .	
UNIT -III 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. Numerical solution of 1st and 2nd order differential equations: Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2 nd Order Differential Equations.	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule .	
UNIT – IV Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General	U4 - 01 - Understanding and learning of many types of regressions U4-02- Understanding and learning squares , non linear regression U4 -03 - Understanding and learning	

Linear Least Squares, Nonlinear Regression Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution	linear programming and types of solutions.	
UNIT – V Random variables: Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance. 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 U5-02 - Understanding of Probability and variance . U5- 03 - Understanding and learning distributions 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 **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. **Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel	U1-01: To learn various toxins present in electronic products. U1-02: Detailed study of Company's Carbon Footprint. U1-03: To study Initiatives taken by UN,	CO1 :To learn overview and issues addressed in Green Computing. CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing.

Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.	Implementation of Basel Conventions. U1-04: To know the significance of WEEE Directives. 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. CO4: Explanation of methods to reduce cooling costs. CO5: Addressing the power usage problems, storage problems and virtualization
UNIT - II **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. **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. U2-02: To Study virtualization and managing power issues with low cost. U2-03: To explain Usage of energy efficient drives. U2-04: To make students aware of cooling techniques, cooling costs and learning HP solutions for the same U2-05: Designing centralised cooling system and its impact on cooling system.	CO6: Implementation of Steps to measure the cooling costs. CO7: To improve the way of work culture in offices in order to use energy efficiently. CO8: To understand cooling demands and steps taken to minimze the cooling costs. CO9: To learn how to green IT infrastructure in our surroundings CO10: To know the role of Chief Green Officer in an organisation and fulfilment of SMART goals by set by him.
UNIT -III **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. **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,	U3 -01- Learning and analyzing the Global Impact of local actions. U3 -02- Learning to use electronic device instead of paper and going paperless.	

Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.		
UNIT - IV **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 **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	U4 -01- Understanding the concept of why recycling is important. U4 -02- Analyze the use of hardware products.	
UNIT - V **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. **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. 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 Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, Variables and Expressions Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions	U1 -01- Understand the concept of Python Programming. U1 -02- Learning to install the python. U1 -03- Understanding the error which occurs while executing. U1 -04- Learning about various keywords and variables in python.	CO1 Comprehend the basics of python programming CO2 Ability to implement modular approach using python CO3 Efficiently implement various data structures provided by python CO4 Develop applications based on object oriented concept CO5 Develop application using GUI and databases
UNIT – II 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	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	

Recursion, Leap of Faith, Checking Types 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.		
UNIT – III 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 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 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 Files: Text Files, The File Object Attributes, Directories Exceptions: Built-in Exceptions, Handling Exceptions, Exception	U3 -01- Understand how to work with list U3 -02- Learning how to access the value in tuple U3 -03- Learning basic tuple operations U3 -04- Analyze the Text Files, The File Object Attributes, Directories	
UNIT – IV Regular Expressions – Concept of regular expression, various types of regular expressions, using match function. Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition,	U4 -01- Understanding the concept of Regular Expressions. U4 -02- Learning the overview of OOP U4 -03- Learning and creating a thread and synchronizing thread.	

Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module	U4 -04- Creating Modules and understand the different type of module.	
UNIT -V Creating the GUI Form and Adding Widgets: Widgets: Button, Canvas,Checkbutton, 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.	U5 -01- Creating the GUI Form and Adding Widgets U5 -02- Analyzing the Widgets such as buttons, menu, radiobutton. 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 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, 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. U1 -02- Learning about data types, algorithms and arrays. U1 -03- Learning about various type of notations.	CO1 Ability to analyze algorithms and algorithm correctness. CO2 Ability to summarize searching and sorting techniques. CO3 Ability to describe stack, queue and linked list operation. CO4 Ability to gain knowledge of tree and graph concepts. CO5 Ability to analyze and choose appropriate data structure and algorithm for program development. CO6 Efficiently use sorting and searching algorithm and know their complexities. CO7 Improve coding skills by applying most suitable data structure for storage and access. CO8 Ability to use trees and graph structures for representing and using complex and non-line data organization. CO9 Demonstrate advantages and disadvantages of specific algorithms and data structures. CO10 Select basic data structures and algorithms for autonomous realization of simple programs or program parts. CO11 Determine and demonstrate bugs in progrsm, recognize

		neededbasic operation with data structures. CO12 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. CO13 To use appropriate algorithmic strategy for better efficiency.
UNIT – II 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. U2 -02- Learning about the concept of linked list.	
UNIT – III Stack: Introduction, Operations on the Stack	U3 -01- Understand the concepts of Stack Memory Representation	

Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion. 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 - 02- Learning about what exactly Queue is. U3 -03- Learning about various types of Queue.	
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,	U4 -01- Understanding about binary trees like property, algorithms and representation. U4 -02- Learning about Advanced Tree Structures.	

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. 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 Introduction: Data communications, networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI	U1 -01- Learning about Data communications. U1 -02- Understanding Physical Layers. U1 -03- Learning about Digital and Analog transmission.	CO1 Understand the importance of computer network and communications. CO2 Learn about transmission media and their characteristics CO3 Learn about role of various layers of ISO OSI Model in communications CO4 Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols. CO5 Demonstrate design issues, flow control and error control. CO6 Illustrate applications of Computer Network capabilities, selection and usage for

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.		various sectors of user community. CO7 Knowledge about various protocols used in computer network. 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 U2 -02- Learning about Switching. 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 ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs.	U3 -01- Understand the concept of Data Link Control. U3 -02- Learning about what media access control is. 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	U4 -01- Understand the basic concept of Network Layer. U4 -02- Get to know about Unicast Routing. U4 -03- Learning about Next generation IP.	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
protocol, transition from IPv4 to IPv6.		
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. U5 -02- Learning Standard Client0Server Protocols	

Course: USIT304 Database Management Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introduction to Databases and Transactions What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management Data Models The importance of data models, Basic building	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data	CO1 Understand the need of modelling data and then storing the data in organized manner CO2 Ability to create appropriate structure to map with specific type of data. CO3 Understand and apply the query processing knowledge for creation, manipulation, deletion and retrieval of data. CO4 Use latest methods of storage and retrieval of data as desired by the user. CO5 Develop models and management information systems as per requirements of clients.

blocks, Business rules, The evolution of data models, Degrees of data abstraction. Database Design,ER Diagram and Unified Modeling Language Database design and ER Model:overview, ERModel, Constraints, ERDiagrams, ERDIssues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML	Models . . U1 - 03 - Learning about ER diagram.	
UNIT – II Relational database model: Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF). Relational Algebra and Calculus Relational algebra: introduction, Selection 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 -01- Understanding the basic concept of Relational database model. U2 - 02 - Understanding the basic concept of Relational database design. 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 . 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. 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 and composite data types, Procedures and Functions, Exceptions Handling,Packages,With	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of different data types , procedures and clauses .	

Clause and Hierarchical Retrieval,Triggers.		

Course: USIT305 Applied Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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. 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	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. U1 -02- Learning and Understanding about complex numbers and its different application .	CO1 Enhancing the Logic building capability. CO2 Compute a given integral using the most efficient method. CO3 Use integrals to formulate and solve application problems in science and engineering. CO4 Matrices will help them better understand computer graphics. CO5 Laplace will be helpful in understanding Digital Signal systems.

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)		
UNIT – II 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 y, Solve for x, Clairaut's form of the equation, Methods of Substitution, Method of Substitution. 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	U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods . U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients. U2 - 03 - Understanding and application of Particular integral	

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.		
UNIT – III 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	U3 - 01 - Introduction to The Laplace Transform and its different theories and methods U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations .	

Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),		
UNIT – IV Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. Applications of integration: Areas, Volumes of solids.	U4 - 01 - Application and learning of Multiple Integrals with its different types and properties .	
UNIT -V Beta and Gamma Functions – Definitions,Properties and Problems. Duplication formula. Differentiation Under the Integral Sign Error Functions	U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions	

Course Outcomes

SYBSC IT – SEM 4

Course: USIT401 Core Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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,	U1 - 01 - Introduction to History, architecture and its components,Java Class	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. CO2 Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc. CO3 Be aware of the important topics and principles of software development. CO4 Have the ability to write a computer program to solve specified problems. CO5 Be able to use the Java SDK environment to create, debug and run simple Java programs

Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.	U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO6 Identify classes, objects, members of a class and relationships among them needed for a specific problem CO7 Write Java application programs using OOP principles and proper program structuring CO8 Demonstrate the concepts of polymorphism and inheritance CO9 Write Java programs to implement error handling techniques using exception handling
UNIT – II Control Flow Statements: The If…Else If…Else Statement, The Switch…Case Statement Iterations: The While Loop, The Do … While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement 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,	U2 - 01 - Understanding and Learning of Control Flow Statements . U2 - 02 - Learning and application of Iterations i.e loops and statements . U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values .	

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.		
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 . 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,	U4 - 01 - Detailed study of arrays and introduction and understanding its types .	

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 , 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 . U5 -02 - Learning of Abstract Window Toolkit in detail . 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 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. Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.	U1 - 02 - Understanding and introduction to Embedded system and its application . U1 - 02 - Learning of the concept of Core of embedded systems. 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. CO2 To provide experience to integrate hardware and software for microcontroller applications systems. CO3 Understand what is microcontroller, microcomputer and embedded system. CO4 Become familier with programming environment used to develop embedded systems. CO5 Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices. CO6 Learn debugging techniques for an embedded systems CO7 Ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers. CO8 Ability to write the programs for microcontroller. CO9 Ability to understand the role of embedded systems in industry. CO10 Ability to

		understand the design concept of embedded systems.
UNIT – II Embedded Systems – Application and Domain Specific:Application specific – washing machine, domain specific - automotive. 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 Driver - Watchdog Timers.	U2 - 01 - Study of Embedded systems and its application . U2 - 02 - Understanding the concept of Embedded Hardware anf types of memory . U2 - 03 - Detailed study of the concept called peripherals .	
UNIT – III 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. U3 - 02 - Learning and application of 8051 Programming in C and its logic.	
UNIT – IV 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 . U4 - 02 - Learning the concept of Programming embedded systems and the structure .	
UNIT -V Real Time Operating System	U5 - 01 - Understanding and	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
(RTOS):Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS. 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.	learning the concept Real Time Operating System (RTOS) and its characteristic .

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
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 | U1 - 01 - Learning the concept of tendencies and its different types of notation .

U1 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion . | CO1 Recognize the error in the number generated by the solution.
CO2 Compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Rapshon method.
CO3 Apply method of interpolation and extrapolation for prediction.
CO4 Recognize elements and variable in statistics and summarize qualitative and quantitative data.
CO5 Calculate mean, median and mode for individual series.
CO6 Outline properties of correlation and compute Karl-Pearson's coefficient of correlation.
CO7 How to apply discrete and continuous probability |

Percentiles,Software and 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.	U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail.	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,	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . U2 - 02 - Detailed study of the	

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.	concept Software Computation of Skewness and Kurtosis. 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,	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.	

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 - 02 - Remembering and Learning and the theory of Statistical Decision . U3 - 03 - Detailed study of Statistics in R and its distribution .	
UNIT – IV 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. The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit,	U4 - 01 - Understanding and Analyzing the Small Sampling Theory . U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	

Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare.		
UNIT -V 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. 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,	U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares . U5 - 02 - The detailed study of correlation and its concept of theories and regression .	

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
UNIT – I Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc. Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements. Software Processes: Process and Project, Component Software Processes. Software Development Process Models. • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process. • The RAD Model • Time boxing Model. 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 . U1 - 02 - Analyzing and creating the software requirements and its requirements . U1 - 03 - Learning and understanding different types of Software Development Process Models. U1 - 04 - Understanding the Agile software development .	CO1 Knowledge of basic SW engineering methods and practices, and their appropriate application. CO2 Describe software engineering layered technology and Process frame work. CO3 A general understanding of software process models such as the waterfall and evolutionary models. CO4 Understanding of software requirements and the SRS documents. CO5 Understanding of the role of project management including planning, scheduling, risk management, etc. CO6 Describe data models, object models, context models and behavioural models. CO7 Understanding of different software architectural styles.

UNIT – II 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. Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems. 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 U2 - 02 - Introduction and Learning of critical system and types of it . U2 - 03 - Understanding and learning of Requirements engineering Processes and its objectives and system types also models .	
UNIT – III Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures. User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface	U3 - 01 - Introduction to Architectural Design and its system and styles . U3 - 02 - Learning and Understanding of User Interface Design .	

Prototyping, Interface Evaluation. Project Management Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management. Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.	U3 - 03 - Analyzing and creating Quality Management .	
UNIT – IV 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. 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. U4 - 02 - Analyze and creating testing components and its functions .	
UNIT -V Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling,	U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc .	

Process Change, The CMMI Process Improvement Framework. Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services. Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse. Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service		

Course: USIT405 Computer Graphics and Animation

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays. Scan conversion – Digital Differential Analyzer (DDA)	U1 - 01 - Introduction to Computer graphics and its application and software description .	CO1 To familiarize students with basic principles and techniques for computer graphics. CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional

algorithm, Bresenhams' Line drawing algorithm.Bresenhams' method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components.	U1 - 02 - Learning and understanding the concepts of scan conversion algorithms , ellipse , and clipping .	transformations. CO3 To gain in-depth learning of various concepts and features such as: 2D viewing, 3D viewing, perspective, lighting, and geometry. CO4 This course will introduce students to all aspects of computer graphics including hardware, software and applications. CO5 To Provide knowledge of computer graphics system, design algorithms and two dimensional transformations.
UNIT – II Two-Dimensional Transformations: Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric	U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices .	

Interpretation of Homogeneous Coordinates, The Window-toViewport Transformations. Three-Dimensional Transformations: Three-Dimensional Scaling, Three-Dimensional Shearing, ThreeDimensional Rotation, Three-Dimensional Reflection, ThreeDimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.	U2 - 02 - Learning and creating Three-Dimensional Transformations and many of its working and objectives . U2 - 03 - Understanding the concepts of Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections etc .	
UNIT – III Viewing in 3D Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. Light:Radiometry,Transport,Equation,Photometry Color:Colorimetry,ColorSpaces,ChromaticAdaptation, Color Appearance	U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective . U3 - 02 - Remembering and learning light and color and its various components .	

UNIT – IV		
Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods. Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, 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	U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques . U4 - 02 - Creating and Learning the planes and curves and surfaces along with its different working and drawings .	
UNIT -V		
Computer Animation: Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects. Image Manipulation and Storage: 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 . U5 - 02 - Creating and analyzing Image Manipulation and Storage in detail .	

Course Outcomes

FYBSC IT – SEM 5

Course: USIT501 Software Project Management

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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, 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	U1 -01- Understanding Why is Software Project Management Important. U1 -02- Learning the basic concept of project. U1 -03- Understanding and learning	CO1 Professional terminologies of software industry. CO2 Problem solving algorithms and techniques. CO3 Understand the development work environment 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. 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.

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 Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning	about what is management. U1 -04- Learning about Overview of Project Planning.	

UNIT – II 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. 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	U2 -01- Analyzing the Appropriate Project Approach. U2 -02- How to choose proper methods and technologies for software development U2 -03- Analyzing the most Appropriate Process Model. U2 -04- Understanding about Software Effort Estimation Techniques.	

Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.		
UNIT – III 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. 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.	U3 -01- Learning about how to plan, when to plan and proper project schedules. U3 -02- Understanding about risk management. U3 -03- Analyzing the Resource Allocation. U3 -04- Analyzing the Cost Schedules	

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.		
UNIT – IV 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). 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	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts. U4 -03- Understanding Behaviour, Organizational Behaviour	

Management, Health and Safety, Some Ethical and Professional Concerns.		
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, Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	U5 - Learning about how to work in teams. 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
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, 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. 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 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. U2 -02- Understanding what is open and closed source. 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,	U3 -01- Understanding how to prototype the physical design. U3 -02- Learning the basic concept of Laser cutting. U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols.	

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.		
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	U4 -01- Understanding what is memory management. U4 -02- Learning the basic concept of Business Model. U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups.	

Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.		
UNIT – V 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, 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. U5 -02- Learning about Ethics. U5 -03- Analyzing the Correctness and Maintainability, Security, Performance	

Course: USIT503 Advanced Web Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introducing .NET: The .NET Framework, C#, VB, and the .NET	U1 -01- Understanding what exactly .NET framework is. U1 -02- Learning about Types,	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies.

Languages, The Common Language Runtime, The .NET Class Library. The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO2 Enable learners to use Visual Studio -an advanced design tool CO3 To gain in-depth learning of various concepts and features of NET coding and developing of web applications. CO4 To Provide knowledge of different State management techniques CO5 To explore ADO.NET- a model for interacting with databases. CO6 Using XML various security fundamentals will be explored
UNIT – II 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. 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,	U2 -01- Understanding the basic concept of Web form fundamentals. U2 -02- Learning about Form controls. U2 -03- Understanding Validation and how to Use Validation Controls.	

User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.		
UNIT – III Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing 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 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. U3 -02- Learning State Management. U3 -03- Learning about how to apply Themes and master pages.	
UNIT – IV ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. Data Binding: Introducing Data Binding, Using Single-Value Data	U4 -01- Understanding the fundamentals of ADO.NET. U4 -02- Learning about Data Binding. U4 -03- Learning about the basic concept of Data controls.	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
Binding, Using Repeated-Value Data Binding, Working with Data Source Controls, 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 XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms. Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication. 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. U5 -02- Learning about what is Security Fundamentals. U5 -03- Understanding Ajax, Using Partial Refreshes.	

Course: USIT505 Linux System Administration

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. Command Line: Working with	U1 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell.	CO1 To familiarize students with Linux Installation. CO2 Enable Students to Install RPM and use Red hat Package Management CO3 To Make Students Install Samba Server and the use of Samba Server

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 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 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 -03- Learning about System Administration Tasks	CO4 To make Students Install Apache, Send Mail. CO5 Write Shell Scripts in Linux.
UNIT – II Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File	U2 -01- Learning about how to configure and manage storage. U2 -02- Understanding NetworkManager,	

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	Working with Services and Runlevels. U2 -03- Learning about how to troubleshoot the network. U2 -04- Learning the basic concept of SSH. U2 -05- Learning about Permissions.	

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 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 Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	

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 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 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 Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	

User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic 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 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	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

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
UNIT – I Understanding Java EE: WhatisanEnterpriseApplication? Whatisjavaenterpriseedition? JavaEETechnologies, JavaEEevolution, Glassfishserver JavaEE Architecture,Serverand Containers: TypesofSystemArchitecture, JavaEEServer, JavaEEContainers. Introduction to Java Servlets: TheNeedforDynamicContent, JavaServletTechnology, WhyServlets? WhatcanServletsdo? Servlet API and Lifecycle: JavaServletAPI, TheServletSkeleton, TheServletLifeCycle, ASimpleWelcomeServlet WorkingwithServlets: GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor. Working with Databases: WhatIsJDBC? JDBCArchitecture, AccessingDatabase, TheServletGUI and DatabaseExample.	U1 -01- Understanding what is Java EE. U1 -02- Learning about the basic concept of Java servlets. U2 -03- Understanding how to work with database.	CO1 Identify advance concepts of java programming with database connectivity. CO2 Design and develop platform independent applications using a variety of component based frameworks. CO3 Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications. 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. 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 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. U2 -02- Learning about cooking. U2 -03- Learning how to work with files.	
UNIT – III 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, PassingParametersforotherActions, LoadingaJavabean. Implicit Objects, Scopeand ElExpressions:	U3 -01- Understand about Java Server pages. U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	

ImplicitObjects, CharacterQuotingConventions, UnifiedExpressionLanguage[UnifiedEl], ExpressionLanguage. Java Server Pages Standard Tag Libraries: WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries.		
UNIT – IV Introduction To EnterpriseJavabeans: EnterpriseBeanArchitecture, BenefitsofEnterpriseBean, TypesofEnterpriseBean, AccessingEnterpriseBeans, EnterpriseBeanApplication, PackagingEnterpriseBeans Workingwith Session Beans: WhentouseSessionBeans? TypesofSessionBeans, RemoteandLocalInterfaces, AccessingInterfaces, LifecycleofEnterpriseBeans, PackagingEnterpriseBeans, Exampleof StatefulSessionBean, Example ofStatelessSessionBean, Example of SingletonSessionBeans. Working with Message DrivenBeans: LifecycleofaMessageDrivenBean, UsesofMessageDrivenBeans, TheMessage DrivenBeansExample. Interceptors: Request andInterceptor, Defining An Interceptor, AroundInvokeMethod, ApplyingInterceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. 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. U4 -02- Learning about types of Java bean U4 - 04 - Introducing and explanation of Java Naming and Directory Interface in detail .	
UNIT – V Persistence, Object/Relational Mapping And JPA: WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards?	U5 - 01 -Introduction and learning about Persistence, Object/Relational	

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.	Mapping And JPA in detail with its meaning . U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications . U5 - 03 - Creating and learning of JSPS, The JPA ApplicationStructure, along with this learning how to run the program . 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
UNIT – I 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. Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture,	U1 - 01 - Describe fundamental concepts of software quality assurance. U1 - 02 - Explore test planning and its management.	CO1 Ability to identify and apply modern software testing methods in software development CO2 Understand testing strategies and defect management CO3 Recognise the importance of software quality assurance CO4 Know about quality improvement, cost control and contribute toward efficient delivery of software solutions

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.		
UNIT – II 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, Challenges in Testing, Test	U2 - 01 - To learn the basic testing techniques. U2 - 02 - Develop knowledge of testing process and features.	

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 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,	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	

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.		
UNIT – IV 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. V-test Model:Introduction, V-model for software, testing during Proposal stage, Testing during requirement stage, Testing during test	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	

planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities		
UNIT – V 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, 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, Risk Associated with New Technologies, Process	U5 - 01 - understanding the levels of testings.	

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 U1 - 02 - determine Secure Design Principles	CO1 Insight into secure design principles and defense models. CO2 Knowledge about storage and database security. CO3 Implement IDS, Firewalls and wireless security. CO4 Skills to implement secure cloud environment for web and application security CO5 Ability to implement physical security for implementing secure information environment.
UNIT – II Authentication and Authorization:	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography,	

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. 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	Public Key Cryptography, Public Key Infrastructure.	
UNIT – III Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security. Network Device Security: Switch and Router Basics, Network Hardening. Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. Wireless Network Security: Radio Frequency Security Basics, DataLink	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	

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.		
UNIT – IV Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). Voice over IP (VoIP) and PBX Security: Background, VoIP Components,VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security.	U4 - 01 - Learn Operating System Security Models. U4 - 02 - Learn Intrusion Detection and Prevention Systems	
UNIT – V Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing. Secure Application Design: Secure	U5 - 01 - Introduce Cloud computing. U5 - 02 - Analyze application Security, Remote Administration Security.	

Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security. Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.		

Course: USIT603 Business Intelligence

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence 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). U1 - 02 -Critically evaluate use of BI for supporting decision making in an organisation. U1 - 03 - Understand and use the technologies and tools that make up BI.	CO1 Ability to use decision support system for BI Applications CO2 Ability to develop and use mathematical models for data mining and data preparations CO3 Know how and when to apply classification and clustering techniques for solving BI problems CO4 Explore insights into important emerging applications of BI CO5 Developing skills to design expert system solutions for business applications
UNIT – II Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction	

Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	U2 - 02 - To develop knowledge of data mining. U2 - 03 - Analyze Data Validation and data preparation.	
UNIT – III Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods U3 - 02 - Explain Clustering and classification model.	
UNIT – IV 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 U4 - 02 - Identify marketing models and production models.	
UNIT – V Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information	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	

Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management 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 - 02 - generate knowledge of AI and other Automation techniques. U5 - 03 - Develop Knowledge of expert system.	

Course: USIT604 Principles of Geographic Information Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis Geographic Information and	U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T). 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 CO2 Relate GIS with remote sensing technologies with recent trends in geospatial analysis CO3 Analyze spatial data, using QGIS analysis tools CO4 Develop and Manage Geodatabases for real world data CO5 Create maps, images and apps to communicate spatial data in a meaningful way to others

Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries 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 Organizing and Managing Spatial Data The Temporal Dimension		
UNIT – II Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)	U2 - 01 -Demonstrate organizational skills in file and database management. U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology.	

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.		
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	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.	

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 checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data		
UNIT – IV Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay operators,Raster overlay operators Neighbourhood functions: Proximity	U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms. 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.	

computations, 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. 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 IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle. Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles. Service Strategy:Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution. Challenges, Critical Success factors and risks:Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.	U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM U1 - 02 - understand how ITSM can operate in an organisation to improve processes 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. CO2 Ability to model, design, implement, manage, operate, administrate and maintain networks, services and contents CO3 Ability to plan networks and decision-making about services. CO4 Learn about service transition and service operations. CO5 Ability to apply Continual Service Improvement in an organization.
UNIT – II Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying	U2 - 01 - communicate management theories and ideas in writing U1 - 02 - problem solve through the lens of management theories U1 - 03 - critically evaluate information from a variety of sources	

and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models Service Design Processes:Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security		
UNIT – III Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition 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,	U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms and businesses. U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems.	

Service Transition under difficult Conditions.		
UNIT – IV Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, a chieving 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. 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. U4 - 03 - Learn of to assess real-time service delivery and generate options for enhancing performance.	
UNIT – V 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	U5 - 01 -Interpret, use and evaluate a wide range of numerical and graphical data to set, manage and achieve service management targets. U5 - 02 -Locate and access appropriate sources of information in order to be able to make informed decisions about effective services delivery. U5 - 03 -Work individually and in project teams to analyse case study material and create effective service business scenarios.	

outputs. 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		

Semester – I

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. UO2: To classify whether the bonds in the compound are organic, inorganic or co-ordinate. 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 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. UO2: To get an in-depth understanding of co-ordinate and non-covalent bonds and the forces associated with them. 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. UO2: To learn to calculate and prepare solutions of different concentrations and to understand primary and secondary standards. 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. UO2: To learn about isomerism and their types and study the structures showing isomerism. UO3: To understand the difference between conformations and configuration and learn the projection formulae of compounds.	CO1: To acquaint students with Concepts of Stereochemistry CO2: To impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry.
2. Titrimetry and Gravimetry	UO1: To know and learn the basic terms associated with titration and gravimetry. UO2: To further study the estimation techniques using titration. 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. UO2: To study about the different analytical techniques along with their applications. 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.	CO1: To acquaint students with concept of Biodiversity and Cell Biology

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	UO2: To learn about plant diversity in detail with examples. UO3: To learn about animal diversity in detail with examples. UO4: To learn about microbial diversity in detail with examples.	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 UO2: To get an overview about eukaryotic cellular structure UO3: To study about extracellular organelles in prokaryotes and eukaryotes. 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. UO2: To understand cultivation, reproduction and growth kinetics of bacteria UO3: To gain knowledge about bacterial isolation and industrial applications. UO4: To classify viruses based on several parameters like host infected, structural similarity, etc UO5: To study properties of plant, animal and bacterial viruses with their significance.	

USBT104 -Core Subject- Basic Life Sciences-II : Microbial Techniques

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME

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. UO2: To study working and applications and phase contrast and dark field microscope. UO3: To learn different staining techniques with its examples and applications.	CO1: To acquaint students with basic techniques in Staining and Sterilization CO2: To impart the knowledge of growth of microorganisms.
2. Sterilization Techniques	UO1: To distinguish between disinfection and sterilization UO2: To study the role of physical and chemical agents used in sterilization. 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. UO2: To learn the concept of culture media and isolation techniques. UO3: To study growth curve and enumeration of bacteria. 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 UO2: To acquaint the students with the different branches of Biotechnology and their applications UO3: To differentiate between traditional and modern biotechnology	CO1: To acquaint students with various fields of Biotechnology and their applications CO2: To impart the knowledge of Food Technology and Fermentation Techniques.

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
2. Applications Biotechnology	UO1: To acquaint students with the applications of Biotechnology in Agriculture UO2: To impart knowledge about the ethics in Biotechnology UO3: To make the students acquainted with IPR	
3. Food and Fermentation Biotechnology	UO1: To impart knowledge about Food Biotechnology UO2: To discuss the biotechnological applications in enhancement of food quality UO3: To discuss about the regulatory aspects in food industries UO4: To acquaint students with fermentation technology 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. UO2: To study enzymes involved in DNA replication. UO3: To learn the recombination process in eukaryotes.	CO1: To acquaint students with DNA Replication, Repair and Genetic Engineering CO2: Impart the knowledge of molecular Biology Techniques
2. Mutation and DNA Repair	UO1: To study different types of mutations UO2: To learn working applications of mutations causing agents. UO2: To learn the basics of different types of repair mechanisms	
3. Genetic Engineering	UO1: To distinguish between DNA and RNA as genetic material. UO2: To gain understanding of Genetic Engineering	

	techniques in various organisms. UO3: To learn concepts about different types of vectors and its applications. UO4: To study roles of enzymes involved in genetic engineering.	

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. UO2: To highlight the notion of linguistic diversity. UO3: To study the concept of regional diversity with respect to various parameters.	CO1: To acquaint the students with concepts of Societal Awareness 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. UO2: To highlight the inequalities faced by people with different types of disabilities. UO3: To develop brief understanding about inequalities arising out of caste system, regionalism and linguistic diversity.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. The Indian Constitution and Significant Aspects of Political Processes	UO1: To learn the basic features of constitution as given in the preamble UO2: To study fundamental duties of a Indian citizen and values required to build effective society. UO3: To understand features of Indian politics with highlight on party system, special amendments and contribution of women in politics.	

Semester – II

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. UO2: To distinguish between simple and complex carbohydrates and study their properties. UO3: To study the types of lipids and the reactions they participate in.	CO1: To aquint students with Bioorganic Molecules 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. UO2: To understand the concept of isoelectric point and study the synthesis of peptides=es. UO3: To learn and understand the reactions carried out by protein and amino acids.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. Biomolecules: Nucleic Acids	UO1: To study the structure and composition of DNA and RNA. UO2: To understand the difference between purine and pyridine bases. 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. UO2: To study the laws of thermodynamics; their laws and limitations. UO3: To solve numericals based on internal energy, work, enthalpy. entropy.	CO1: To aquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions CO2: To impart skills in Kinetics and Chemical Reactions
2. Chemical Kinetics	UO1: To understand the progress of a reaction based on their rate. UO2: To learn about the order of reaction 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. UO2: To understand the role of oxidizing and reducing agents. 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.	CO1: To acquaint students with Physiological Processes in Plants and Animals

	UO2: To distinguish between dark phase, C3, C4 cycles and photorespiration. UO3: To learn the action of several plant hormones and secondary metabolites.	CO1: To impart the knowledge of Physiology and Ecology
2. Animal Physiology	UO1: To study mechanisms of digestion, absorption and assimilation in humans. UO2: To learn anatomy, physiology of the human kidney. UO3: To learn anatomy, physiology of respiration. 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. UO2: To learn concepts of food chain, food web and food pyramids. UO3: To get detailed understanding about biogeochemical cycles and interactions between organisms.	

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. UO2: To distinguish between genotype and phenotype. UO3: To understand the principles of non-Mendelian genetics.	CO1: To acquaint students with concepts in Genetics CO2: To impart skills in Techniques in Genetic Analysis and Population Genetics

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	UO3: To highlight environmental effects on genes and gene interactions.	
2. Microbial Genetics	UO1: To learn to classify bacteria as prototrophs and auxotrophs. UO2: To study mechanism and pathway of genetic material exchange in bacteria. UO3: To learn transduction and bacterial virus life cycles and transposable elements.	
3. Population Genetics	UO1: To study Hardy-Weinberg law and its applications. UO2: To understand genetic variations in populations at DNA level. 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. UO2: To develop insight about basic framework of plant tissue culture laboratory. 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 CO2:To impart the skills of PTC, ATC and Science Communication
2. Animal Tissue Culture	UO1: To introduce cell culture techniques and its applications. UO2: To learn significance of	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	growth factors, cell metabolism and growth kinetics. 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. UO2: To learn the principles and applications of scientific writing with examples. 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. UO2: To study the mechanism, enzyme kinetics and effects of various parameters of enzyme activity. UO3: To analyse mechanisms of different modes of enzyme inhibitions and allosteric modulators.	CO1: To acquaint students with concepts in Enzymology, Immunology and Biostatistics 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 UO2: To discuss about the different types of immunity UO3: To impart knowledge about the antigens and	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	different classes of antibodies UO4: To gain insight about the antigen-antibody interactions UO5: To discuss about different types of vaccines	
3. Biostatistics	UO1: To study the importance of Statistics in Biology. UO2: To learn the terms associated with Statistics and understand the representation of different forms of charts. 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 UO2: To discuss about the concept of Human rights in-depth and develop and understanding for the same 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 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 UO2: To understand the environmental threats and how one can protect it	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
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 UO2: To understand the significance of social values and ethics UO3: To discuss and analyze the various methods of stress management	

Semester III

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. UO2: To learn about the spectroscopic techniques, specifically about the UV region of the electromagnetic spectrum. 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. CO2: By the end of the course the student will: • Develop an understanding of the different aspects of classical Physics. 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. UO2: To study about sound and their types based on their properties such as frequencies and understand the applications. UO3: To study about viscosity, surface tension and other surface phenomenon with their	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	application in Biological Sciences.	
3. Electrophoretic Techniques	UO1: To get an overview about principles of electrophoresis of different types with suitable examples. UO2: To study mechanism of different types of paper and gel electrophoresis with suitable examples. UO3: To gain insight about staining, detection methods and industrial applications of electrophoresis.	

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 UO2: To study about the role of essential and non essential metal ions in biological systems and their significance. UO3: to understand the difference between enzymes, co-enzymes and apo-enzymes UO4: to understand the biological role of metalloenzymes wrt to myoglobin and haemoglobin. 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. CO2: By the end of the course the student will be able to: • Develop an understanding of the different aspects of Organic and Green Chemistry. CO3: Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds. 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. UO2: To understand the criteria for synthesis that can provide a good yield.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	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. UO2: To study the principles of green chemistry. 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 UO2: To acquaint students with the cells and organs of the immune system 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. CO2- By the end of the course the student will be able to: • Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology. CO3: Understand the principles underlying various Immuno-techniques
2. Cell Receptors	UO1: To learn the mechanism of T-cell receptor's activation with its structure. UO2: To demonstrate the antigen presentation pathways by MHC class I and MHC class II. UO3: To study the mechanism of B-cell receptor's activation with its structure and its	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	interaction with T-cell.	
3. ImmunoTechniques	UO1: To acquaint students with the precipitation reactions UO2: To acquaint students with the agglutination reactions 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. UO2: To study the role of microfilaments as a crucial element with its structure and associated motor protein-myosin. 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. CO2- By the end of the course the student will be able to: • Develop an understanding of the Cytoskeleton and Cell Membrane. CO3: Discuss the structure of Chromosomes and types of Chromosomal Aberrations. CO4: Discuss the principles underlying Sex Determination, Linkage and Mapping.
2. Cell Membrane	UO1: To understand the principles of membrane transport with examples. UO2: To study different types of cell-cell and cell extracellular matrix junctions. UO3: To learn the structure and functions of cell coats with suitable examples related to cell recognition.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. Cytogenetics	UO1: To develop brief understanding about chromosome, its types and highlight mutations caused change in chromosome number. UO2: To analyze the mechanism of sex determination and linkage. 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 U02: To illustrate the details of initiation,elongation and termination of transcription U03: To develop a brief understanding of the types of polymerases and promoters 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. CO2: By the end of the course the student will be able to: • Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation. 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 UO2: To study the mechanism of protein synthesis and discuss each step of initiation, elongation, translocation and termination. U03: To demonstrate the various post-translational modifications	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. Regulation of Gene Expression	U01: To demonstrate various operons in Prokaryotes, specifically in bacteria such as lac and trp U02: To analyse the intricate mechanisms of lytic and lysogenic cycles in viruses U03: To discuss the various operons in Eukaryotes and the methods of gene silencing	

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 UO2: To acquaint students with screening and its types 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. CO2- By the end of the course the student will be able to: • Develop an understanding of the various aspects of Bioprocess Technology. CO3: Develop skills associated with screening of Industrially Important Strains. 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 UO2: To gain insight about the fermentation media UO3: To discuss about sterilization and the process parameters	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	UO4: To acquaint students about the types of fermentation UO5: To study the representative fermentation processes	
3. In-vivo and Invitro Assay of Industrial Products	UO1: To discuss the assay of industrial processes UO2: To acquaint the students with half-life determination of pharmaceutical products 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. UO2: To learn different types of research and its significance 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. CO2:- By the end of the course the student will be able to: • Understand basic principles of Research Methodology and identify a Research Problem. CO3: Understand a general definition of Research Design. 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. UO2: To demonstrate mechanism of formulating a research plan. UO3: To study different methods of data collection and its applications.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. Interpretation and Report Writing	UO1: To introduce the concept of data interpretation. UO2: To learn principles of report writing and its types. UO3: To summarize importance of oral presentation and precautions to be taken while writing scientific report.	

SEMESTER IV

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. UO2: To learn the principles of electron transport chain and oxidative phosphorylation with its inhibitors. 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. CO2:- By the end of the course the student will be able to • Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides. 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. UO2: To study biosynthesis of key hormones and regulators from amino acids. UO3: To analyze deamination, transamination and reactions of urea cycle along with	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	regulation and disorders.	
3. Lipid and Nucleotide Metabolism	UO1: To learn mobilization and transport of fatty acids. UO2: To develop understanding about catabolism pathway of different types of fatty acids and its regulation. UO3: To study ketone body breakdown pathway and highlight catabolism of purines and pyrimidines.	

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. UO2: To study about the various types of separation techniques and their applications in biological sciences. 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. CO2- By the end of the course the student will: • Develop an understanding of the different aspects of Analytical Chemistry. CO3: Gain knowledge of Natural Product Chemistry and related acquired skills. 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. UO2: To learn about the structure and functions of alkaloids, phenolics, sterols and essential oils. Also study about their structural elucidation.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	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. 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 UO2: To gain insight about infection 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. CO2:- By the end of the course the student will be able to: • List the factors playing a role in causing a disease. CO3: Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis. 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 UO2: To study S. pyogenes UO3: To discuss respiratory tract infections caused by M. tuberculosis and S. pneumoniae UO4: To gain knowledge about UTIs caused by E. coli and Proteus	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
3. Medical Microbiology - Causative Organisms- II	UO1: To study the GI tract infections caused by Salmonella and Shigella UO2: To study the sexually transmitted diseases 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. UO2: To study the types, sources, classification of water pollutants and study water pollution monitoring and prevention. 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. CO2- By the end of the course the student will be able to: • Gain an understanding of the causes, types and control methods for Environmental Pollution. 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. UO2: To state the importance of global warming, ozone depletion and regulations of Kyoto protocol. UO3: To analyse the damaging consequences of UV radiation and acid rain.	
3. Bioremediation	UO1: To understand the concept of bioremediation. UO2: To learn about the microorganisms in bioremediation.	

	UO3: To learn about bioaugmentation and biostimulation 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. UO2: To state the applications biological databases and its classification. 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. CO2:- By the end of the course the student will be able to: • Gain an understanding of the basic concepts of Bioinformatics and Biostatistics. CO3: Understand the tools used in Bioinformatics. CO4: Apply the various Statistical Tools for Analysis of Biological Data.
2. BLAST and Sequence Alignment	UO1: To introduce the concepts of sequencing technique such as BLAST and its types UO2: To study the various alignment methods, namely, global and local 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. UO2: To study the test in studying statistical hypothesis.	

	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 UO2: To demonstrate the various characterisation and analysis technique of nucleic acids and proteins 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. CO2: By the end of the course the student will be able to: • Gain an understanding of the basic Principles used in Molecular Diagnosis. CO3: Gain critical thinking and analytical skills to understand new Diagnostic Methods. 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 UO3: To understand the concept of ligase chain reaction	
3. Molecular Biology based Diagnostics	UO1: To study the concept of DNA polymorphism and understand RFLP, sickle cell Anemia as well as parentage technique UO2: To briefly discuss the various methods of	m

	molecular diagnostics for infectious diseases 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. UO2: To state qualities required to be a successful entrepreneur 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. CO2: By the end of the course the student will be able to: • Develop an understanding of the systematic process and to select and screen a Business Idea. CO3: Design strategies for successful implementation of ideas. 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. UO2: To learn methodologies involved in planning, organization and implementation of a project along with its feasibility. UO3: To get an in -depth understanding of regulatory affairs, corporate laws	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	associated with establishing an enterprise.	
3. Marketing, Sales, Advertising and International Market research	UO1: To learn to design effective marketing plan. UO2: To analyse different principles of advertising and sales promotion. UO3: To study strategies of market assessment and different types of market research with suitable examples.	

SEMESTER V

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. UO2: To analyse the significance of yeast's genetics in regulation of cell cycle. 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: Gain knowledge about the cell multiplication and death at molecular level. CO1. Understand the molecules involved in cell signaling. CO2. Gain an understanding of the basic concepts of events during fertilization and early embryonic development. 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. UO2: To study signaling via Enzyme linked receptors with suitable examples. UO3: To learn principles of target cell adaptation and	

	UNIT OUTCOME	COURSE OUTCOME
	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. UO2: To elaborate different stages on development and germ layers. UO3: To gain insights about various mechanisms of differentiation along with different modes of pattern formation and morphogenetic movements.	
4. Cancer Biology	UO1: To understand the principles of cancer biology highlighting the development of cancer as a microevolutionary process. UO2: To elaborate on molecular genetics of cancer along with the role of viruses in causing cancer. 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. UO2: To illustrate cultivation methods for studying viruses along with principles of assays/techniques followed for virus purification.	By the end of the course the student will be able to: CO1. Learn the different type of virus cultivation and enumeration CO2. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs.

		UO3: To learn replication cycles of ds DNA phages, animal and plant viruses with suitable examples. 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.	CO3. Get an insight into the various spectroscopic methods used in biological studies. CO4. Understand the principle and applications of chromatographic and tracer techniques.
2.	Chemotherapeutic drugs	UO1: To study the discovery and design of antimicrobial agents UO2: To study the mode of action of antimicrobial agents UO3: To gain insight into the mechanisms of drug resistance UO4: To discuss the use and misuse of antimicrobial agents UO5: To acquaint the students with antifungal and antiviral drugs	
3.	Spectroscopy	UO1: To study about the principle and instrumentation techniques related to Spectroscopy. UO2: To understand their importance and application in Biology. 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. UO2: To learn about each of the separation technique based on the principle of chromatography.	

	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 UO2: To demonstrate the various methods of artificial gene transfer 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: CO1. Use molecular biology tools and techniques in the field of biotechnology. CO2. Gain knowledge regarding recent developments in genome sequencing and editing. CO3. Understand the basis of gene cloning and development of transgenic animals and plants. CO4. Understand more about the science that underlies the methods of gene transfer and development of genetically modified organisms.
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. UO2: To gain insights about the various vectors used for animal 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 UO2: To discuss and develop an understanding on the various isolation methods, restriction digestion, blotting techniques etc. UO3: To gain knowledge about the various recombinant selection methods and hybridization techniques UO4: To understand the cloning strategies and the construction of DNA libraries along with the concepts of chromosome walking and jumping 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 UO2: To focus on the human genome mapping in-depth UO3: To understand the various gene editing tools such ZNF, TALENS, CRISPER/cas		

USBT 504 Marine Biotechnology

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME	

1. Marine Biotechnology-Introduction & Bioprospecting	U01: To develop aptitude in learning the functioning of marine ecosystems, highlighting significance of marine microbial habitats. UO2: To elaborate on the principles of bioprospecting and highlight the role of microbes involved in the same. 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: 1. Gain insight in the field of marine biotechnology. 2. Describe different marine products which can be used as pharmaceuticals. 3. Discuss marine functional foods and nutraceuticals and its applications. 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 UO2: To elaborate on marine microbial enzymes. UO3: To describe different pharmaceutical compounds obtained from marine organisms.		
3. Marine Functional foods and Nutraceuticals	UO1: To discuss marine functional foods UO2: To study marine derived ingredients with biological properties UO3: To acquaint the students with marine nutraceuticals		
4. Marine Bioresource	UO1: To gain insight into marine bioresources, marine		

	secondary metabolites, marine proteins, marine lipids UO2: To discuss cosmetics from marine sources UO3: To acquaint the students with products and treatments based on marine resources		
s and cosmetics			

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 UO2: To acquaint the students with genetically modified agent hazards UO3: To discuss the potential hazards associated with work practices UO4: To gain insight into safety equipment and facility safeguards	CO1: To introduce students to the concepts of biosafety. CO2: To discuss the significance of good lab practices used in the biotechnology industry and research. CO3: To state the possible contaminants in different samples. CO4: To study the applications of rDNA technology and importance of bioethics.
2. GLP	UO1: To discuss the concept of GLP UO2: To acquaint the students with the guidelines of GLP UO3: To gain insight into documentation of laboratory work UO4: To gain knowledge about the calibration and validation methods UO5: To acquaint the students with audits and audit reports	
3. Detection and testing of contaminants	UO1: To describe microbial contamination in food products	

	UO2: To study microbial contamination in pharma products UO3: To acquaint the students with microbial assays	
4. Biosafety in Biotechnology	UO1: To study the concepts on biosafety in Biotechnology UO2: To discuss rDNA technology UO3: To acquaint the students with regulation of food and food ingredients UO4: To learn about genetically engineered crops UO5: To study about the contemporary issues in Bioethics	

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. UO2: To Study the protein's function with suitable examples along with protein purification methods. UO3: To learn the complementary interactions between proteins and ligands with suitable examples. 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. CO2. To understand the mechanism of action of various hormones, their synthesis, storage, release and associated disorders. 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. UO2: To learn the metabolic pathways of starch and	

	sucrose and glycogen synthesis and its regulation by various factors. 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. UO2: To learn the mode of action, storage, release, transport of hormones secreted by thyroid gland, parathyroid gland, adrenal medulla and adrenal cortex. UO3: To study the functioning, storage, transport of hormones of pancreas, placenta, male and female gonads.	
4. Nutrition	UO1: To gain key insights about sources, bioactive form, mode of action and disorders associated with vitamins. UO2: To explain functions and mode of action of minerals in metabolism. 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	CO1: To introduce to various downstream processing technologies for extraction and purification of biological products

		UO2: To discuss dairy technology preservation methods UO3: To gain insight into starter cultures UO4: To gain knowledge about the different fermented products	produced using Bioprocess technology. CO2: To elaborate on the concept of GMP, implementation, Regulatory certification and SOPs used during QC and QA implementation. CO3: To gain insight in the various processes involved in production of commercially available dairy products. CO4: To have an in-depth understanding of downstream processes.
2.	Down-stream Processing (DSP)	UO1: To study DSP UO2: To discuss foam separation and types of precipitation UO3: To gain insight about filtration, centrifugation and chromatography UO4: To describe the cell disruption methods UO5: To acquaint the students about crystallization and whole broth processing	
3.	Fermentation process	UO1: To study inoculation development in bacteria and fungi UO2: To discuss scale up and scale down UO3: To learn fermentation processes of different fermentation products UO4: To discuss biotransformation	
4.	QA-QC	UO1: To study the concept of GMP and requirements for GMP implementation UO2: To gain insight into the documentation of GMP practices	

	UO3: To learn the concept of QC and requirements for implementing QC 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 UO2: To aid in the understanding of drug receptors and its respective responses UO3: To learn the chemistry of drug-receptor binding, the relationship between dose and response UO4: To study the concept of effective dose and lethal dose 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. CO2. To study the significance of drug absorption and distribution in the system, mode of administration of drugs and factors influencing drug absorptivity. 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. 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
2. Drug Absorption and Distribution	UO1:To learn how the drugs is absorbed from the alimentary tract and the factors affecting it UO2: To study the absorption of through from lungs and skin	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	UO3: To understand the various routes of parenteral administration and the factors that influence the distribution of drug 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 UO2: To understand and distinguish between the allergic responses, side effects and adverse effects UO3: To gain knowledge about poisonings and its types UO4: To demonstrate about specific poisons 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 UO2: To demonstrate about the neuronal pathways and the working of nerve impulses UO3: To understand the mechanism of neuronal excitation and inhibitions UO4: To learn about the gap junctions, synapses and the action of various neuro toxics along with neurotransmitters.	

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. UO2: To understand the principles of biogas technology, factors influencing biogas production and its applications. 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. CO2. To study biological processes used to treat effluent from industries. CO3. To study different methodologies to treat solid and liquid waste from different industries. 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. UO2: To learn processes involved in treatment of solid waste and state the applications of biosensors. UO3: To understand principles of biodegradation with suitable examples. 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. UO2: To learn about the importance and advantage of packaged micro-organisms and their utilities in the treatment of waste.	

UNIT NO. AND NAME	UNIT OUTCOME	COURSE OUTCOME
	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, UO2: To study about the methodology of treatment of wastes generated due to dairy, antibiotic and distillery industries. UO3: To highlight the importance of water treatment due to oil spillage, other green desposits	

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. UO2: To elaborate the design, media and applications of greenhouse irrigation systems. UO3: To discuss the significance of phytotrons and precision cultivation systems.	CO1: To get an overview about precision agriculture and management of agriculture systems. CO2: To discuss significance of abiotic stress, biotic stress, photooxidative stress. CO3: To highlight the applications of molecular markers used in plant breeding. 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.	

	UO2: To learn the concept of photooxidative stress, its causes, sources and consequences with suitable examples. 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 UO2: To learn the application of molecular markers UO3: To discuss the techniques used in plant DNA barcoding	
4. Biofertilizers and Biopesticides	UO1: To study biofertilizer UO2: To discuss plant growth promotion by fungi UO3: To gain insight about microbial inoculants UO4: To study biopesticides	

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: 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. (Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers. Sequential circuits and functions: State diagram and state table; finite state machines and their synthesis.	1) Students are able to understand basic functions of computer. 2) To learn about how computer systems work and underlying principles 3) To understand the basics of digital electronics needed for computers	1) To learn about how computer systems work and underlying principles 2) To understand the basics of digital electronics needed for computers 3) To understand the basics of instruction set architecture for reduced and complex instruction sets 4) To understand the basics of processor structure and operation 5) To understand how data is transferred between the processor and I/O devices
UNIT 2: 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	1) To understand the basics of instruction set architecture for reduced and complex instruction sets 2) Understand types of machine instructions 3) Understand difference between RISC and CISC	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
language, assembler directives. Function calls, processor runtime stack, stack frame. Types of machine instructions: arithmetic, logic, shift, etc. Instruction sets, RISC and CISC examples.		
UNIT 3: 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. 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 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
UNIT 1: 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. 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	1) To understand why Python is a useful scripting language for developers 2) Understand the process of designing programs . 3) Acquire knowledge about programming 4) To implement inbuilt functions of Python	1) Students should be able to understand the concepts of programming before actually starting to write programs. 2) Students should be able to develop logic for Problem Solving. 3) Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc. 4) Students should be able to apply the problem solving skills using syntactically simple language i.e.

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. 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: 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. 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 2. Demonstrate conditional statements 3. Discuss the compound statements 4. Construct programs to solve problems using functions, dictionary	
UNIT 3: Anonymous functions. List comprehensions. Gentle introduction to object-oriented programming; using the built-in dir()	. 1. Understand the working of anonymous functions 2. Cursory explanation of OOPS concepts 3. Illustrate Tuples and List	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
function, enumerate the methods of strings, tuples, lists, dictionaries. Using these methods for problem-solving with compound types	4. Programming using Tuples and List.	

Course: Free and Open Source Software

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction 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. 2) To learn about various terms in open source software like FOSS, GNU, license, patents, copyrights, etc. 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. 2) This course shall help student to learn Open Source methodologies, case studies with real life examples.
UNIT 2: Case Studies	1) Discuss various examples of open	

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 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. Starting and Maintaining own Open Source Project.	source software like Android, Linux, etc. 2) To illustrate how to use various open source software.	
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 technologies	1) To learn various technologies like docker, programming languages, etc. 2) To understand Linux and other FOSS technologies like hardware, virtualization, etc.	

Course: Database Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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) 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 ER to Table- Entity to Table, Relationship to tables with and without key constraints.	1) To understand the basic use of database. 2) Various models like RDBMS, Network model, etc. 3) To understand the terms of the database for example, tuples, relations, relationship, attributes, entity etc. 4) Constraints used in database management system. 5) To understand how to convert ER to table so that we can implement these tables in database application. 6) Describe fundamental elements of RDBMS. 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. 2) Students should be able to design the database schema with the use of appropriate data types for storage of data in database. 3) Students should be able to create, manipulate, query and back up the databases.
UNIT 2: Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. Relational Algebra operations (selection, projection, set operations union,	1) To understand Functional dependencies, schema so that the table relationship is can be understood which will further help to create tables in database. 2) To illustrate DDL statements, DML	

intersection, difference, cross product, Joins –conditional, equi join and natural joins, division) 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 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	statements, Joins to update, alter or delete any record from the database without changing other records of tables. 3) Explain the basic concepts of relational data model, relational database design, relational algebra and database language SQL. 4) Criticize a database and improve the design by normalization.	
UNIT 3: 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 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,	1) To understand types of in built functions so that they can manipulate database records easily. 2) String functions, math functions, date function, 3) To understand about the DBA, permissions and security 4) Basic of Database protection & Distributed databases	

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 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.	1) Students are able to understand the concept of functions. 2) Understand types of relation 3) Acquire concept of partially ordered set 4) Implement recurrence relation concepts	1) To provide an overview of the theory of discrete objects, starting with relations and partially ordered sets. 2) Study about recurrence relations, generating functions and operations on them. 3) Give an understanding of graphs and trees, which are widely used in software. 4) Provide basic knowledge about models of automata theory and the corresponding formal languages.
UNIT 2: Counting Principles ,	1) Problem solving based on Permutation	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
Languages and Finite State Machine (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. (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). (c) Languages, Grammars and Machines: Languages , regular Expression and Regular languages, Finite state Automata, grammars, Finite state machines, Gödel numbers, Turing machines.	and combination 2) Understand concept of counting principle 3) Acquire basic knowledge about models of automata theory and the corresponding formal languages.	
UNIT 3: Graphs and Trees (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 in a graph; Insertion in a graph, Deleting from a graph, Traversing a graph- Breadth-First search and Depth-First search. (b) Trees: Definition and elementary results. Ordered rooted tree, Binary trees, Complete and extended binary trees, representing	1) Understand the concept of graphs and trees, which are widely used in software. 2) Explain algorithms of operation on Graph 3) Implement Graph traversal techniques 4) Implement tree traversal techniques	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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		

Course: Descriptive Statistics and Introduction to Probability

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Different types of Data required for analysis. Presentation of Data using different tools Calculating the centered value on the basis of observation. To Learn about Variance in the given data.	Provide basic learning about different types of data and presenting tools. To understand different centered values like mean, median and mode. Learn about different Methods to calculate variation in the data	To provide complete learning about statistical data and its representation methods. TO make students familiar with Central tendency and dispersion methods. To learn scatteredness of data using methods of skewness, Kurtosis, Quartile, Coefficient of Variance. To provide detailed learning about Probability and related examples and ensure students learn about Bayes theorem and conditional probabilities.
UNIT 2: To Understand Spreadness of data in the given set of observations. To check the symmetricity of data using skewness and kurtosis. To analyze the regression analysis using Karl Pearson's methods. Learn the scatterness of data using slope of line and least square method.	Provide learning of Raw and Central Moments. Students should understand the symmetry in data using skewness value and kurtosis graph. Learn about scatter plot and Karl pearson's coefficient Provide learning about least square method and regression coefficient.	
UNIT 3: To Learn the different terms used in probability like random sample, event, experiment, types of events. Definition of Probability and examples based on probability. Addition and Multiplication	Provide information about Probability ensure basic learning of terminology and definition of probability. Students should be able to solve the example based on probability. Learning about Statements and Conditional probability	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
statements, Bayes theorem and conditional probability		

Course: Soft Skills Development

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction to Softskill and Hard Skill. Personality Development, Emotional Intelligence, Etiquette and Mannerism, Communication Today.	Student should understand about knowing self and Johari's Window. Difference between Emotional and Intelligence Quotient. To provide learning about Professional and Personal etiquette. 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 2) Understand the importance and type of communication in personal and professional environment. 3) To provide insight into much needed technical and non-technical qualities in career planning. 4) Learn about Leadership, team building, decision making and stress management
UNIT 2: Employment Communication: Like Introduction to Organization process Professional Presentation: Presenting self for different prospects of presentation Job Interviews: TO appear for Interview Group Discussion: Importance and requirement	Introduction to JOb Interview, Resume and CV. To make the cover letter and Job Application. Learn to Present in professional life. Understand the steps of Interview and FAQ. Group discussion process and arrangement , topics involved in group discussions	
UNIT 3: Creativity at Workplace: Create the Work enviornment Ethical Values: Values and SOciety Ethics Capacity Building: Learn, Unlearn and Relearn: To build the capacity of learning Leadership and Team Building: Qualities required to be leader. Decision Making and	To understand the workplace creativity and get the work completed in innovative ways. Develop ethical values. Build the capacity of learning right point and unlearn not required or wrong points. Increase the decision making	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
Negotiation: Quick and right decision makings Stress and Time Management:To learn time and stress management	capabilities. Learn to understand stress and method to overcome 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: Structure of C program: Header and body, Use of comments. Interpreters vs compilers, Python vs C. Compilation of a program. Formatted I/O: printf(), scanf(). Data: Variables, Constants, data types like: int, float char, double and void, short and long size qualifiers, signed and unsigned qualifiers. Compare with datatypes in Python. Compare static typing in C vs dynamic typing in Python Variables: Declaring variables, scope of the variables according to block, hierarchy of data types. Compare explicit declarations in C with implicit declarations in Python. Types of operators: Arithmetic, relational, logical, compound assignment, increment and decrement, conditional or ternary, bitwise and comma operators. Precedence and order of evaluation, statements and Expressions. Automatic and explicit type conversion. Iterations: Control statements for decision making: (i) Branching: if statement, else..	1) Students understand the difference between Python and C. 2) Students should be able to use different data types in a computer program. 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. 2) Students should be able to use different data types in a computer program. 3) Students should be able to design programs involving decision structures, loops and functions. 4) Students should be able to explain the difference between call by value and call by reference 5) Students should be able to understand the dynamics of memory by the use of pointers. 6) Students should be able to use different data structures and create/update basic data files.

if statement, (does the writer 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: 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. Data Input and Output functions: Character I/O format: getch(), getche(), getchar(), getc(), gets(), putchar(), putc(), puts(). Manipulating Strings: Declaring and initializing String variables, Character and string handling functions. Compare with Python strings. 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 2) Able to understand data input and output functions 3) Students should be able to explain the difference between call by value and call by reference	
UNIT 3: 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() and sizeof operator. Compare with automatic garbage collection in Python. Structure: Declaration of structure, reading and	1) Understand concept of pointers 2) Students should be able to understand the dynamics of memory by the use of pointers 3) Students should be able to use different data structures and create/update basic data files.	

assignment of structure variables, Array of structures, arrays within structures, structures within structures. Compare C structures with Python tuples. Unions: Defining and working with unions. 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().		

Course: Programming with Python – II

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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. Exception handling: What is an exception, various keywords to handle exceptions such try, catch, except, else, finally, raise. Regular Expressions: Concept of regular expression, various types of regular expressions, using match function.	1) To understand concept of File I/O, Exception Handling and Regullar expression. 2) To implement programs based on File I/O, Exception Handling and Regullar expression. 3) Evaluate pupils by designing regular expressions.	1) Students should be able to understand how to read/write to files using python. 2) Students should be able to catch their own errors that happen during execution of programs. 3) Students should get an introduction to the concept of pattern matching. 4) Students should be made familiar with the concepts of GUI controls and designing GUI applications. 5) Students should be able to connect to the database to move the data to/from the application. 6) 6)Students should know how to connect to computers, read from URL and send email.
UNIT 2: What is GUI, Advantages of GUI, Introduction to GUI library. Layout management, events and bindings, fonts, colours, drawing on canvas (line, oval, rectangle, etc.) 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. 2) To implement tkinter widgets	
UNIT 3: Database connectivity in Python: Installing mysql connector, accessing connector	1) To differentiate between the front end and back-end 2) To implement	

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 3) To create simple database application. 4) Applying networking concepts using python	

Course: Linux

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution. Why learn Linux? Importance of Linux in software ecosystem: web servers, supercomputers, mobile, servers. Installation Installation methods, Hands on Installation using CD/DVD or USB drive. Linux Structure 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. 2. To understand importance of Linux in the real world. 3. Demonstrated various methods to install Linux. 4. Difference between CLI vs GUI.	1) Upon completion of this course, students should have a good working knowledge of Linux, from both a graphical and command line perspective, allowing them to easily use any Linux distribution. 2) This course shall help students to learn advanced subjects in computer science practically. 3) Student shall be able to progress as a Developer or Linux System Administrator using the acquired skill set.
UNIT 2: Graphical Desktop Session Management, Basic Desktop Operations, Network Management, Installing and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors, Multimedia applications. Command Line Command line mode options,	1. Discussed various text editors in Linux. 2. To learn general purpose commands to start with Linux. 3. File system used in Linux.	

Shells, Basic Commands, General Purpose Utilities, Installing Software, User management, Environment variables, Command aliases. Linux Documentation man pages, GNU info, help command, More documentation sources File Operations Filesystem, Filesystem architecture, File types, File attributes, Working with files, Backup, compression		
UNIT 3: Security Understanding Linux Security, Uses of root, sudo command, working with passwords, Bypassing user authentication, Understanding ssh Networking Basic introduction to Networking, Network protocols: http, ftp etc., IP address, DNS, Browsers, Transferring files. ssh, telnet, ping, traceroute, route, hostname, networking GUI. Basic Shell Scripting Features and capabilities, Syntax, Constructs, Modifying files, Sed, awk command, 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. 2. Discussed networking commands to check network-related tasks in Linux. 3. Basic commands to work with file manipulation.	

Course: Data Structures

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators. Application Arrays: Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Data	1. To understand data types, arrays, ADT, searching, and sorting concepts	1) Learn about Data structures, its types and significance in computing 2) Explore about Abstract Data types and its implementation

Type, Application Sets and Maps: Sets-Set ADT, Selecting Data Structure, List based Implementation, Maps-Map ADT, List Based Implementation, Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarrays, Application Algorithm Analysis: Complexity Analysis-Big-O Notation, Evaluating Python Code, Evaluating Python List, Amortized Cost, Evaluating Set ADT, Application Searching and Sorting: Searching-Linear Search, Binary Search, Sorting-Bubble, Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List, Maintaining sorted Lists.		3) Ability to program various applications using different data structure in Python
UNIT 2: Linked Structures: Introduction, Singly Linked List-Traversing, Searching, 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	1. To learn various types of data structures like linked list, stack, queue, list, etc. 2. Also make student understand where these data structures can be implemented.	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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. 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: 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. 2) Problem solving on derivative in graphing and applications	1) Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions. 2) Ability to appreciate real world applications which use these concepts. 3) Skill to formulate a problem through Mathematical modeling and simulation.
UNIT 2: 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	1) Understand the concept of integration 2) Problem solving with different types of integration methods. 3) Problem solving on modeling with differential equation	

Integration: Simpson's Rule. 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 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 Functions of Two Variables.	1) Understand the concept partial derivatives 2) Implement partial derivatives on different applications	

Course: Statistical Methods and Testing of Hypothesis

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Learn about Random Variable, it's type discrete and continuous. Different functions like pdf,pmf,cdf and reliability. 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. 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. To Analyze and proof the hypothetical statements using test statistics. Learn to read tabulated value of different functions. Analysis or compare 2 and more samples together and conclude the outcome. Learn to calculate and analyze the Non parametric distribution and CHi square association.
UNIT 2: Learn about Hypothesis and steps to proof the Hypothesis. Learn about Analysis of variance : one-way, two-way analysis of variance and Parametric tests.	Definition of Hypothesis and steps to conclude the hypothesis Learn Methods of ANOVA and analyze more than 2 data simultaneously.	
UNIT 3: Learn about Non Parametric test and different methods to analyze the qualitative data. 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: 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? Green Devices and Hardware: Introduction , Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose 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 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. 2) Understand the strategies, frameworks, processes and management of green IT
UNIT 2: Green Data Centres: Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure:	1) To encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services	

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.	2) To impart knowledge on the methods of reducing CO2 levels in atmosphere	
UNIT 3: 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, Development of the G-Readiness Framework, Measuring an Organization's G-Readiness Sustainable IT Services: Creating a Framework for Service Innovation: Introduction, Factors Driving the Development of Sustainable	1) To explores the use of approaches to embrace green IT initiatives 2) To gain knowledge of the importance of life cycle assessment	

IT, Sustainable IT Services (SITS), SITS Strategic Framework 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		

S.Y.B.Sc. COMPUTER SCIENCE SEM 3

Course: Theory of Computation

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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 2) Identifying DFA and NDFA. 3) Defining Grammer and Languages 4) Distinguish different computing languages and classify their respective types	1. Understand Grammar and Languages 2. Learn about Automata theory and its application in Language Design 3. Learn about Turing Machines and Pushdown Automata 4. Understand Linear Bound Automata and its applications
UNIT 2: 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	1) analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars. 2) To Apply transformation between multiple representations of finite automata. 3) Problem solving based on Regular Sets and Regular Grammar	

Lemma for CFG Pushdown Automata: Definitions, Acceptance by PDA, PDA and CFG		
UNIT 3: 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. 2) Problem solving based on Linear Bound Automata	

Course: Core JAVA

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: The Java Language: Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays OOPS: Introduction, Class, Object, Static Keywords, Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces String Manipulations: String, String Buffer, String Tokenizer 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. 2) Understand the basic concepts of classes and objects. 3) Understand JVM Concept , Data types and Operators, Strings. 4) To implement String methods 5) 2. 3. 4. Understand Internet Programming Using Java Applets & Graphic Programming & Make use of array,	1. Object oriented programming concepts using Java. 2. Knowledge of input, its processing and getting suitable output. 3. Understand, design, implement and evaluate classes and applets. 4. Knowledge and implementation of AWT package.

Defined Packages, Access specifiers	constructors, Inheritance, Packages and Interfaces. 5.	
UNIT 2: Exception Handling: Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams, File, Random access File, Serialization Networking: Introduction, Socket, Server socket, Client –Server Communication	1) To recognise the exceptions 2) Understand the concept of Exceptional Handling 3) To model multithreading 4) To generate Client server code in Java	
UNIT 3: Wrapper Classes: Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes Collection Framework: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class 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 2) To use the inbuilt util package. 3) To implement interface 4) To illustrate the use of AWT packages 5) To relate event driven programming. 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: 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 Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication Threads: Overview, Multicore Programming, Multithreading Models	1) To understand the services provided by and the design of an operating system. 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 2. Develop and master understanding of algorithms used by operating systems for various purposes.
UNIT 2: 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 CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	1) Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques. 2) Analyze important algorithms eg. Process scheduling and memory management algorithms 3) Students should understand the data structures and algorithms used to implement an OS. 4) To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. 5) Understanding CPU	

	Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.	
UNIT 3: Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing 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. 2) To understand different approaches to memory management. 3) Describe the role of paging, segmentation and virtual memory in operating systems. 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: Stored Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures. Triggers: Concept of triggers, Implementing triggers –	1) To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage. 2) To understand	1. Master concepts of stored procedure and triggers and its use. 2. Learn about using PL/SQL for data management 3. Understand concepts and implementations of transaction management and crash recovery

creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers. Sequences: creating sequences, referencing, altering and dropping a sequence. 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.	concept of trigger, data integrity, sequence and file organization to further implement on projects.	
UNIT 2: 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	1) To understand basics of PL/SQL. 2) Different operators in PL/SQL. 3) To learn different data types in PL/SQL. 4) To illustrate case statements and conditional statements.	
UNIT 3: Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol,	1) Understanding concept of tracsaction management and crash recovery.	

Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol. DCL Statements: Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK 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.		

Course: Combinatorics and Graph Theory

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Describing Combinatorics and graph theory. Understanding Strings, BInomial Coefficients and Multinomial Coefficients. Solving Examples based on combinatorics using Induction method.	To provide knowledge about Enumeration method, sudoku puzzle. TO provide learning about Strings and sets. Solving Combinatorics using a recursive method. Learning the method of induction to get the combinatorial results.	Students should be able to develop different methods of solving the example. Enhance the ability to think differently and solve the example with all possible outcomes. Use Graph theory to identify best path from source to sink. Student should able to identify path and cycles using different combinatorial methods. Identify Network path in the given graph using Tree method, Ford Fulkerson method and augmenting methods.
UNIT 2: Learning about Graph theory, Basic Notations. Eulerian and Hamiltonian Graph, Types of graph. Understanding labeling of trees, Applying probability to combinatorics. Learn about Ramsey Numbers	Understand the graph and basic notations like vertices,edges. To identify all possible paths and cycles in the given graph using Eulerian and Hamiltonian methods. Applying Ramsey Number theory to Combinatorics	

UNIT 3:	Learn about basic Notations like path and node.	
Learning about NEtwork flows in Combinatorics.		
Solving example based on Bipartite and Chain Partitioning.	Learn Labeling algorithm using Ford Fulkerson method.	
Understand Polya's Enumeration.	Augmenting the given path to identify the best possible route.	
	Coloring of Vertices using polya's enumeration.	

Course: **Physical Computing and IoT Programming**

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: SoC and Raspberry Pi System on Chip: What is System on chip? Structure of System on Chip. SoC products: FPGA, GPU, APU, Compute Units. ARM 8 Architecture: SoC on ARM 8. ARM 8 Architecture Introduction Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi. 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. 2) Learn to program Raspberry Pi. 3) Understanding basic architecture of SoC.	1. Enable learners to understand System On Chip Architectures. 2. Introduction and preparing Raspberry Pi with hardware and installation. 3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's 4. Learn how to make consumer grade IoT safe and secure with proper use of protocols.
UNIT 2: Programming Raspberry Pi Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands Programing interfaces: Introduction to Node.js, Python. Raspberry Pi Interfaces:	1) To learn linux commands which is used to operate Raspberry pi. 2) Understand nodejs 3) Raspberry Pi basic interfaces like UART, GPIO, I2C, SPI, etc. 4) To illustrate raspberry pi with camera module.	

UART, GPIO, I2C, SPI Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera.		
UNIT 3: Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program. IoT and Protocols IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP. IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED. IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability.	1) Implementation of internet of Things and Protocols. 2) Understanding IoT security protocols like HTTP, UPnp, CoAP, MQTT, and XMPP. 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: 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 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 2) Understand types of CSS how to apply on website	1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies. 2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites 3. To develop and implement client-side and server-side scripting language programs. 4. To develop and implement Database Driven Websites. 5. Design and apply XML to create a markup language for data and document centric applications.
UNIT 2: JavaScript: Using JavaScript	1) Student learn popup boxes used in	

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 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	JavaScript 2) Understand JavaScript objects 3) Learn Form validation using JavaScript 4) Understand comparison XML and HTML 5) Student learn about XSLT	
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 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, 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. 2) To Discuss various algorithm design techniques for developing algorithms.	1. To understand basic principles of algorithm design and why algorithm analysis is important 2. To understand how to implement algorithms in Python 3. To understand how to transform new problems into algorithmic problems with efficient solutions 4. To understand algorithm design techniques for solving different problems 5. Understand the concepts of algorithms for designing good program 6. Implement algorithms using Python
UNIT 2: 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 Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection	1) To Discuss various searching, sorting and graph traversal algorithms. 2) Analyze the asymptotic performance of algorithms. 3) Explain the major graph algorithms and their analyses 4) To implement Graph Traversal Techniques	

Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order		
UNIT 3: Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique 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 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, 2) Demonstrate a familiarity with major algorithms and data structures. 3) Apply dynamic programming approach to solve suitable problems 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.	

Course: Advanced JAVA

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES

UNIT 1: 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, Connection Modes, SavePoint, Batch Updations, CallableStatement, BLOB & CLOB	1) To learn the creation of pure Dynamic Web Application using JDBC. 2) To implement programs using Swing objects	1) Understand the concepts related to Java Technology 2) Explore and understand use of Java Server Programming
UNIT 2: 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 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. 2) To implements Servlets	
UNIT 3: Java Beans: Introduction, JavaBeans Properties, Examples Struts 2: Basic MVC Architecture, Struts 2	1) To acquire knowledge on creation of software components using JAVA Beans. 2) Understand the concept of MVC 3) Craing applications using JSON	

framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java		

Course: Computer Networks

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction Network Models: 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. 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. Data and Signals, Analog and Digital Data, Analog and Digital Signals, Sine Wave Phase, Wavelength, Time and Frequency Domains,	Understanding about Netowrk Modesl and OSI Model. To provide knowledge about different terminology used in computer networks. Rules in Networking and TCP/IP Protocol suite. Encapsulation and Decapsulation methods. Multiplexing and demultiplexing methods. 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'. 2. Useful to proceed with industrial requirements and International vendor certifications.

Composite 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: 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 Detection and Correction, introduction, Types of Errors, Redundancy, Detection versus Correction,	Learning about different Modulation techniques PCM. Conversion of Signal as per the transmission medium. Learn about types of cables and transmission medium. Types of Shift key, Amplitude and Phase. Learning about Switching methods.	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 3: Network layer, Transport Layer 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. Error detection and Channelization. IP addressing learning of IPV4 and IPV6. Learn about Network device Like Router and Switches. Difference between TCP and UDP	

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,	1) Understand the fundamental concepts of Software Engineering Lifecycle models. 2) Summarize the software requirement	1. Understand the process to be followed in SDLC. 2. Define formulate and analyze a problem. 3. Apply design and testing principles to software project development & Design Methodologies.

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, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram	specifications and the SRS documents. 3) Understanding of different software architectural styles.	4. Apply the project management and analysis principles to software project development. 5. Knowledge about software development life cycle and problem articulation
UNIT 2: 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 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 Software Project Management: Estimation in Project Planning Process –Software Scope And	1) Describe software engineering layered technology and Process frame work. 2) Demonstrate the competence in communication, planning, analysis, design, construction, and development of software as per the Requirements. 3) Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance	

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		
UNIT 3: 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. 2) Understanding of software testing approaches. 3) Describe software measurement and software risks 4) Understanding on quality control and how to ensure good quality software.	

Course: Linear Algebra using Python

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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	1) To offer the learner the relevant linear algebra concepts through computer science applications. 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. 2. Understand the concepts through program implementation 3. Instill a computational thinking while learning linear algebra.

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		
UNIT 2: 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 From function inverse to matrix inverse 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 Dimension: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator	1) Understand concepts of matrix, basis, and dimension to implement in computer applications.	
UNIT 3: 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	Understand concepts of Guass Elimination, orthogonalization, eigen vector.	

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.		

Course: .NET Technologies

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: The .NET Framework:.NET Languages, Common Language Runtime, .NET Class Library 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 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	1) Understand the .NET framework 2) Acquire knowledge of C# language 3) Implement programs on C# programming language 4) Understand concept and HTML Server Controls of ASP.NET	1. Understand the .NET framework 2. Develop a proficiency in the C# programming language 3. Proficiently develop ASP.NET web applications using C# 4. Use ADO.NET for data persistence in a web application

Class, HtmlContainerControl Class, HtmlInputControl Class, Page Class, global.asax File, web.config File		
UNIT 2: Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events and AutoPostBack, Page Life Cycle State Management: ViewState, Cross-Page Posting, Query String, Cookies, Session State, Configuring Session State, Application State Validation: Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions Rich Controls: Calendar Control, AdRotator Control, MultiView Control 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 Website Navigation: Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control	1) Understand Web Controls in ASP.NET 2) Acquire knowledge on working of validators, master pages 3) Implement programs on website navigation	
UNIT 3: ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access Data Binding: Introduction, Single-Value Data Binding,	1) Understand concept of ADO.NET 2) Understand working with XML 3) Acquire knowledge of LINQ basics 4) Understand how AJAX used in ASP.NET 5) Develop web	

Repeated-Value Data Binding, Data Source Controls – SqlDataSource Data Controls: GridView, DetailsView, FormView Working with XML: XML Classes – XMLTextWriter, XMLTextReader Caching: When to Use Caching, Output Caching, Data Caching LINQ: Understanding LINQ, LINQ Basics, ASP.NET AJAX: ScriptManager, Partial Refreshes, Progress Notification, Timed Refreshes	application in ASP.NET using C# programming language.	

Course:Skill Enhancement: Android Developer Fundamentals

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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 2) To implement Basic Views	1) Understand the requirements of Mobile programming environment. 2) Learn about basic methods, tools and techniques for developing Apps 3) Explore and practice App development on Android Platform 4) Develop working prototypes of working systems for various uses in daily lives.
UNIT 2: User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader,	1) To program various Input controls 2) To design simple Andriod App	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently		
UNIT 3: 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 2) To understand the implementation of SQLite	

T.Y.B.Sc. COMPUTER SCIENCE SEM 5

Course: Artificial Intelligence

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: What Is AI: Foundations, History and State of the Art of AI. Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents. 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 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 3) Toclassify the different types of agents	1) After completion of this course, learner should get a clear understanding of AI 2) Different search algorithms used for solving problems. 3) The learner should also get acquainted with different learning algorithms and models used in machine learning.
UNIT 2: Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the	1) To formulate and choose best hypothesis 2) To understand and the architecture of Artificial Neural Networks	

Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning	3) To understand the working of SVM 4) To Justify the use of ensemble learning	
UNIT 3: 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 2) To describe Reinforcement Learning and its type.	

Course: Linux Server Administration

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction: Technical Summary of Linux Distributions, Managing Software Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems, Core System Services, Process of configuring, compiling, Linux Kernel 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. 2) Learner will be able to install appropriate service on Linux server as per requirement. 3) Learner will have proficiency in Linux server administration.
UNIT 2: Internet Services: Domain Name System	1) Effectively operate a Linux system inside of a network	

(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	environment to integrate with existing service solutions. 2) Demonstrate various internet services like DNS, SMTP, FTP, POP, IMAP, SSH, LDAP and DNS.	
UNIT 3: Intranet Services: 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 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. 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: Introduction to IOT, Design Principle and Standards. IOT reference model and architecture, ITs deployment and operational view. Learning about device domain	To provide the learning about IOT domain and its architectural view. To Learn about Reference Model and Architectural view Learning about Function of device domain and gateway domain.	Students should have a complete understanding of IOT Networks and its deployment. Learn the different layer protocol to apply in applications for better security. Learn the need of IPv4 and IPv6 along with all layer protocols.
UNIT 2: Protocols involved in Data link and Network layer PHY/MAC - 3GPP, Wireless HART, BLE. IPV4 and IPV6 requirements, 6LowPAN, CORPL and other protocols	Learning f Data link layer like 3GPP and Wireless HART. Understanding the difference between protocols. Requirement of IPv4 and IPv6 and its differences Learn the working about network layer protocol.	

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 3: Transport layer Protocol TCP, MPTCP etc. Session LAyer Protocol - HTTP, CoAP etc. Service Layer Protocol oneM2M, ETSI, M2M etc.	Learn the functions of transport layer protocol like connection oriented, multipath TCP etc. Understand the session layer protocol HTTP and CoAP to exchange the packets. Machine to Machine Services.	

Course: Web Services

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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		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: The REST Architectural style : 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		
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		

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 Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule 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 Transformations: 2D Transformations, Matrices, Homogeneous Coordinates,	1) Understand basic concept of mathematics used in computer graphics 2) Acquire knowledge on different types of transformations 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.

3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU?		
UNIT 2: DirectX Pipeline and Programming: 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), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM) Understanding Meshes or Objects, Texturing, Lighting, Blending. Interpolation and Character Animation: Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions Curves: Circle, Bezier, B-Splines Analytic Geometry: Review of	1) Understand DIrectX Pipeline 2) Understand trigonometry formulas and types of curves 3) Acquire knowledge of types of interpolation 4) Understand analytical geometry concept	

Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line.		
UNIT 3: Introduction to Rendering Engines: Understanding the current market Rendering Engines. 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	1) Understand rendering engines concept 2) Understand difference between AR, VR and MR 3) Understand working in Unity 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: 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. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC. Network architecture,	Learn the Introduction to WSN and its need in todays world. Understand Deployment architecture, Topology used in deployment. Different components of WSN Hardware and Software requirements of WSN. 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, 2) Describe the concepts, protocols, design, 3) implementation and use of wireless sensor networks. 4) Also implement and evaluate new ideas for solving wireless sensor network design issues.

Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.		
UNIT 2: 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. Protocols used for Transport layer like conversion of existing TCP to suite the environment of WSN for efficient use of power.	
UNIT 3: 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,	To provide knowledge about history of WSN and its application, Learn about Cellular system in telecom How does the HAndover and Takeover of call works Satellite functioning and different architecture. Learn ts application in GEO,LEO and MEO.	

Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover.	

Course: Cloud Computing

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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 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 2) The possible applications for state-of-the-art cloud computing using open source technology. 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. 4) They should explain the core issues of cloud computing such as security, privacy, and interoperability.
UNIT 2: 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: Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations,	1) Elucidate the concepts of OpenStack Cloud Computing architecture and its design challenges	

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	2) Illustrate the fundamental concepts of cloud storage	

Course: Information Retrieval

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: 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. 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 2) its relationship to search engines. 3) It will give the learner an understanding to apply information retrieval models.
UNIT 2: 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 2) Describe Map-Reduce. 3) Analyze working of QA systems	
UNIT 3: Web Search Engine: Web	1) To understand the acrchitectutre of web search engine	

	2) To demonstrate XML retrieval.	
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.		

Course: Digital Image Processing

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing 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 graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, 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	1) Review the fundamental concepts of a digital image processing system. 2) Understand the Human Visual Systems 3) Explain the fundamentals of digital image and its processing 4) Descibe the 2D Signals 5) Problem solvig in Image Convolution	1) Learner should review the fundamental concepts of a digital image processing system. 2) Analyze the images in the frequency domain using various transforms. 3) Evaluate the techniques for image enhancement and image segmentation. 4) Apply various compression techniques. 5) They will be familiar with basic image processing techniques for solving real problems.

transform		
UNIT 2: 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 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. 2) learn different techniques employed for the enhancement of images. 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 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 2) To learn the spatial and frequency domain techniques of image compression. 3) To implement image segmentation techniques	

Course: Ethical Hacking

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT 1: Information Security : Attacks and Vulnerabilities Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle Types of malware :Worms, viruses, Trojans, Spyware, Rootkits 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 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 Case-studies : Recent	1) Understand concept of information security 2) Understand types of malware and vulnerabilities 3) Acquire knowledge on types of attacks and their prevention mechanisms 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.

attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit		
UNIT 2: Ethical Hacking – I (Introduction and pre-attack) 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. 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 Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing, Phases: Reconnaissance/foot-printing/ Enumeration, Phases: Scanning, Sniffing	1) Discuss types of ethical hacking 2) Understand how penetration testing is important 3) Acquire knowledge of different phases of ethical hacking	
UNIT 3: Ethical Hacking :Enterprise Security	Acquire knowledge to test and exploit systems using various tools and understand	

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)	the impact of hacking in real time machines.	