Program: Bachelors of Science in (Information Technology)

Program Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.

PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.

PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.

PSO5: Identify, design, and analyze complex computer software systems and implement and interpret the results from those systems.

PSO6: Analyze the local and global impact of computing on individuals, organizations, and society.

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

Course Outcomes
FYBSC IT – SEM 1

Course: USIT101 Programming Principles with C

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1-01 - Understand Fundamentals of Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	**CO1** - To develop the 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	U2 - 01 - Managing Input and Output Operations U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions U3 - Understanding the conditional statements	
UNIT III	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of Instructions: Loops U3 - 03 - Understand Group of Statements: Functions	
UNIT IV	U4 - 01 - Implementing Pointers. U4 -02 - Learn Characters Arrays	
UNIT V	U5 - 01- Implementing Structures using C U5 - 02 - Learning File operations.	

Course: USIT102 Digital Logic and Applications

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1-01 Students learned the difference between Analog System and Digital System U1-02 Understanding different number system and their conversions. U1-03 Understanding weighted codes and non-weighted codes U1-04 Students learnt different codes with examples and performed binary arithmetic. U1-05 Students understood basic gates, universal gates and other gates concepts.	**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:	U2-01 Understanding and Solving Boolean Algebra problems. U2-02 Understood the concept of principle of Duality. U2-03 Understanding Minterms and Maxtrems U2-04 Understanding and solving reduction techniques using Karnaugh maps.	
UNIT III:	U3-01 Designing and implementing Combinational Logic Circuits U3-02 Understood difference between combinational and sequential circuits. U3-03 Learning different Arithmetic Circuits	
UNIT IV:	U4-01 Designing and implementing S-R Latch. U4-02 Designing and learning various Flipflops U4-03 Learnt Master - Slave Flipflop. U4-04 Designing and learning various Shift Registers.	
UNIT V:	U5-01 Designing and implementing Bit Arithmetic and Logic Unit. U5-02 Learning functioning of Carry Look ahead Counter. U5-03 Understood Binary multiplication. U5-04 Understood Division Algorithm.	

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

Course: USIT103 Fundamentals of Database Management Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1 - 01 - Understanding & learning the introduction of database U1 - 02 - Understanding the basic concept of Relational Database model & algebra.	**CO1** Define and describe the fundamental elements of relational database management systems. **CO2** To relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. **CO3** Design ER-models to represent simple database application scenarios. **CO4** Transform the ER-model to relational tables, populate relational databases and formulate SQL queries on data. **CO5** Improve the database design by normalization.
UNIT – II:	U2 - 01 - Learning about ER diagrams. U2 - 02 - Understand the concepts on ER model U2 - 03 - Learning about UML diagrams.	
UNIT– III	U3 - 01 - Understanding & learning functional dependency. U3 - 02 - Understanding normalization.	
UNIT– IV	U4 - 01 - Learning applications of constraints. U4 - 02 - Learning applications of views and SQL. U4 - 03 - Learning file structures & indexing in files.	
UNIT – V	U5 - 01 - Learning about Transaction Management and Concurrency Control. U5 - 02 - Learning and understanding of different methods of recovery management.	

Course: USIT104 Discrete Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1 - 01 - Understands the various set operations. U1 - 02 - Remembering the different types of sets. U1 -03 - Applying and analyzing the relation operations.	**CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures. **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:	U2 - 01 - Understands the Logarithmic and mathematical function U2 - 02- Learning different types of functions on sets. U2 - 03 - Understand the applications of algorithms.	
UNIT III:	U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion. U3 -02- Interpreting Counting principle and U3 - 03 - Understanding working of recursion	
UNIT IV:	U4 - 01 - Implementing Different searching algorithms. U4 -02 - Analyzing the Graphs & trees.	
UNIT V:	U5 - 01 - leaning the concept of binary tree. U5 - 02 - Implementing Search tree. U5 -03 - Understand the working of Priority Queue.	

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

Course: USIT105 Technical Communication Skills

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I:	U1 - 01 - Understanding the fundamentals of Communication skills. U1-02- Analyzing and Applying Communication skills.	CO1. Analyze, synthesize and utilize the process and strategies from delivery to solving communication problem. CO2. Learn the communication methodologies at workplace and learning about importance of team collaboration. CO3. Learn about different technical communication such as presentations and interviews. CO4. Understand and apply the art of written communication in writing reports, proposals. CO5. Ground rules of ethical communication and MIS. CO6. Understand the functions of graphs, maps, charts.
UNIT II:	U2 - 01 - Understanding the 7Cs of Communication skills. U2 - 02 - Understanding and remembering the development of Oral communication skills for business through conversations and group discussion. U2 - 01 - Applying and learning the writing of Business messages such as email and its etiquettes.	
UNIT III:	U3 - 01 - Analyzing and Evaluating the importance of Active listening skills. U3 - 02 - Understanding and Remembering specific communication needs U3-03 Applying the skills of presentation through strategies and analyzing how to face a job interview.	
UNIT IV:	U2 - 01 - Applying and learning the writing of Business correspondence, messages and documents. U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs	
UNIT V:	U5 - 01 - Learning and Understanding the different ways of financial communication. U5 - 02 - Creating and applying the business communication ethics. U5 -03 Understanding the importance of visual aids in presentation.	

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

Course Outcomes

FYBSC IT – SEM 2

Course: USIT201 Object oriented Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I	U1 -01- Learning Object oriented programming. U1 -02- Understands the principles and features of C++. U1 - 03 - Implementing programs using perators and pointers.	CO1: Students will understand the need of object-oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment. 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. 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	U2 -01- Understands the classes and Objects in OOPs. U2 -02- Remembering the Constructors and Destructors. U2 - 03 - Understands the concept of overloading.	
UNIT- III	U3 -01- Understand the concept of formatting. U3 -02- Analyze the Virtual functions. U3 - 03 - Analyze the different types of inheritance.	
UNIT- IV	U4 -01- Understand the concept of file handling. U4 -02- Learning the concept of Exception handling.	
UNIT - V	U5 -01- Understand the concept of Templates. U5 -02- Working and creating programs on string manipulation. U5 - 03 - Summarize the new features of Ansi c++	

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

Course: USIT202 Fundamentals of Micro Processor and Microcontrollers

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I	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 Learnt different types of memory and input and output devices. U1-O5 Learning 8155 memory segment, memory interfacing. U1-O6 Illustration of 8085 based microcomputer.	**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 microprocessors. **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 embedded systems and general purpose computers. **CO9** Understanding 8051 microcintroller, internal architecture, coding of 8051 programming in C and various applicatio codes. **CO10** Studying design and development of embedded systems and IDE.
UNIT - II	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 Programming model and 8085 Instruction Set. U2-05 Understanding various debugging techniques.	
UNIT -III	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. U3-06 Learnt various software and hardware interrupts.	
UNIT-IV	U4-01 Learning embedded systems and general purpose computers. U4-02 Understaning Memory map, I/O map & Interrupt map Concepts. U4-03 Learning applications of different types of memories. U4-04 Understanding 8051 microcintrollers and its internal architecture. U4-05 Learnt coding of 8051 programming in C and applications of 8051.	
UNIT - V	U5-01 Designing different applications of 8051 microcontrollers. U5-02 Learning various factors required to select a microcontroller. U5-03 Understanding structure of embedded program. U5-04 Understanding design and development of embedded systems and IDE. U5-05 Learning cross compilation concept, embedded product development life cycle.	

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

Course: USIT203 Web Applications Development

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Understanding and introduction of the internet and its application. 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.	• Analyze working of the Internet. • Gain an insight into designing web pages. • Use different ways of styling web pages using CSS. • Implement basic and complex functionalities of JavaScript in a web page. • Employ PHP Scripts to execute dynamic tasks in a web page. • Perform various database tasks using PHP.
UNIT - II	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning . U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more . U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML .	
UNIT -III	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	
UNIT – IV	U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling .	
UNIT – V	U5 - 01 - Understanding and learning of advanced PHP . U5-02- Analyzing and implementing connection between PHP with MYSQL to work with database.	

Course: USIT204 Numerical Methods

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - The overall objective is to learn Error solving , handling and to apply various formulas of any mathematical models U1 - 02 -Learning different types of errors that take place in problem solving .	CO1 Understand numerical techniques to find the roots of nonlinear equations and solution of systems of linear equations. CO2 Understand the difference operators and the use of interpolation CO3 Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
UNIT – II	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method U2 - 02 - Learning of different Interpolation .	
UNIT -III	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration U3 - 02 - Learning Taylor's series and Simpson's rule .	
UNIT – IV	U4 - 01 - Understanding and learning of many types of regressions U4-02- Understanding and learning squares , non linear regression	
UNIT – V	U5 - 01- Detailed study of linear programming problems & graphical solutions. U5 - 02 - Understanding of Partial differential equations. U5 - 03 - Understanding and learning Laplace, Bender-Schmidt's equations. U5 - 04 - Understanding of hyperbolic equations.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHEETH L.E.T.

Course: USIT205 Green IT

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I	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, Implementation of Basel Conventions. U1-04: To know the significance of WEEE Directives. U1-05: To learn the non-regulatory government initiatives.	CO1 :To learn overview and issues addressed in Green Computing. CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing. 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 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 - II	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.	
UNIT -III	U3 -01- Learning and analyzing the Global Impact of local actions. U3-02 - Understanding green data storage, green software and green networking and communications. U3 -02- Learning to use electronic device instead of paper and going paperless.	
UNIT - IV	U4-01- Understanding the concept of why recycling and refurbishing is important. U4 -02- Analyze the use of hardware products. U4 -03- Learning hard drive, CD and DVD recycling and disposal. U$ -04 Understanding energy star programs and Remote Desktops.	
UNIT - V	U5 -01- Learning about the use of IS to achieve environmental objectives. U5 -02- Analyzing the green supply chain concepts. U5 -03- Understanding the role of Chief Green Officer and CEO. U5 -04 - Understanding various things about data such as tracking, Analysing and conducting audits.	

SHETHLJ & SIR M. V. COLLEGE OF SCIENCE & COMMERCE

Course Outcomes

SYBSC IT – SEM 3

Course: USIT301 Python Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Understand the concept of Python Programming. 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	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	
UNIT – III	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	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. U4 -04- Creating Modules and understand the different type of module.	
UNIT -V	U5 -01- Creating the GUI Form and Adding Widgets U5 -02- Analyzing the Widgets such as buttons, menu, radio button. U5 -03- Learning how to design GUI applications with proper layout management features.	

Course: USIT302 Data Structures

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Understand the concept of Data Structure and classification of data structure. 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	U2 -01- Understand types of linked lists. U2 -02- Learning about the concept of linked list.	
UNIT – III	U3 -01- Understand the concepts of Stack Memory Representation U3 - 02- Learning about what exactly Queue is.	
UNIT – IV	U4 -01- Understanding about binary trees like property, algorithms and representation. U4 -02- Learning about Advanced Tree Structures.	
UNIT -V	U5 -01- Understand about hashing techniques. U5 -02- Learning about the introduction of graph and representation of graph.	

SHETH M. V. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

Course: USIT303 Computer Networks

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	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 various sectors of user community. CO7 Knowledge about various protocols used in computer network. CO8 Demonstrate different routing and switching algorithms.
UNIT – II	U2 -01- Understanding about Bandwidth Utilization U2 -02- Learning about Switching. U2 -03- Learning about Data Link Layer	
UNIT – III	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	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 -V	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	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data Models . . U1 - 03 - Learning about ER diagram.	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.
UNIT – II	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	U3 - 01 - Learning the application of constraints , views and sql . U3 - 02 - Understanding the concept of functions and values .	
UNIT – IV	U4 - 01 - Learning about Transaction management and Concurrency Control. U4 -02 - Learning and Application of different methods and database recovery management	
UNIT -V	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of different data types , procedures and clauses .	

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

Course: USIT305 Applied Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. 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.
UNIT – II	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	
UNIT – III	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 .	
UNIT – IV .	U4 - 01 - Application and learning of Multiple Integrals with its different types and properties .	
UNIT -V	U5 - 01 - Understanding and learning the Beta and Gamma Functions , along with its formula and error functions	

SYBSC IT – SEM 4

Course: USIT401 Core Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Introduction to History, architecture and its components,Java Class U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 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 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	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 .	
UNIT – III	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	U4 - 01 - Detailed study of arrays and introduction and understanding its types . U4 - 02 - Understanding and learning of multi threading and its various properties , U4 - 03 - Application and Understanding of exception handling .	
UNIT -V	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 .	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE • SHETHLI • ANDHERI (EAST) MUMBAI-69.

Course: USIT402 Introduction to Embedded Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 02 - Understanding and introduction to Embedded system and its application . 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	U2 - 01 - Study of Embedded systems and its application . U2 - 02 - Understanding the concept of Embedded Hardware and types of memory . U2 - 03 - Detailed study of the concept called peripherals .	
UNIT – III	U3 - 01 - Studying and Understanding the The 8051 Microcontrollers. U3 - 02 - Learning and application of 8051 Programming in C and its logic.	
UNIT – IV	U4 - 01 - Learning the application of Designing Embedded System with 8051 Microcontroller . U4 - 02 - Learning the concept of Programming embedded systems and the structure .	
UNIT -V	U5 - 01 - Understanding and learning the concept Real Time Operating System (RTOS) and its characteristic . U5 - 02 - Analyzing the Design and Development: Embedded system of the development Environment and the types of files	

Course: USIT403 Computer Oriented Statistical Techniques

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Learning the concept of tendencies and its different types of notation . U1 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion . U1 - 03 - Learning and understanding the concept of deviation and studying the same in dtail.	CO1 Recognize the error in the number generated by the solution. 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 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
UNIT – II	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . U2 - 02 - Detailed study of the 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	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory. U3 - 02 - Remembering and Learning and the theory of Statistical Decision .	

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

	U3 - 03 - Detailed study of Statistics in R and its distribution .	test for Independence as well as Goodness of Fit.
UNIT – IV	U4 - 01 - Understanding and Analyzing the Small Sampling Theory . U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software.
UNIT -V	U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares . U5 - 02 - The detailed study of correlation and its concept of theories and regression .	

Course: USIT404 Software Engineering

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - The learning and Introduction to Software engineering . 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	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	U3 - 01 - Introduction to Architectural Design and its system and styles . U3 - 02 - Learning and Understanding of User Interface Design . U3 - 03 - Analyzing and creating Quality Management .	
UNIT – IV	U4 - 01 - Understanding and learning about the Verification and Validation. U4 - 02 - Analyze and creating testing components and its functions .	
UNIT -V	U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc .	

SHETHLI T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE * ANDHRA (EAST) MU... 559.

Course: USIT405 Computer Graphics and Animation

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Introduction to Computer graphics and its application and software description . U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping .	CO1 To familiarize students with basic principles and techniques for computer graphics. CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional 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	U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices . 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	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	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	U5 - 01 - Learning and understanding the concept of Computer Animation in detail . U5 - 02 - Creating and analyzing Image Manipulation and Storage in detail .	

FYBSC IT – SEM 5

Course: USIT501 Software Project Management

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Understanding Why is Software Project Management Important. U1 -02- Learning the basic concept of project. U1 -03- Understanding and learning about what is management. U1 -04- Learning about Overview of Project Planning.	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.
UNIT – II	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.	
UNIT – III	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	
UNIT – IV	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts. U4 -03- Understanding Behaviour, Organizational Behaviour	
UNIT – V	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.	

SHETH L.U.J. & SHRI V.J. COLLEGE OF ARTS & SCIENCE * ANDHERI (EAST) MUMBAI-69.

Course: USIT502 Internet of Things

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	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	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	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.	
UNIT – IV	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.	
UNIT – V	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	U1 -01- Understanding .NET framework . U1 -02- Learning about Types, Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies. 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	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.	
UNIT – III	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	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 – V	U5 -01- Understanding what is XML. U5 -02- Learning about what is Security Fundamentals. U5 -03- Understanding Ajax, Using Partial Refreshes.	

SIR M.V. COLLEGE OF SCIENCE & COMMERCE * SHETH L.U.J. * ANDHERI (EAST) MUMBAI-59.

Course: USIT505 Linux System Administration

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell. U1 -03- Learning about System Administration Tasks	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 CO4 To make Students Install Apache, Send Mail. CO5 Write Shell Scripts in Linux.
UNIT – II	U2 -01- Learning about how to configure and manage storage. U2 -02- Understanding NetworkManager, 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.	
UNIT – III	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	
UNIT – IV	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	
UNIT – V	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

Course: USIT506 Enterprise Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 -01- Understanding what is Java EE. 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	U2 -01- learning the concept of Request Dispatcher. U2 -02- Learning about cooking. U2 -03- Learning how to work with files.	
UNIT – III	U3 -01- Understand about Java Server pages. U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	
UNIT – IV	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	U5 - 01 -Introduction and learning about Persistence, Object/Relational 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 .	

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

TYBSC IT – SEM 6

Course: USIT601 Software Quality Assurance

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Describe fundamental concepts of software quality assurance. 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
UNIT – II	U2 - 01 - To learn the basic testing techniques. U2 - 02 - Develop knowledge of testing process and features.	
UNIT – III	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	
UNIT – IV	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	
UNIT – V	U5 - 01 - understanding the levels of testing's.	

Course: USIT602 Security in Computing

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - simplify Information Security Overview 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	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure.	
UNIT – III	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	
UNIT – IV	U4 - 01 - Learn Operating System Security Models. U4 - 02 - Learn Intrusion Detection and Prevention Systems	
UNIT – V	U5 - 01 - Introduce Cloud computing. U5 - 02 - Analyze application Security, Remote Administration Security.	

Course: USIT603 Business Intelligence

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - Describe the concepts and components of Business Intelligence (BI). U1 - 02 -Critically evaluate use of BI for supporting decision making in an organization. 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
UNIT – II	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction U2 - 02 - To develop knowledge of data mining.	

SHENOY COLLEGE OF COMMERCE & SHENOY V. COLLEGE OF ARTS ANDHERI (EAST) MUMBAI-69.

	U2 - 03 - Analyze Data Validation and data preparation.	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 – III	U3 - 01 -evaluate classification models, Bayesian methods, Clustering methods, Partition methods, Hierarchical methods U3 - 02 - Explain Clustering and classification model.	
UNIT – IV	U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficiency measures, efficient frontier, The CCR model U4 - 02 - Identify marketing models and production models.	
UNIT – V	U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems. 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	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
UNIT – II	U2 - 01 -Demonstrate organizational skills in file and database management. U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology.	
UNIT – III	U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.	
UNIT – IV	U4 - 01 -Effectively communicate and present project results in oral, written, and graphic forms. U4 - 02 -Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems.	
UNIT – V	U5 - 01 -Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis. U5 - 02 -Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS).	

Course: USIT605 IT Service Management

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I	U1 - 01 - To develop knowledge and critical understanding of the fundamental principles of ITSM 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
UNIT – II	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	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE (AUTO.) ANDHERI (EAST) MUMBAI-400 069.

UNIT – III	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.	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 – IV	U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector. 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	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.	

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

Academic Year-2022-23

Program: Bachelors of Science in (Information Technology)

Program Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking
and actions, checking out the degree to which these assumptions are accurate and valid, and looking at
our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic
media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and
help reach conclusions in group settings.
PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of
your decisions, and accept responsibility for them.
PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable
development.
PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.



Academic Year: 2022-23

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.

PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.

PSO5: Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.

PSO6: Analyze the local and global impact of computing on individuals, organizations, and society.

Course Outcomes

FYBSC IT – SEM 1
2022-2023

Course: USIT101 Programming Principles with C

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Introduction:** Algorithms, History of C, Structure of C Program. Program Characteristics, Compiler, Linker and preprocessor, pseudo code statements and flowchart symbols, Desirable program characteristics. Program structure. Compilation and Execution of a Program, C Character Set, identifiers and keywords, data types and sizes , constants and its types, variables, Character and character strings, typedef, typecasting	U1-01 - Understand Fundamentals of Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	**CO1** - To develop the 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 **Type of operators:** Arithmetic operators, relational and logical operators, Increment and Decrement operators, assignment operators, the conditional operator, Assignment operators and expression, Precedence and order of Evaluation Block Structure, Initialization, C Preprocessor **Control Flow:** Statements and Blocks, If-Else, Else-If, Switch, Loops- While and For LoopsDo-while, Break and Continue, Goto and Labels	U2 - 01 - Managing Input and Output Operations U2 - 02 - Performing Mathematical and Logical functions: Operators and Expressions U3 - Understanding the conditional statements	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE ★ SHETHLULA ★ ANDHERI (EAST) MUMBAI-69.

UNIT III **Functions and Program Structure:** Basics of functions, User defined and Library functions, Function parameters, Return values, Recursion External variables, Scope Rules, Standard Input and Output, Formatted Output-printf() and Formatted Input- scanf(), Line Input and Output, Error Handling- StdErr and Exit, Header Files	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of Instructions: Loops U3 - 03 - Understand Group of Statements: Functions	
UNIT IV **Pointer and Arrays** Pointer and Addresses, Pointer and Function Arguments, Pointer and Arrays, Address Arithmetic, Character Pointers and Functions, Pointer Arrays: Pointers and Functions, Multidimensional Array, Command-line Arguments, Pointers to Functions, Dynamic memory allocation	U4 - 01 - Implementing Pointers. U4 -02 - Learn Characters Arrays	
UNIT V **Structures:** Basics of structures, Structures and Functions, Arrays of Structures, Pointers to Structures, Unions, Bit-fields, **File management in C:** Defining and Opening file, Closing a file, Input / Output operations on file, Error handling in C, Random access to files, Command line arguments.	U5 - 01- Implementing Structures using C U5 - 02 - Learning File operations.	

Course: USIT102 Digital Logic and Applications

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Digital Systems and Binary numbers** Digital Systems and Binary numbers Introduction to Number systems, Positional Number systems, Conversions (converting between bases), Non positional number systems, Unsigned and Signed binary numbers, Binary Codes, Number representation and storage in computer system. **Logic gates and Logic Circuits** Basic and Universal Gates.	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 Students learnt different codes with examples and performed binary arithmetic. U1-05 Students understood basic gates, universal gates and other gates concepts.	**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

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

		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 Gate level minimization** Introduction, Postulates of Boolean Algebra, Two Valued Boolean Algebra, Principle of Duality, Basic Theorems of Boolean Algebra, Boolean Functions and their Representation, Gate-Level Minimization (Simplification of Boolean Function), QuineMcCluskey Method, Review questions	U2-01 Understanding and Solving Boolean Algebra problems. U2-02 Understood the concept of principle of Duality. 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:** Introduction, Analysis and Design Procedure for Combinational Logic Circuits, Types of Combinational Circuit, Review Questions .	U3-01 Designing and implementing Combinational Logic Circuits U3-02 Understood difference between combinational and sequential circuits. U3-03 Learning different Arithmetic Circuits	
UNIT IV: **Sequential circuit:** Introduction, Latch, Flip-Flops, Registers, Counters, Review Questions **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.	U4-01 Designing and implementing S-R Latch. U4-02 Designing and learning various Flipflops U4-03 Learnt Master - Slave Flipflop. U4-04 Designing and learning various Shift Registers. U4-05 Learnt various Up-Counters and Down-Counters.	

SHETH L.U.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-400 069.

UNIT V: **Applications:** Bit Arithmetic and Logic unit, Carry lookahead generator, Binary Multiplication and Division algorithm, Booth's multiplication algorithm counter.	U5-01 Designing and implementing Bit Arithmetic and Logic Unit. U5-02 Learning functioning of Carry Look ahead Counter. U5-03 Understood Binary multiplication. U5-04 Understood Division Algorithm. U5-05 Learnt Booth's multiplication algorithm.	

Course: USIT103 Fundamentals of Database Management Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: Database system- concept and Architecture, Relational model and Relational database constraints. Relational Algebra.	U1 - 01 - Understanding & learning the introduction of database U1 - 02 - Understanding the basic concept of Relational Database model & algebra.	**CO1** Define and describe the fundamental elements of relational database management systems. **CO2** To relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. **CO3** Design ER-models to represent simple database application scenarios. **CO4** Transform the ER-model to relational tables, populate relational databases and formulate SQL queries on data. **CO5** Improve the database design by normalization.
UNIT – II: Conceptual modelling and database design: Data modelling using the Entity Relationship model (ER).The enhanced entity relationship model. Relational database design by ER and EER model. Practical database design methodology and use of UML diagrams.	U2 - 01 - Learning about ER diagrams. U2 - 02 - Understand the concepts on ER model U2 - 03 - Learning about UML diagrams.	
UNIT – III Database Design theory and normalization: Basics of functional dependencies and normalization for	U3 - 01 - Understanding & learning functional dependency. U3 - 02 - Understanding normalization.	

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

relational databases. Relational database design and further dependencies.		
UNIT – IV Introduction to SQL . Complex queries, triggers, views, joining database tables and schema modification. Query Processing and optimization. File structure, hashing and indexing	U4 - 01 - Learning applications of constraints. U4 - 02 - Learning applications of views and SQL. U4 - 03 - Learning file structures & indexing in files.	
UNIT – V Transaction management and concurrency control and recovery: Introduction to transaction processing concepts and theory. Concurrency control technique. Database recovery technique.	U5 - 01 - Learning about Transaction Management and Concurrency Control. U5 - 02 - Learning and understanding of different methods of recovery management.	

Course: USIT104 Discrete Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Set Theory** Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction **Relations** Introduction, Product Sets, Relations, Pictorial Representatives of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations	U1 - 01 - Understands the various set operations. U1 - 02 - Remembering the different types of sets. U1 -03 - Applying and analyzing the relation operations.	**CO1** Gain experience in using various techniques of mathematical induction to prove simple mathematical properties of a variety of discrete structures. **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.

SIR M. V. COLLEGE OF SCIENCE & COMMERCE

UNIT II: **Functions and Algorithms** Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions, Sequences, Indexed Classes of Sets, Recursively Defined Functions, Cardinality, Algorithms and Functions, Complexity of Algorithms **Probability** Introduction, Sample Space and Events, Finite Probability Spaces, Conditional Probability, Independent Events, Independent Repeated Trials, Binomial Distribution, Random Variables, Chebyshev's Inequality, Law of Large Numbers	U2 - 01 - Understands the Logarithmic and mathematical function U2 - 02- Learning different types of functions on sets. U2 - 03 - Understand the applications of algorithms.	
UNIT III: **Techniques of Counting** Introduction, Basic Counting Principles, Mathematical Functions, Permutations, Combinations, the Pigeonhole Principle, The Inclusion–Exclusion Principle, Tree Diagrams **Advanced Counting Techniques, Recursion** Introduction, Combinations with Repetitions, Ordered and Unordered Partitions, Inclusion–Exclusion Principle Revisited, Pigeonhole Principle Revisited, Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Solving SecondOrder Homogeneous Linear Recurrence, Relations, Solving General Homogeneous Linear Recurrence Relations	U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion. U3 -02- Interpreting Counting principle and U3 - 03 - Understanding working of recursion	
UNIT IV: **Graph Theory** Introduction, Data Structures,,Graphs and Multigraphs, Subgraphs, Isomorphic and Homeomorphic Graphs, Paths, Connectivity, Traversable and Eulerian Graphs, Bridges of Königsberg, Labeled and Weighted Graphs, Complete, Regular, and Bipartite Graphs, Tree Graphs, Planar Graphs, Graph Colorings, Representing Graphs in	U4 - 01 - Implementing Different searching algorithms.. U4 -02 - Analyzing the Graphs & trees.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SIKETH L.U.E. ANDHERI (EAST) MUMBAI

Computer Memory, Graph Algorithms, Traveling-Salesman Problem, Solved Problems **Directed Graphs** Introduction, Directed Graphs, Basic Definitions, Rooted Trees, Sequential Representation of Directed Graphs, Warshall's Algorithm, Shortest Paths, Linked Representation of Directed Graphs, Graph Algorithms: Depth-First and Breadth-First Searches, Directed Cycle-Free Graphs, Topological Sort, Pruning Algorithm for Shortest Path		
UNIT V: **Binary Trees** Introduction, Binary Trees,, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees, Priority Queues, Heaps, Path Lengths, Huffman's Algorithm, General (Ordered Rooted) Trees Revisited **Ordered Sets and Lattices** Introduction, Ordered Sets, Hasse Diagrams of Partially Ordered Sets, Consistent Enumeration, Supremum and Infimum, Isomorphic (Similar) Ordered Sets, Well Ordered Sets, Lattices 346 Bounded Lattices, Distributive Lattices, Complements, Complemented Lattices	U5 - 01 - leaning the concept of binary tree. U5 - 02 - Implementing Search tree. U5 -03 - Understand the working of Priority Queue.	

Course: USIT105 Technical Communication Skills

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **Fundamentals of Technical Communication** Introduction, The process of communication, Language as tool of communication, levels of communication, The flow of communication, Communication Networks, The importance of technical communication **Barriers to communication** Definition of Noise, classification of	U1 - 01 - Understanding the fundamentals of Communication skills . U1-02- Analyzing and Applying Communication skills.	CO1. Analyze, synthesize and utilize the process and strategies from delivery to solving communication problem. CO2. Learn the communication methodologies at workplace and learning about importance of team collaboration. CO3. Learn about

SHETHLU L & Sh. M. V. COLLEGE OF SCIENCE & COMMERCE • ANDHERI (EAST) MUMBAI-59.

Barriers **Non-verbal Communication** **Introduction** Definition, significance of nonverbal, forms of non -verbal communication, types of non-verbal communication		different technical communication such as presentations and interviews. CO4. Understand and apply the art of written communication in writing reports, proposals. CO5. Ground rules of ethical communication and MIS. CO6. Understand the functions of graphs, maps, charts.
UNIT II: **The Seven Cs of Effective Communication**: Completeness, Conciseness, Consideration,Concreteness, Clarity, Courtesy, Correctness **Conversations** Introduction, Importance of Business conversion, Essential of Business conversion,Conversation Management **Meeting and conferences** Introduction, Purpose of Meeting, planning a meeting, Meeting Process, Leading effective meeting, Evaluating meeting, planning conference, teleconferencing **Group Discussion and team presentation** Introduction, Benefits of GD, Workplace GD guidelines, Functional and non functional roles in GD, Improving group performance, Assessment of group discussion ,Team presentation **Email communication** Introduction, Advantages of email, problems in email communication, Email etiquettes,Techniques of writing Effective Email	U2 - 01 - Understanding the 7Cs of Communication skills . U2 - 02 - Understanding and remembering the development of Oral communication skills for business through conversations and group discussion. U2 - 01 - Applying and learning the writing of Business messages such as email and its etiquettes.	

SHETHLUT & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

UNIT III: **Active Listening** Introduction, Type of listening, Traits of good listener, Active vs Passive listening, Implication of effective listening **Effective presentation Strategies** Introduction, Defining purpose, Analyzing audience and Locale, Organizing contents,preparing outline, Visual Aids, Understanding Nuances of delivery, Kinesics **Interview** Introduction, objectives, types of interview, job interviews	U3 - 01 - Analyzing and Evaluating the importance of Active listening skills. U3 - 02 - Understanding and Remembering specific communication needs U3-03 Applying the skills of presentation through strategies and Analyzing how to face a job interview.	
UNIT IV: **Business writing** Introduction, Importance of written Business, Five main strategies of writing , business messages **Business correspondence** Business letter writing, common component of Business letter, Strategies for writing body of a letter, Types of Business letter, writing memos **Business reports and proposal** What is report? Steps in writing routine Business report, parts of report, corporate reports and Business proposals **Careers and Resume** Introduction to career building, resume format, traditional, electronic and video resumes,sending resume, follow up letters and online recruitment process	U2 - 01 - Applying and learning the writing of Business correspondence, messages and documents. U4 - 01 - Analyzing and Evaluating or Understanding specific communication needs	
UNIT V: **Communication across Functional areas** Financial communication, MIS **Ethics in Business Communication** Ethical communication, Values, ethics and communication, ethical dilemmas facing manager,strategic approaches to corporate ethics **Creating and Using Visual Aids** Object, Models, Handouts, Charts and Graphs, Text Visuals , Formatting Computer generated charts, graphs and visuals	U5 - 01 - Learning and Understanding the different ways of Financial communication . U5 - 02 - Creating and applying the business communication ethics. U5 -03 Understanding the importance of visual aids in presentation.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHETH L.U.J. * ANDHERI (EAST) MUMBAI-59

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHETH L.U.J. * ANDHERI (EAST) MUMBAI-59

Course Outcomes

FYBSC IT – SEM 2-2022-23

Course: USIT201 Object oriented Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I **INTRODUCTION OF OBJECT-ORIENTED DESIGN :** Introduction, Objects, Class and Instance, Polymorphism, Inheritance, Object-Oriented Analysis , Finding the Objects ,Conceptual Modeling Requirements Model , Analysis Model, The Design Model, The Implementation Model , Test Model, ObjectOriented Analysis and Design, The Evolution of Object Model, Object-Oriented Programming, Object-Oriented Design, Object-Oriented Analysis, Elements of Object Model ,The Role of OOAD in the Software Life Cycle, OOAD Methodologies, Grady Booch Approach, **STARTING WITH C++:** C++ Overview, C++ Character Set, C++ Tokens, Variables, Counting Tokens, Data Types, Qualifiers, Range of Data Types, Your First C++ Program, Structure of a C++ Program, Styles of, Writing C++ Programs, Programming Examples **FEATURES OF C++:** Introduction, Operators and Expressions, Declaring Constants, Type Conversion, Decision Making: An Introduction, Unconditional Branching Using Goto , Introduction to Looping **OPERATORS AND REFERENCES IN C++:** Introduction, Scope Resolution Operator, Reference Variables, The Bool Data Type, The Operator New and Delete, Malloc Vs. New ,Pointer Member Operators	U1 -01- Learning Object oriented programming. U1 -02- Understands the principles and features of C++. U1 - 03 - Implementing programs using perators and pointers.	CO1: Students will understand the need of object oriented programming, fundamental concepts and will be able to solve computational problems using basic constructs like if-else, control structures, array, strings in Java environment. 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. 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 **FUNCTION IN C++:** Introduction ,Function Declaration/Prototyping ,,The Main Function in C++,Recursion ,Call by Reference ,Call by Reference Vs Call by Address , Return by Reference ,,Inline Function ,Function Overloading ,Function with Default Arguments CLASS AND OBJECTS IN C++ : Working with Class, Structure in C++ ,Accessing Private Data Passing and Returning Object ,Array of Object ,Friend	U2 -01- Understands the classes and Objects in OOPs. U2 -02- Remembering the Constructors and Destructors. U2 - 03 - Understands the concept of	

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

Function ,Static Class Members ,Constant Member Function **WORKING WITH CONSTRUCTOR AND DESTRUCTOR:** Introduction, Constructor with Parameters, Implicit and Explicit Call to Constructor, Copy Constructor, Dynamic Initialization of Objects, Dynamic Constructor, Destructor **WORKING WITH OPERATOR OVERLOADING:** Introduction, Operator Overloading with Binary Operator Overloading Assignment (=) Operator, Overloading 12 Annexure I Unary Operators, Overloading Using Friend Function, Rules of Operator Overloading, Type Conversion	overloading.	
UNIT - III **WORKING WITH INHERITANCE IN C++:** Introduction, Types of Inheritance, Public, Private and Protected Inheritance, Multiple Inheritance, Hierarchical Inheritance, Virtual Base Class, Constructor and Destructor in Inheritance, Containership **POINTERS TO OBJECTS AND VIRTUAL FUNCTIONS:** Pointer to Objects, The This Pointer, What is Binding in C++? , Virtual Functions ,Working of a Virtual Function ,Rules for Virtual Function ,Pure Virtual Function and Abstract Class ,Object Slicing ,Some Facts about Virtual Function ,Virtual Destructor **INPUT-OUTPUT AND MANIPULATORS IN C++:** Introduction, C++ Stream Classes, Unformatted Input/Output, Formatted Input /Output Operations, Manipulators	U3 -01- Understand the concept of formatting. U3 -02- Analyze the Virtual functions. U3 - 03 - Analyze the different types of inheritance.	
UNIT IV: **FILE HANDLING IN C++:** Introduction, File Streams, Opening and Closing a File, File Opening Modes Checking End of File, Random Access in File, Command Line Arguments, Working with Binary Mode Error Handling **TEMPLATE PROGRAMMING:** Introduction , Function Template , Class Template **EXCEPTION HANDLING IN C++ :** Introduction , Basics of Exception Handling , Exception Handling Mechanism , Programming Examples ,Exception Handling with Class Catching all Exceptions , Specifying Exception for a Function	U4 -01- Understand the concept of file handling. U4 -02- Learning the concept of Exception handling.	
UNIT V: **INTRODUCTION TO THE STANDARD TEMPLATE LIBRARY :** Introduction , Components of STL , Containers , Algorithms , Iterators ,Application of Container Classes Function Objects **MANIPULATING STRINGS :** Introduction , Creating (string) Objects , Manipulating String Objects , Relational Operations, String Characteristics , Accessing Characters in Strings , Comparing and Swapping **NEW FEATURES OF ANSI C++ STANDARD :** Introduction ,New Data Types , New Operators , Class Implementation , Namespace Scope , Operator Keywords , New Keywords , New Headers	U5 -01- Understand the concept of Templates. U5 -02- Working and creating programs on string manipulation. U5 - 03 - Summerize the new features of ansi c++	

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

Course: USIT202 Fundamentals of Micro Processor and Microcontrollers

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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 the8085 Memory Segment.	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 Learnt different types of memory and input and output devices. U1-O5 Learning 8155 memory segment, memory interfacing. U1-O6 Illustration of 8085 based microcomputer.	**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 embedded systems and general purpose computers. **CO9** Understanding 8051 microcintroller. internal architecture, coding of 8051 programming in C and various applicatio codes. **CO10** Studying design and development of embedded systems and IDE.
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, 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	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 Programming model and 8085 Instruction	

SHETH L.U.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-59

Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.	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 **Interrupts:** The 8085 Interrupt, 8085 Vectored and Non vectored Interrupts, Restart as S/W Instructions.	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. U3-06 Learnt various software and hardware interrupts.	
UNIT-4: Micro Controllers: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems. **Embedded Hardware:** Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. **Peripherals:** Control and Status Registers, Device Driver, Timer watch Timer **The 8051 Microcontrollers:** Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. **8051 Programming in C:** Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs	U4-01 Learning embedded systems and general purpose computers. U4-02 Understaning Memory map, I/O map & Interrupt map Concepts. U4-03 Learning applications of different types of memories. U4-04 Understanding 8051 microcintrollers and its internal architecture. U4-05 Learnt coding of 8051 programming in C and applications of 8051.	
UNIT-5:**Designing Embedded System with 8051 Microcontroller:**Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051. **Programming embedded systems:** structure of embedded program, infinite loop, compiling, linking and debugging.	U5-01 Designing different applications of 8051 microcontrollers. U5-02 Learning	

COLLEGE OF SCIENCE & COMMERCE * SHETHLOJ
ANDHERI
MUMBAI

Design And Development: Embedded system development Environment – IDE, types of file generated on cross compilation, Embedded Product Development cycle and Trends in embedded Industry	various factors required to select a microcontroller. U5-03 Understanding structure of embedded program. U5-04 Understanding design and development of embedded systems and IDE. U5-05 Learning cross compilation concept, embedded product development life cycle.	

Course: USIT203 Web Applications Development

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I **Internet and the World Wide Web:** What is Internet? Applications of Internet, E-mail, Telnet, FTP, E-commerce and E-business, Internet Service Providers, Domain Name Server, Internet Address, World Wide Web (WWW): World Wide Web and its Evolution, Uniform Resource Locator (URL), Browsers, Common Features of Browsers, Search Engine, Web Server, HTTP Protocol. **HTML5:** Introduction, Formatting Text by using Tags, Using Lists, Creating Hyperlinks and Bookmarks, Defining Metadata about an HTML Document, Redirecting to another URL. **CSS:** Implementing Styles using CSS – Stylesheets, Formatting Text and Links using CSS,CSS Selectors, Changing Background, Adding Border, Margin and Padding, Setting Dimensions, Using Inline Container to mark up a part of a text.	U1 - 01 - Understanding and introduction of the internet and its application . 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 .	• Analyze working of the Internet. • Gain an insight into designing web pages. • Use different ways of styling web pages using CSS. • Implement basic and complex functionalities of JavaScript in a web page. • Employ PHP Scripts to execute dynamic tasks in a web page. • Perform various database tasks using PHP.



HTML Page Layout: Using Layout Elements, Semantic Elements, Creating, Positioning and Formatting Divisions, Floating Divisions next to each other, Responsive Web Design, Inline Frames. **HTML Media, Tables and Forms:** Embedding Images, Creating Client-side and Server-side Image Map, adding Favicon, Embedding audio and video on web page. Creating Simple Table, Table Dimension, Merging Table Cells, Formatting **Tables:** Applying Borders, Background and Foreground fills, Changing Cell Padding, Spacing and Alignment Collecting user input with HTML Forms, Additional Input Types in HTML5.	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning . U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more . U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML .	
UNIT -III **JavaScript:** Introduction, Difference between Client-side and Server-side Scripting, JavaScript Variables and Constants, Data Types, Statements, Comments, Functions, Variable Scope, Hoisting, Strict Mode, JavaScript Objects, Dialog Boxes, void Keyword **Operators:** Arithmetic Operators, Assignment Operators, Comparison Operators, Logical Operators, Bitwise Operators **Statements:** Conditional Statements – if else, switch, Loops –	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values .	

SHETHL U.J. & Smt. M.V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) M 400 069.

while, do while, for, for in, for of, Loop Control – break, continue, labels **JavaScript Objects:** User-defined Objects, with Keyword, Native Objects – Array, String, Date, Math, Number, RegExp **DOM:** Introduction, DOM Properties and Methods. **Browser BOM:** Moving back and forward with History, Cookies **Events and Event Handlers:** HTML Events, DOM Events, DOM Event Listener, onAbort, onBlur, onChange, onClick, onDblClick, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onReset, onResize, onSelect, onSubmit, onUnload,	U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	
UNIT – IV **PHP:** Introduction, Server-side Scripting, PHP Syntax and Comments, Variables and Constants, Data Types, Control Structures, Looping, Loop Termination, Functions. PHP Form Handling, PHP Form Validation, Superglobals, PHP Arrays, PHP Strings. PHP RegEx, PHP Numbers, PHP Math, Basic PHP Errors	U4 - 01 -Understanding , learning and application of PHP and MySql its syntax and variables , functions , arrays , expression and error handling .	
UNIT – V **Advanced PHP:** PHP Date and Time, PHP Include, PHP Cookies, PHP Sessions, Validating and Sanitizing Data with PHP Filters **PHP and MySQL** Why PHP and MySQL? Connect to MySQL, Creating Database and Tables, Inserting Single and Multiple Rows, Retrieving Last ID, MySQL Prepared, Selecting Data, Updating Data, Deleting Data, Limiting Data.	U5 - 01 - Understanding and learning of advanced PHP . U5-02- Analyzing and implementing connection between PHP with MYSQL to work with database.	

Course: USIT204 Numerical Methods

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Mathematical Modeling and Engineering Problem Solving: A Simple Mathematical Model, Conservation	U1 - 01 - The overall objective is to learn Error solving , handling and to apply various	CO1 Understand numerical techniques to find the roots of nonlinear equations and

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

Laws and Engineering Problems Approximations and Round-Off Errors: Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors and the Taylor Series: The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty	formulas of any mathematical models U1 - 02 -Learning different types of errors that take place in problem solving .	solution of systems of linear equations. CO2 Understand the difference operators and the use of interpolation CO3 Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
UNIT – II Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method U2 - 02 - Learning of 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.	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration U3 - 02 - Learning Taylor's series and Simpson's rule .	
UNIT – IV Numerical solution of 1st and 2nd order differential equations: Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2nd Order Differential Equations. Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression	U4 - 01 - Understanding and learning of many types of regressions U4-02- Understanding and learning squares , non linear regression	
UNIT – V Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution. Numerical Solutions of Partial Differential Equations: Classification of Partial Differential Equations of the second order, Difference equation corresponding to Laplace Equation, Liebmann's Iteration Process, Bender-Schmidt's Difference Equation corresponding to the parabolic equation, Crank Nicolson's difference equations corresponding to the parabolic equation, Difference equation corresponding to the Hyperbolic equation.	U5 - 01- Detailed study of linear programming problems & graphical solutions. U5 - 02 - Understanding of Partial differential equations. U5 - 03 - Understanding and learning Laplace, Bender-Schmidt's equations. U5 - 04 - Understanding of hyperbolic equations.	

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

Course: USIT205 Green IT

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I **Overview to Green IT:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Regulating Green IT: Laws, Standards and Protocols** Introduction, The Regulatory Environment and IT Manufacturers RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment. Nonregulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Green Data Centres , Social Movements and Greenpeace.	U1-01: To learn various toxins present in electronic products. U1-02: Detailed study of Company's Carbon Footprint. U1-03: To study Initiatives taken by UN, Implementation of Basel Conventions. U1-04: To know the significance of WEEE Directives. U1-05: To learn the non regulatory government initiatives.	CO1 :To learn overview and issues addressed in Green Computing. CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing. 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 Greening IT: Green PCs, Notebooks and Servers, Green Data Centres , Green Cloud Computing, Green Data Storage , Green Software, Green Networking and Communications. **Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to	U3 -01- Learning and analyzing the Global Impact of local actions. U3-02 - Understanding green data storage, green software and green networking and communications. U3 -02- Learning to use electronic device instead of p.	

SHETH L.U.J. & SIA M.V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI

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, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.	electronic device instead of paper and going paperless.	
UNIT - IV **Recycling:** Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online **Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors, Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection.	U4-01- Understanding the concept of why recycling and refurbishing is important. U4 -02- Analyze the use of Hardware products. U4 -03- Learning hard drive, CD and DVD recycling and disposal. U5 -04 Understanding energy star programs and Remote Desktops.	
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 green supply chain concepts. U5 -03- Understanding the role of Chief Green Officer and CEO. U5 -04 - Understanding various things about data such as tracking, Analysing and conducting audits.	

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

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

Course Outcomes

SYBSC IT – SEM 3 2022-23

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 ExpressionsValues 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 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.	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	

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, 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 -01- Understanding the concept of Regular Expressions. U4 -02- Learning the overview of OOP U4 -03- Learning and creating a thread and synchronizing thread. U4 -04- Creating Modules and understand the different type of module.	
UNIT -V Creating the GUI Form and Adding Widgets: Widgets: Button, Canvas,Checkbutton,	U5 -01- Creating the GUI Form and Adding Widgets U5 -02- Analyzing the Widgets such as	

V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. Layout Management: Designing GUI applications with proper Layout Management features. Look and Feel Customization:Enhancing Look and Feel of GUI using different appearances of widgets. Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	buttons, menu, radiobutton. 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,	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

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

General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.		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 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	U3 -01- Understand the concepts of Stack Memory Representation U3 - 02- Learning about what exactly Queue is. U3 -03- Learning about various types of Queue.	

COLLEGE OF SCIENCE & COMMERCE
ANDHERI
MUMBAI

Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue, Applications of Queues.		
UNIT – IV Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, 12 6 Binary, Indexed Sequential Searches, Binary Search. Tree:Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree. Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.	U4 -01- Understanding about binary trees like property, algorithms and representation. U4 -02- Learning about Advanced Tree Structures.	
UNIT -V Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	U5 -01- Understand about hashing techniques. U5 -02- Learning about the introduction of graph and representation of graph.	

Course: USIT303 Computer Networks

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

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 model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.	U1 -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 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,	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.	

COLLEGE OF SCIENCE & COMMERCE

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.		
UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	U4 -01- Understand the basic concept of Network Layer. U4 -02- Get to know about Unicast Routing. U4 -03- Learning about Next generation IP.	
UNIT -V Introduction to the Transport Layer: Introduction. Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.	U5 -01- Understanding the basic concepts of Transport layer. 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 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,	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data Models . . U1 - 03 - Learning about ER diagram.	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.

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

ERModel, Constraints, ERDiagrams, ERDIssues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML		CO5 Develop models and management information systems as per requirements of clients.
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 Clause and	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of different data types , procedures and clauses .	

SHETHLI & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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 functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j(=i)as an operator(Electrical circuits)	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. 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.
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	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.	

SHETHLU T. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE * ANDHERI (EAST) 69.

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 equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	U2 - 03 - Understanding and application of Particular integral	
UNIT – III The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	U3 - 01 - Introduction to The Laplace Transform and its different theories and methods U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations .	
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	

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

Course Outcomes

SYBSC IT – SEM 4 2022-23

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, 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 - 01 - Introduction to History, architecture and its components,Java Class U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 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 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,	U2 - 01 - Understanding and Learning of Control Flow Statements . U2 - 02 - Learning and application of Iterations i.e loops and statements .	

SHETHL.U.J. & Smt. N.L. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.	U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values .	
UNIT – III Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods. Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages. Using A Package	U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces . U3 - 02 - Learning and understanding the concept of creating packages and importing it .	
UNIT – IV Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector. 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	U4 - 01 - Detailed study of arrays and introduction and understanding its types . U4 - 02 - Understanding and learning of multi threading and its various properties , U4 - 03 - Application and Understanding of exception handling .	

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

started with character streams, writing file, reading file		
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 and 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 .	

SHETHLUS COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

UNIT -V Real Time Operating System (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.	U5 - 01 - Understanding and 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 – 1 The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and 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	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 . U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail.	CO1 Recognize the error in the number generated by the solution. 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 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

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

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.		Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software.
UNIT – II Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory. Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement. Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . U2 - 02 - Detailed study of the 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;	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory.	

SRI VENKATESWARA V COLLEGE OF SCIENCE & COMMERCE

Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, . Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R.	U3 - 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, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare.	U4 - 01 - Understanding and Analyzing the Small Sampling Theory . U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	
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	U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares .	

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

Regression, Linear Correlation,Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coe ffi, cient of Correlation Remarks Concerning the Correlation Coe ffi, cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas, Regression Lines and the Linear Correlation Coe ffi, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression.	U5 - 02 - The detailed study of correlation and its concept of theories and regression .	

Course: USIT404 Software Engineering

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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.

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

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 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 - 01 - Introduction to Architectural Design and its system and styles . U3 - 02 - Learning and Understanding of User Interface Design . 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	U4 - 01 - Understanding and learning about the Verification and Validation.	

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

Testing, Test Case Design, Test Automation. Software Measurement: Size-Oriented Metrics, Function-OrientedMetrics, Extended Function Point Metrics Software Cost Estimation:Software Productivity, EstimationTechniques, Algorithmic Cost Modelling, Project Duration and Staffing	U4 - 02 - Analyze and creating testing components and its functions .	
UNIT -V Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, 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	U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc .	

Course: USIT405 Computer Graphics and Animation

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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	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,

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

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) 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 .	three dimensional graphics and three dimensional 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 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	U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices . U2 - 02 - Learning and creating Three-Dimensional Transformations and many of its working and objectives .	

SHETHLUL & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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 - 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	U4 - 01 - Understanding and Learning Visible-Surface Determination and its different techniques .	

SHETTHI U.S. & SIR V. COLLEGE OF SCIENCE COMMERCE ANDHERI (EAST) MUMBAI

Sem - IV

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 - 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 .	

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

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

Course Outcomes

FYBSC IT – SEM 5 2022-23

Course: USIT501 Software Project Management

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – 1 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 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	U1 -01- Understanding Why is Software Project Management Important. U1 -02- Learning the basic concept of project. U1 -03- Understanding and learning about what is management. U1 -04- Learning about Overview of Project Planning.	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.



Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning		
UNIT – II 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 Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	U2 -01- Analyzing the Appropriate Project Approach. 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.	
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,	U3 -01- Learning about how to plan, when to plan and proper project schedules. U3 -02- Understanding about risk management.	

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

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. Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	U3 -03- Analyzing the Resource Allocation. U3 -04- Analyzing the Cost Schedules	
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 Management, Health and Safety, Some Ethical and Professional Concerns.	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts. U4 -03- Understanding Behaviour, Organizational Behaviour	
UNIT – V Working in Teams: Introduction, becoming a Team,	U5 - Learning about how to work in teams.	

SHETH L.U.J. & Sir M.V. COLLEGE OF SCIENCE & COMMERCE

Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	U5 -02- Analyzing how good the software quality should be. U5 -03- Learning about how the project closure should be.	

Course: USIT502 Internet of Things

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I The Internet of Things: An Overview: The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens on The Internet, Graceful Degradation, Affordances. Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS,	U1 -01- Understanding what is Internet Of Things. U1 -02- Learning Flavour of the Internet of Things. U1 -03- Understanding the principles of internet. U1 -04- Understanding different types of IP addresses.	CO1 This course focuses on the latest microcontrollers with application development, product design and prototyping. CO2 Ideally suited for engineering students and graduates with a basic understanding of electronics and microprocessors. CO3 The Internet of Things (IOT) is the next wave, world is going to witness. CO4 Today we live in an era of connected devices (mobile phones, computers etc.), the future is of connected things (Eg: home appliances, vehicles, lamp-posts, personal accessories, your pets, industrial equipment's and everything which you use in day-to-day life). CO5 Internet of Things is a term given to the attempt of connecting objects to the

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

Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses. TCP and UDP Ports. An Example: HTTP Ports, Other Common Ports. Application Layer Protocols. HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.		internet and also to each other - allowing people and objects themselves to analyze data from various sources in realtime and take necessary actions in an intelligent fashion.
UNIT – II Thinking About Prototyping: Sketching, Familiarity. Costs versus Ease of Prototyping. Prototypes and Production. Changing Embedded Platform. Physical Prototypes and Mass Personalisation. climbing into the Cloud. Open Source versus Closed Source. Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects. Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors. Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers. System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness. Raspberry Pi. Cases and Extension Boards. Developing on the Raspberry Pi, Some Notes on the Hardware. Openness.	U2 -01- Learning about Costs versus Ease of Prototyping. 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, Software. CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs. Scraping, Legalities, writing a New API, Clockodillo. Security, implementing the API, Using Curl to Test, Going Further. Real-Time Reactions, Polling, Comet, Other Protocols.	U3 -01- Understanding how to prototype the physical design. U3 -02- Learning the basic concept of Laser cutting. U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols.	

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

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 Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	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.	
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	

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

Course: USIT503 Advanced Web Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introducing .NET: The .NET Framework, C#, VB, and the .NET 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.	U1 -01- Understanding .NET framework . U1 -02- Learning about Types, Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies. 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, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	U2 -01- Understanding the basic concept of Web form fundamentals. U2 -02- Learning about Form controls. U2 -03- Understanding Validation and how to Use Validation Controls.	
UNIT – III	U3 -01- Learning and understanding about	



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,	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 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	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 – 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	U5 -01- Understanding what is XML. U5 -02- Learning about what is Security Fundamentals. U5 -03- Understanding Ajax, Using Partial Refreshes.	

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

Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.		

Course: USIT505 Linux System Administration

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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 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 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell. U1 -03- Learning about System Administration Tasks	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 CO4 To make Students Install Apache, Send Mail. CO5 Write Shell Scripts in Linux.
UNIT – II Configuring and Managing Storage: Understanding Partitions and	U2 -01- Learning about how to configure and manage storage.	

SHETHLL T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-59

Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	U2 -02- Understanding NetworkManager, Working with Services and Runlevels. U2 -03- Learning about how to troubleshoot the network. U2 -04- Learning the basic concept of SSH. U2 -05- Learning about Permissions.	

SHETHLU.T. & Sir M. V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

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 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.	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	
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 User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	

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

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 GRUB. High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster,	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

SHETTY L.U. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

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,

V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EST) MUMBAI

		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: ImplicitObjects, CharacterQuotingConventions, UnifiedExpressionLanguage[UnifiedEl], ExpressionLanguage. Java Server Pages Standard Tag Libraries: WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries.	U3 -01- Understand about Java Server pages. U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	
UNIT – IV Introduction To EnterpriseJavabeans: EnterpriseBeanArchitecture,	U4 -01- Understanding Enterprise java Bean.	

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

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 andIntereceptor, Defining An Intereceptor, 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 -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? Object/RelationalMapping, Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications. Writing JPA Application: ApplicationRequirementSpecifications.	U5 - 01 -Introduction and learning about Persistence, Object/Relational Mapping And JPA in detail with its meaning . U5 - 02 - Understanding and learning of JavaPersistence API with its objective and specifications .	

SHRI L.V.S. & SRI M.V. COLLEGE OF SCIENCE & COMMERCE ANDHRA (EAST) MANGALORE

SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. Introduction to Hibernate: WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? WritingHibernate,Application: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication.	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 2022-23

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, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.	U1 - 01 - Describe fundamental concepts of software quality assurance. 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
UNIT – II Fundamentals of testing: Introduction, Necessity of	U2 - 01 - To learn the basic testing techniques.	



testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	U2 - 02 - Develop knowledge of testing process and features.	
UNIT – III Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing,	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	

SHETHLULLA SIKH M.V. COLLEGE OF SCIENCE & COMMERCE * ANDHERI (EAST) MUMBAI-69.

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 planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	
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,	U5 - 01 - understanding the levels of testings.	

SHETHLUL & SIKH M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHSA (EAST), MU

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 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: Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure	

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

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		
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 Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn 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	

SHETH L.U.J. & SHRI ... V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (E), MUMBAI

UNIT – V Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing. Secure Application Design: Secure 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.	U5 - 01 - Introduce Cloud computing. U5 - 02 - Analyze application Security, Remote Administration Security.	

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 Data mining: Definition of data mining. Representation of input data .	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation. data transformation, data reduction U2 - 02 - To develop knowledge of data mining. U2 - 03 - Analyze Data Validation and data preparation.	

SHETH T. J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
AMDHER (EAST)
MUMBAI-69.

Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction		
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: Efficieney measures, Efficient frontier, The CCR model, Identification of good operating practices	U4 - 01 -study relational marketing, sales force management, optimization models for logistics planning, efficieney 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 Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management	U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems U5 - 02 - generate knowledge of AI and other Automation techniques. U5 - 03 - Develop Knowledge of expert system.	

SHETHL.U.A.B.N.M.V. COLLEGE OF SCIENCE & COMMERCE • SHETH

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		

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 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	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
UNIT – II Data Management and Processing Systems	U2 - 01 -Demonstrate organizational skills in file and database management.	

SHETHLUKAR V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Hardware and Software Trends Geographic Information Systems: GIS Software. GIS Architecture and functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.	U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology.	
UNIT – III Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data	U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.	
UNIT – IV Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay	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	

SHETH L.U.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-400 069.

operators.Raster overlay operators Neighbourhood functions: Proximity 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	GIS, and seek help from software/website help menus and the GIS community to solve problems.	
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 OUT
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	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 t interoperability networks with local, access a with service in CO2 Ability t manage, opera networks, servi and contents CO3 Ability tc making about s CO4 Learn a service operati CO5 Ability Improvement i

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

risks:Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.		
UNIT – II Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models Service Design Processes:Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security	U2 - 01 - communicate management theories and ideas in writing U1 - 02 - problem solve through the lens of management theories U1 - 03 - critically evaluate information from a variety of sources	
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, Service Transition under difficult Conditions.	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.	
UNIT – IV Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, a chieving balance in service operations, Providing service, Operation staff	U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector. U4 - 02 - Identify the strengths and weaknesses of a services system within a case study exercise and draw out implications for services management in	

SHETHLULIA & SHAH V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

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	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 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	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.	

SHETH L.U.J. & SHRI. V.V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

SHETH L.U.J. & SHRI. V.V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

ACADEMIC YEAR 2021-2022

Program: Bachelors of Science in Information Technology.

Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
PSO5: 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 OUTCOME

FYBSC IT – SEM 1
2021-2022

Course: USIT101 Imperative Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **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.	U1-01 - Understand Fundamentals of Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	**CO1** - To develop the 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.	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of Instructions: Loops U3 - 03 - Understand Group of Statements: Functions	

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

Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value.		
UNIT IV **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 Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers.	U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions U5 - 02 - Pointing to a Location: 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	U1-01 Students learned the difference between Analog System and Digital System U1-02 Understanding different number system	**CO1** - Course Outcomes: concepts and techniques used in digital electronics. **CO2** - Have a detailed understanding of the

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

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	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	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	U3-01 Designing and implementing Combinational Logic Circuits U3-02 Understanding Code converters design and	

SHETNUL & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Arithmetic Circuits: Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.	Implementations U3-03 Learning different Arithmetic Circuits	
UNIT IV: **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.	U4-01 Designing and implementing 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. **Processes and Threads:** Processes, threads, interprocess communication,	U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc. U1 - 02 - Analyze Processes & threads	**CO1** Analyze the structure and functions of operating systems. **CO2** Understand role of operating system as process manager, resource manager, file system manager, memory manager and I/O manager

SHETHLUJ & SIR H. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

scheduling, IPC problems.		**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 efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems:** Multiprocessors, multicomputers, distributed systems.	U4 - 01 - Understanding the different types of hypervisors U4 - 02 - Analyzing different processor 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,	U5 - 01 - Understands different types of operating systems U5 - 02 - Remembering different types of functioning in different types of Microsoft Windows.	

SHETHLIA'S M. V. COLLEGE OF SCIENCE & COMMERCE
MULUND (EAST) MUMBAI-81.

processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows.		

Course: USIT104 Discrete Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **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	U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion. U3 -02- Learning	

SHETH T.J. & SIR R.N.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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	different types of functions.	
UNIT IV: **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.	U4 - 01 - Understand 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

SHETH T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

		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: **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 - 01 - Learning and Understanding the different ways of presentation process . U5 - 02 - Creating and applying the graphics to your presentation .	

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

Course Outcomes

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 2021-2022

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:** OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing	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. 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	U3 -01- Understands the concept of overloading. U3 -02- Analyze the Virtual functions.	

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

arithmetic assignment operator, Data Conversion between objects and basic types, **Virtual Functions:** Introduction and need, Pure 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	U1-O1 Understanding Microprocessor Concepts, Microcomputers. U1-O2 Learning large	**CO1:**Describe the architecture & organization of 8085 Microprocessor. **CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish

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

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.	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.	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, 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.	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 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	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.	

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

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.		
UNIT-4:Code Conversion, BCD Arithmetic, and 16-Bit Data Operations: BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-toSeven-Segment-LED Code Conversion, Binary-to-ASCII and ASCIIto-Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction To Advanced Instructions and Applications, Multiplication, Subtraction With Carry. 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.	U4-01 Learning code conversion techniques. U4-02 Application of code conversion techniques. 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.	

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

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 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:	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning . U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more .	

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

Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.	U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML .	
UNIT -III Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object,	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	

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

String, regExp Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, 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

SHEIMLU & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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 Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of different Interpolation .	
UNIT -III Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method. Numerical differentiation and Integration:	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule .	

SHETH L.U.J. & SIKM. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

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.		
UNIT – IV Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution	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 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 .	

SIR H. V. COLLEGE OF SCIENCE & COMMERCE
SHETH J. J. & ANDHERI (EAST) MUMBAI-93.

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 Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.	U1-01: To learn various toxins present in electronic products. U1-02: Detailed study of Company's Carbon Footprint. U1-03: To study Initiatives taken by UN, 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.	
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.	
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, 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	U3 -01- Learning and analyzing the Global Impact of local actions. U3 -02- Learning to use electronic device instead of paper and going paperless.	

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

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	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.	CO1 :To learn overview and issues addressed in Green Computing. CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing. 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
		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.

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

Course Outcomes

FYBSC IT – SEM 3
2021-2022

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 ExpressionsValues 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 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.	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	
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	U3 -01- Understand how to work with list U3 -02- Learning how to access the value in tuple U3 -03- Learning basic tuple operations	

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

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 -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, 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 -01- Understanding the concept of Regular Expressions. U4 -02- Learning the overview of OOP U4 -03- Learning and creating a thread and synchronizing thread. 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.	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.	

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

Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.		

Course: USIT302 Data Structures

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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.

SHETH L.U.J. & Shri M.J. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-59.

		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 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 -01- Understand the concepts of Stack Memory Representation U3 - 02- Learning about what exactly Queue is. U3 -03- Learning about various types of Queue.	
UNIT – IV Bubble, Selection, Insertion,	U4 -01- Understanding about binary trees like property, algorithms and	

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

Merge Sort. Searching: Sequential, 12 6 Binary, Indexed Sequential Searches, Binary Search. Tree:Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.	representation. U4 -02- Learning about Advanced Tree Structures.	
UNIT -V Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	U5 -01- Understand about hashing techniques. 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,	U1 -01- Learning about Data communications.	CO1 Understand the importance of computer network and communications. CO2 Learn about transmission media and their

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

networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.	U1 -02- Understanding Physical Layers. U1 -03- Learning about Digital and Analog transmission.	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 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,	U3 -01- Understand the concept of Data Link Control.	

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

Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs.	U3 -02- Learning about what media access control is. U3 -03- Get to know about wireless LANs.	
UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	U4 -01- Understand the basic concept of Network Layer. U4 -02- Get to know about Unicast Routing. U4 -03- Learning about Next generation IP.	
UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World	U5 -01- Understanding the basic concepts of Transport layer. U5 -02- Learning Standard Client0Server Protocols	

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

wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.		

Course: USIT304 Database Management Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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 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	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data Models . . U1 - 03 - Learning about ER diagram.	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.
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	U2 -01- Understanding the basic concept of Relational database model. U2 - 02 - Understanding the basic concept of Relational database design.	

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities	U2 - 03 - Learning and understanding calculus .	
UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	U3 - 01 - Learning the application of constraints , views and sql . 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	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of	

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

Structures, Cursors and Transaction,Collections and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers.	different data types , procedures and clauses .	

Course: USIT305 Applied Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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 functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. 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.

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

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 equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X, the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods . U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients. U2 - 03 - Understanding and application of Particular integral	
UNIT – III The Laplace Transform: Introduction, Definition of the Laplace	U3 - 01 - Introduction to The Laplace Transform and its different theories and methods	

SHETHLU'S V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI 69.

Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations .	
UNIT – IV 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	

SHETHLIA COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Course Outcomes

SYBSC IT – SEM 4
2021-2022

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, 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 - 01 - Introduction to History, architecture and its components,Java Class U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 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 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	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	

SHETHLJ & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this Instance, static fields of a class, static methods of a class, garbage collection.	classes and its different objects , methods , attributes , and values .	
UNIT – III Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package	U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces . U3 - 02 - Learning and understanding the concept of creating packages and importing it .	
UNIT – IV Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.	U4 - 01 - Detailed study of arrays and introduction and understanding its types . U4 - 02 - Understanding and learning of multi threading	

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

Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file	and its various properties , 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	U1 - 02 - Understanding and introduction to Embedded system and its application . U1 - 02 - Learning of the concept of Core of embedded systems.	CO1 To have knowledge about the basic working of a microcontroller system and its programming in assembly language. CO2 To provide experience to integrate hardware and software for microcontroller applications

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

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 - 03 - Detailed study of Characteristics and quality attributes of embedded systems.	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,	U3 - 01 - Studying and Understanding the The 8051 Microcontrollers. U3 - 02 - Learning and application of 8051 Programming in C and its logic.	

SHETHL.U.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

I/O Programming, Logic operations, Data conversion Programs.		
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 (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.	U5 - 01 - Understanding and 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 Percentiles,Software and	U1 - 01 - Learning the concept of tendencies and its different types of notation . U1 - 02 - The detailed study of The	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.

SHETH L.U.J. & SHRI V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

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,Propertles of the Standard Deviation,Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coe ffi,Standar cient of Variation dized Variable; Standard Scores, Software and Measures of Dispersion. Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays.	Standard Deviation and Other Measures of Dispersion . U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail.	CO7 How to apply discrete and continuous probability distributions to various businessproblems. CO8 Perform Test of Hypothesis as well as calculate confidence Interval for a population parameter for single sample and two sample cases. Understand the concept of p-values. CO9 Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit. CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software.
UNIT – II Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis,	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis.	

SHETHLL.S.RAHEJA COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.	U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory	
UNIT – III Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, . Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R.	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory. 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,	U4 - 01 - Understanding and Analyzing the Small Sampling Theory .	

SHETHLU.T.& SIKKIM V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare.	U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	
UNIT -V 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, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression.	U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares . U5 - 02 - The detailed study of correlation and its concept of theories and regression .	

Course: USIT404 Software Engineering

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES

SHETH L.U.J. & SHRI. N. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

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	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 .	

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

types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.		
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 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 - 01 - Introduction to Architectural Design and its system and styles . U3 - 02 - Learning and Understanding of User Interface Design . 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	U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc .	

SHETHLU.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

and Modeling, 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) 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,	U1 - 01 - Introduction to Computer graphics and its application and software description . U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping .	CO1 To familiarize students with basic principles and techniques for computer graphics. CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional 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



Clipping Polygons, problem with multiple components.		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 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 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices . 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	U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective .	

SHETHLU & SHRIMATI V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

model and viewing pyramid. Light:Radiometry,Transport,Equation,Photometry Color:Colorimetry,ColorSpaces,ChromaticAdaptation, Color Appearance	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	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 .	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHETH LUX
ANDHERI (EAST)
MUMBAI-69.

Space Curves, Cubic Splines, , Bezier Curves, B spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces Bezier Surfaces		
UNIT -V 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 2021-2022

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,	U1 -01- Understanding Why is Software Project Management Important. U1 -02- Learning the basic concept of project.	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



Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize	U1 -03- Understanding and learning about what is management. U1 -04- Learning about Overview of Project Planning.	student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player.

SIES (N) COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Plan, Steps 9 and 10: Execute Plan/Lower Levels of 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 Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	U2 -01- Analyzing the Appropriate Project Approach. 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.	

SHETHL.U.J.& SRM.M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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. Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	U3 -01- Learning about how to plan, when to plan and proper project schedules. U3 -02- Understanding about risk management. U3 -03- Analyzing the Resource Allocation. U3 -04- Analyzing the Cost Schedules	
UNIT – IV Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring,	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts.	

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

Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	U4 -03- Understanding Behaviour, Organizational Behaviour	
UNIT – V Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability,	U5 - Learning about how to work in teams. U5 -02- Analyzing how good the software quality should be. U5 -03- Learning about how the project closure should be.	

SHETHLU L & SINA... COLLEGE OF SCIENCE & COMMERCE ANDHERI (W) MUMBAI-58

Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.		

Course: USIT502 Internet of Things

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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:	U2 -01- Learning about Costs versus Ease of Prototyping.	

SHETH L.U.J. & COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	U2 -02- Understanding what is open and closed source. U3 -03- learning about Arduino and Raspberry PI.	
UNIT – III Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained	U3 -01- Understanding how to prototype the physical design. U3 -02- Learning the basic concept of Laser cutting. U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHETHLU & SIR M. V. ANDHERI (EAST) MUMBAI-69.

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 Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	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.	
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,	U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards. U5 -02- Learning about Ethics. U5 -03- Analyzing the Correctness and Maintainability, Security, Performance	

SHENOY & SIKRI V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.		

Course: USIT503 Advanced Web Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introducing .NET: The .NET Framework, C#, VB, and the .NET 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.	U1 -01- Understanding what exactly .NET framework is. U1 -02- Learning about Types, Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies. 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, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control,	U2 -01- Understanding the basic concept of Web form fundamentals. U2 -02- Learning about Form controls. U2 -03- Understanding Validation and how to Use Validation Controls.	

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

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 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	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 – 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	U5 -01- Understanding what is XML. U5 -02- Learning about what is Security Fundamentals. U5 -03- Understanding Ajax, Using Partial Refreshes.	

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

Control Toolkit.		

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 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 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell. U1 -03- Learning about System Administration Tasks	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 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 Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes,	U2 -01- Learning about how to configure and manage storage. U2 -02- Understanding NetworkManager, Working with Services and Runlevels. U2 -03- Learning about how to troubleshoot the network.	



Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	U2 -04- Learning the basic concept of SSH. U2 -05- Learning about Permissions.	
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	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	

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

Module, Configuring NAT Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files 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 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	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	

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

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 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	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

Course: USIT506 Enterprise Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Understanding Java EE:	U1 -01- Understanding what is Java EE.	CO1 Identify advance concepts of java



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 -02- Learning about the basic concept of Java servlets. U2 -03- Understanding how to work with database.	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	U3 -01- Understand about Java Server pages.	

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

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: ImplicitObjects, CharacterQuotingConventions, UnifiedExpressionLanguage[UnifiedEl], ExpressionLanguage. Java Server Pages Standard Tag Libraries: WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries.	U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	
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:	U5 - 01 -Introduction and learning	



WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping, Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications. Writing JPA Application: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. Introduction to Hibernate: WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? WritingHibernateApplication: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication.	about Persistence, Object/Relational Mapping And JPA in detail with its meaning . 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

2021-2022

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	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

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

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, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.		improvement, cost control and contribute toward efficient delivery of software solutions
UNIT – II Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing,	U2 - 01 - To learn the basic testing techniques. U2 - 02 - Develop knowledge of testing process and features.	

SHETH L.U.J. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing		
UNIT – III Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	
UNIT – IV Software Verification and Validation:Introduction, Verification, Verification Workbench, Methods	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	

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

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 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,	U5 - 01 - understanding the levels of testings.	

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

Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.		

Course: USIT602 Security in Computing

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	U1 - 01 - simplify Information Security Overview 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: Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure.	

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

Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring		
UNIT – III 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 Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn 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	U4 - 01 - Learn Operating System Security Models. U4 - 02 - Learn Intrusion Detection and Prevention Systems	

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Models, Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security.		
UNIT – V Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing. Secure Application Design: Secure 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.	US - 01 - Introduce Cloud computing. US - 02 - Analyze application Security, Remote Administration Security.	

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 Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction U2 - 02 - To develop knowledge of data mining. U2 - 03 - Analyze Data Validation and	

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

Data preparation: Data validation, Data transformation, Data reduction	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 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 - 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 U5 - 02 - generate knowledge of AI and other Automation techniques. U5 - 03 - Develop Knowledge of expert system.	

Course: USIT604 Principles of Geographic Information Systems

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

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 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	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
UNIT – II Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and	U2 - 01 -Demonstrate organizational skills in file and database management. U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and	

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

functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.	Technology.	
UNIT – III Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data	U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.	

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

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 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	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.	
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	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).	

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

terrain elevation, How to map time series Map Cosmetics, Map Dissemination		

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	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

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

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.		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 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	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	
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.	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.	

SHRI M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.		
UNIT – IV Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. Challenges, Critical Success factors and risks:Challenges,	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.	

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

Critical Success factors, Risks		
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 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	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.	





ACADEMIC YEAR 2020-2021

Program: Bachelors of Science in Information Technology.

Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
PSO5: Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
PSO6: Analyze the local and global impact of computing on individuals, organizations, and society.

SHETH T.J. & SIR H.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

ACADEMIC YEAR 2020-2021

Program: Bachelors of Science in Information Technology.

Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
PSO5: Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
PSO6: Analyze the local and global impact of computing on individuals, organizations, and society.

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

COURSE OUTCOME

FYBSC IT – SEM 1

2020-2021

Course: USIT101 Imperative Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **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.	U1-01 - Understand Fundamentals of Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	**CO1** - To develop the 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.	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of Instructions: Loops U3 - 03 - Understand Group of Statements: Functions	

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

Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value.		
UNIT IV **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 Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers.	U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions U5 - 02 - Pointing to a Location: 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	U1-01 Students learned the difference between Analog System and Digital System U1-02 Understanding different number system	**CO1** - Course Outcomes: concepts and techniques used in digital electronics. **CO2** - Have a detailed understanding of the

SHETHLL.T. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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	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	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	U3-01 Designing and implementing Combinational Logic Circuits U3-02 Understanding Code converters design and	

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

Arithmetic Circuits: Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.	implementations U3-03 Learning different Arithmetic Circuits	
UNIT IV: **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.	U4-01 Designing and implementing 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. **Processes and Threads:** Processes, threads, interprocess communication,	U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc. U1 - 02 - Analyze Processes & threads	**CO1** Analyze the structure and functions of operating systems. **CO2** Understand role of operating system as process manager, resource manager, file system manager, memory manager and I/O manager

SHETHLU & SGRM. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

scheduling, IPC problems.		**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 efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems:** Multiprocessors, multicomputers, distributed systems.	U4 - 01 - Understanding the different types of hypervisors U4 - 02 - Analyzing different processor 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,	U5 - 01 - Understands different types of operating systems U5 - 02 - Remembering different types of functioning in different types of Microsoft Windows.	

SHETHLU.J.S.SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

processes and threads in windows, memory management, caching in windows, I/O in windows, Windows NT file system, Windows power management, Security in windows.		

Course: USIT104 Discrete Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **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	U3 - 01 - Learning, understanding and analyzing the Sequences, Mathematical Induction and recursion. U3 -02- Learning	

SHETHLJ & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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	different types of functions.	
UNIT IV: **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.	U4 - 01 - Understand 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.	

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

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

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

		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: **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 - 01 - Learning and Understanding the different ways of presentation process . U5 - 02 - Creating and applying the graphics to your presentation .	

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

Course Outcomes

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 -2020-2021

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:** OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing	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. 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	U3 -01- Understands the concept of overloading. U3 -02- Analyze the Virtual functions.	

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

arithmetic assignment operator, Data Conversion between objects and basic types, **Virtual Functions:** Introduction and need, Pure 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	U1-O1 Understanding Microprocessor Concepts, Microcomputers. U1-O2 Learning large	**CO1:**Describe the architecture & organization of 8085 Microprocessor. **CO2:** Understand and classify the instruction set of 8085 microprocessor and distinguish

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

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.	computers to small chip microcontrollers. U1-03 Understanding microprocessor internal Architecture and pin configuration. U1-04 Study of Microprocessor based system applications. U1-05 Learning 8155 memory segment, memory interfacing. U1-06 Illustration of memory design for MCTS project.	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, 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.	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 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	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.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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.		
UNIT-4:Code Conversion, BCD Arithmetic, and 16-Bit Data Operations: BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-toSeven-Segment-LED Code Conversion, Binary-to-ASCII and ASCIIto-Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction To Advanced Instructions and Applications, Multiplication, Subtraction With Carry. 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.	U4-01 Learning code conversion techniques. U4-02 Application of code conversion techniques. 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.	

SHETH T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

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 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:	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , semantic layouts, formatting and positioning . U2 - 02 - Creating and application of tables , cells , boxes, buttons and many more .	

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

Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.	U2 - 03 - Learning of incorporating sound and video in HTML5 , HTML .	
UNIT -III Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object,	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

String, regExp Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, . onMouseDown, onMouseMove, onMouseOut, 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

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

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 Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of different Interpolation .	
UNIT -III Solution of simultaneous algebraic equations (linear) using iterative methods: Gauss-Jordan Method, Gauss-Seidel Method. Numerical differentiation and Integration:	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule .	

SHETH T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69

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.		
UNIT – IV Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution	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 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 .	

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

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 Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.	U1-01: To learn various toxins present in electronic products. U1-02: Detailed study of Company's Carbon Footprint. U1-03: To study Initiatives taken by UN, 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.	
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.	
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, 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	U3 -01- Learning and analyzing the Global Impact of local actions. U3 -02- Learning to use electronic device instead of paper and going paperless.	

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

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	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.	CO1 :To learn overview and issues addressed in Green Computing. CO2 : To learn Initiatives and standards adopted by different countries towards Green Computing. 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
		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.





Course Outcomes

FYBSC IT – SEM 3
2020-2021

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 ExpressionsValues 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 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.	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	
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	U3 -01- Understand how to work with list U3 -02- Learning how to access the value in tuple U3 -03- Learning basic tuple operations	

SHETHLJT & RIS & M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

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 -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, 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 -01- Understanding the concept of Regular Expressions. U4 -02- Learning the overview of OOP U4 -03- Learning and creating a thread and synchronizing thread. 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.	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.	

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

Storing Data in Our MySQL Database via Our GUI :Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.		

Course: USIT302 Data Structures

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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.

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

		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 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 -01- Understand the concepts of Stack Memory Representation U3 - 02- Learning about what exactly Queue is. U3 -03- Learning about various types of Queue.	
UNIT – IV Bubble, Selection, Insertion,	U4 -01- Understanding about binary trees like property, algorithms and	

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

Merge Sort. Searching: Sequential, 12 y, Binary, Indexed Sequential Searches, Binary Search. Tree:Tree,Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree,Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.	representation. U4 -02- Learning about Advanced Tree Structures.	
UNIT -V Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	U5 -01- Understand about hashing techniques. 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,	U1 -01- Learning about Data communications.	CO1 Understand the importance of computer network and communications. CO2 Learn about transmission media and their

SHETHLULIA & BIS M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

networks, network types, Internet history,standards and administration. Network Models:Protocol layering, TCP/IP protocol suite, The OSI model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.	U1 -02- Understanding Physical Layers. U1 -03- Learning about Digital and Analog transmission.	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 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,	U3 -01- Understand the concept of Data Link Control.	

SHETH L.U.J. & S.R.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs.	U3 -02- Learning about what media access control is. U3 -03- Get to know about wireless LANs.	
UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	U4 -01- Understand the basic concept of Network Layer. U4 -02- Get to know about Unicast Routing. U4 -03- Learning about Next generation IP.	
UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World	U5 -01- Understanding the basic concepts of Transport layer. U5 -02- Learning Standard Client0Server Protocols	

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

wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.		

Course: USIT304 Database Management Systems

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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 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	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data Models . . U1 - 03 - Learning about ER diagram.	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.
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	U2 -01- Understanding the basic concept of Relational database model. U2 - 02 - Understanding the basic concept of Relational database design.	

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

and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities	U2 - 03 - Learning and understanding calculus .	
UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	U3 - 01 - Learning the application of constraints , views and sql . 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	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of	

SHETH T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Structures, Cursors and Transaction,Collections and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers.	different data types procedures and clauses .	

Course: USIT305 Applied Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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 functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. 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.

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

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 equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods . U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients. U2 - 03 - Understanding and application of Particular integral	
UNIT – III The Laplace Transform: Introduction, Definition of the Laplace	U3 - 01 - Introduction to The Laplace Transform and its different theories and methods	

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

Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	U3 - 02 - Understanding and application of Inverse Laplace Transform , with its different functions and equations .	
UNIT – IV 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	

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

Course Outcomes

SYBSC IT – SEM 4
2020-2021

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, 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 - 01 - Introduction to History, architecture and its components,Java Class U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 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 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	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	

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

Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.	classes and its different objects , methods , attributes , and values .	
UNIT – III Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package	U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces . U3 - 02 - Learning and understanding the concept of creating packages and importing it .	
UNIT – IV Enumerations,Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.	U4 - 01 - Detailed study of arrays and introduction and understanding its types . U4 - 02 - Understanding and learning of multi threading	

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

Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file	and its various properties , 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	U1 - 02 - Understanding and introduction to Embedded system and its application . U1 - 02 - Learning of the concept of Core of embedded systems.	CO1 To have knowledge about the basic working of a microcontroller system and its programming in assembly language. CO2 To provide experience to integrate hardware and software for microcontroller applications

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

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 - 03 - Detailed study of Characteristics and quality attributes of embedded systems.	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,	U3 - 01 - Studying and Understanding the The 8051 Microcontrollers. U3 - 02 - Learning and application of 8051 Programming in C and its logic.	

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

I/O Programming, Logic operations, Data conversion Programs.		
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 (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.	U5 - 01 - Understanding and 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 Percentiles,Software and	U1 - 01 - Learning the concept of tendencies and its different types of notation . U1 - 02 - The detailed study of The	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.

SHETH L.U.J. & SHRM. V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Measures of Central Tendency. The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation,The Range, The Mean Deviation, The SemiInterquartile Range,The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation,Properties of the Standard Deviation,Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coe ffi,Standar cient of Variation dized Variable; Standard Scores, Software and Measures of Dispersion. Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays.	Standard Deviation and Other Measures of Dispersion . U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail.	CO7 How to apply discrete and continuous probability distributions to various businessproblems. CO8 Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values. CO9 Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit. CO10 Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model. Be able to perform a multiple regression using computer software.
UNIT – II Moments, Skewness, and Kurtosis :Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis,	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis . U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis.	

SHETH L.U.J. & V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.	U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory	
UNIT – III Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests,Operating-Characteristic Curves; the Power of a Test, pValues for Hypotheses Tests, Control Charts, Tests Involving Sample Di ffTests Involving Binomial Distributions erences, . Statistics in R: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R.	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory. 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,	U4 - 01 - Understanding and Analyzing the Small Sampling Theory .	

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare.	U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	
UNIT -V 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, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression.	U5 - 01 - Understanding and learning of Curve Fitting and the Method of Least Squares . U5 - 02 - The detailed study of correlation and its concept of theories and regression .	

Course: USIT404 Software Engineering

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES

Sir M. V. COLLEGE OF SCIENCE & COMMERCE ★ SHETH L.U.J. ANDHERI (EAST) MUMBAI-69.

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	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 .	

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

types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.		
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 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 - 01 - Introduction to Architectural Design and its system and styles. U3 - 02 - Learning and Understanding of User Interface Design. 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	U5 - 01 - Analyze and creating the process of Improvement i.e product, quality etc.	

SHETKARI SHIKSHAN V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

and Modeling. 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) 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,	U1 - 01 - Introduction to Computer graphics and its application and software description . U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping .	CO1 To familiarize students with basic principles and techniques for computer graphics. CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional 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

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

Clipping Polygons, problem with multiple components.		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 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 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices . 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	U3 - 01 - Understanding and learning the concepts of Viewing in 3D and its objective .	

SHETHLUJ & SIKHM. V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

model and viewing pyramid. Light:Radiometry,Transport,Equation,Photometry Color:Colorimetry,ColorSpaces,ChromaticAdaptation, Color Appearance	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	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 .	

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

Space Curves. Cubic Splines, , Bezier Curves, B spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces		
UNIT -V 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 2020-2021

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,	U1 -01- Understanding Why is Software Project Management Important. U1 -02- Learning the basic concept of project.	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



Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize	U1 -03- Understanding and learning about what is management. U1 -04- Learning about Overview of Project Planning.	student realize that whether a student becomes a project manager in future or not, still even as an employee he/she should learn to be an efficient team player.

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

Plan, Steps 9 and 10: Execute Plan/Lower Levels of 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 Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	U2 -01- Analyzing the Appropriate Project Approach. 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.	

SHETHLUL & SMT. V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

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. Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	U3 -01- Learning about how to plan, when to plan and proper project schedules. U3 -02- Understanding about risk management. U3 -03- Analyzing the Resource Allocation. U3 -04- Analyzing the Cost Schedules	
UNIT – IV Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring,	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts.	

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

Getting the Project Back to Target, Change Control, Software Configuration Management (SCM) Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	U4 -03- Understanding Behaviour, Organizational Behaviour	
UNIT – V Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability.	U5 - Learning about how to work in teams. U5 -02- Analyzing how good the software quality should be. U5 -03- Learning about how the project closure should be.	

SHETH L.U.J. & SHRI M.J. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Quality Plans. Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.		

Course: USIT502 Internet of Things

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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:	U2 -01- Learning about Costs versus Ease of Prototyping.	

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

Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.	U2 -02- Understanding what is open and closed source. U3 -03- learning about Arduino and Raspberry Pi.	
UNIT – III Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained	U3 -01- Understanding how to prototype the physical design. U3 -02- Learning the basic concept of Laser cutting. U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols.	

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

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, What Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customization, be a Key Resource, Provide Infrastructure, Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	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.	
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,	U5 -01- Understanding about Manufacturing Printed Circuit Boards, Etching Boards. U5 -02- Learning about Ethics. U5 -03- Analyzing the Correctness and Maintainability, Security, Performance	

SHETH T.J. & SIR H. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.		

Course: USITS03 Advanced Web Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Introducing .NET: The .NET Framework, C#, VB, and the .NET 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.	U1 -01- Understanding what exactly .NET framework is. U1 -02- Learning about Types, Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies. 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, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control,	U2 -01- Understanding the basic concept of Web form fundamentals. U2 -02- Learning about Form controls. U2 -03- Understanding Validation and how to Use Validation Controls.	

SHETH T.J. & SIES V.P. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69.

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 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	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 – 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	U5 -01- Understanding what is XML. U5 -02- Learning about what is Security Fundamentals. U5 -03- Understanding Ajax, Using Partial Refreshes.	

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

Control Toolkit.		

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 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 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell. U1 -03- Learning about System Administration Tasks	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 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 Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes,	U2 -01- Learning about how to configure and manage storage. U2 -02- Understanding NetworkManager, Working with Services and Runlevels. U2 -03- Learning about how to troubleshoot the network.	

SHETH T.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	U2 -04- Learning the basic concept of SSH. U2 -05- Learning about Permissions.	
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	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	

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

Module, Configuring NAT Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: The Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files 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 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	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	

SHETH L.U.J. & SHRI M.V. COLLEGE OF SCIENCE & COMMERCE
ANCHERI (EAST)
MUMBAI-69.

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 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	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

Course: USIT506 Enterprise Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Understanding Java EE:	U1 -01- Understanding what is Java EE.	CO1 Identify advance concepts of java



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 -02- Learning about the basic concept of Java servlets. U2 -03- Understanding how to work with database.	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	U3 -01- Understand about Java Server pages.	

SHETH L.U.J. & SHRI M.V. COLLEGE OF SCIENCE & COMMERCE ★ ANDHERI (EAST) MUMBAI-69.

ServerPages? JSPv\sServlets, DisadvantagesOfJSP, LifeCycleofaJSPPage, HowdoesaJSPfunction? HowdoesJSPexecute? AboutJava ServerPages Getting Started With Java ServerPages: Comments, JSPDocument, JSPElements, JSPGUIExample. Action Elements: IncludingotherFiles, ForwardingJSPPagetoAnotherPage, PassingParametersforotherActions, Loadingajavabean. Implicit Objects, Scopeand ElExpressions: ImplicitObjects, CharacterQuotingConventions, UnifiedExpressionLanguage[UnifiedEl], ExpressionLanguage. Java Server Pages Standard Tag Libraries: WhatiswronginusingJSPScriptletTags? HowJSTLFixesJSPScriptlet'sShortcomings? DisadvantagesOfJSTL, TagLibraries.	U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	
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:	U5 - 01 -Introduction and learning	

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

WhatisPersistence? PersistenceinJava, CurrentPersistenceStandardsinJava, WhyanotherPersistenceStandards? Object/RelationalMapping, Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication, ArchitectureofJPA, HowJPAWorks? JPA Specifications. Writing JPA Application: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingPersistenceUnit[Persistence.Xml], CreatingJSPS, TheJPAApplicationStructure, RunningtheJPAApplication. Introduction to Hibernate: WhatisHibernate? WhyHibernate? Hibernate,DatabaseandTheApplication, ComponentsofHibernate, ArchitectureofHibernate, HowHibernateWorks? WritingHibernateApplication: ApplicationRequirementSpecifications, SoftwareRequirements, TheApplicationDevelopmentApproach, CreatingDatabaseandTablesinMysql, creatingaWebApplication, AddingtheRequiredLibraryFiles, creatingaJavabeanClass, CreatingHibernateConfigurationFile, AddingaMappingClass, CreatingJSPS, RunningTheHibernateApplication.	about Persistence, Object/Relational Mapping And JPA in detail with its meaning . 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	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

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

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, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.		improvement, cost control and contribute toward efficient delivery of software solutions
UNIT – II Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing,	U2 - 01 - To learn the basic testing techniques. U2 - 02 - Develop knowledge of testing process and features.	

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

Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing		
UNIT – III Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	
UNIT – IV Software Verification and Validation:Introduction, Verification, Verification Workbench, Methods	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	

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

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 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,	U5 - 01 - understanding the levels of testings.	

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

Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.		

Course: USIT602 Security in Computing

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	U1 - 01 - simplify Information Security Overview 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: Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography, Public Key Cryptography, Public Key Infrastructure.	

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

Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring		
UNIT – III 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 Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn 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	U4 - 01 - Learn Operating System Security Models. U4 - 02 - Learn Intrusion Detection and Prevention Systems	

Models, Classic Security Models, Reference Monitor, Trustworthy International Standards for Operating System Security.		
UNIT – V Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing. Secure Application Design: Secure 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.	U5 - 01 - Introduce Cloud computing. U5 - 02 - Analyze application Security, Remote Administration Security.	

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 Data mining: Definition of data mining, Representation of input data Data mining process, Analysis methodologies	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction U2 - 02 - To develop knowledge of data mining. U2 - 03 - Analyze Data Validation and	

SHETHLULIA & SHRIMATI V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Data preparation: Data validation, Data transformation, Data reduction	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 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 - 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 U5 - 02 - generate knowledge of AI and other Automation techniques. U5 - 03 - Develop Knowledge of expert system.	

Course: USIT604 Principles of Geographic Information Systems

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

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 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	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
UNIT – II Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and	U2 - 01 -Demonstrate organizational skills in file and database management. U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and	

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

functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.	Technology.	
UNIT – III Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data	U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.	

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

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 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	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.	
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	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).	

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

[illegible]		

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	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

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

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.		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 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	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	
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.	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.	

SHETH L.U.J. & S.R.M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.		
UNIT – IV Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. Challenges, Critical Success factors and risks:Challenges,	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.	

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

Critical Success factors, Risks		
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 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	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.	





ACADEMIC YEAR 2019-2020

Program: Bachelors of Science in Information Technology.

Programme Outcomes:

Students of all undergraduate general degree Programs in Science at the time of graduation will be able to:

PO1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusion and help reach conclusions in group settings.
PO4: Effective Citizenship: Demonstrate empathetic social concern and equality-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
PO7: Self-directed and Life-long Learning: Acquire the ability to engage independent and life-long learning in the broadest context of socio-technological changes.

Programme Specific Outcome

PSO1: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
PSO2: Apply standard Software Engineering practices and strategies in software project development using an open-source programming environment to deliver a quality product for business success.
PSO3: Be acquainted with contemporary issues, the latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
PSO4: Apply the knowledge of Technology, Mathematics, Networks, and computing in the core information technologies.
PSO5: Identity, design, and analyze complex computer software systems and implement and interpret the results from those systems.
PSO6: Analyze the local and global impact of computing on individuals, organizations, and society.



Course Outcomes

FYBSC IT – SEM 1
2019 -2020

Course: USIT101 Imperative Programming

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT I: **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.	U1-01 - Understand Fundamentals of Programming U1-02 - Exploring C Programming U1-03 - Classifying Data using Data types in C Programming	**CO1** - To develop the 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:**	U3 - 01 - Controlling the Program Order: Decision Making U3 - 02 - Repeating Sequence of	

M.L.T. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-59.

Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement **Functions:** Overview, defining a function, accessing a function, passing arguments to a function, specifying argument data types, function prototypes, recursion, modular programming and functions, standard library of c functions, prototype of a function: parameter list, return type, function call, block structure, passing arguments to a function: call by reference, call by value.	Instructions: Loops 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 Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions, Structures and pointers.	U5 - 01- Storing Different Data Types in Same Memory: Structures and Unions U5 - 02 - Pointing to a Location: Pointers	

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

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,	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.	



K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method.		
UNIT III: **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 Understanding Code converters design and implementations U3-03 Learning different Arithmetic Circuits	
UNIT IV: **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.	U4-01 Designing and implementing 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	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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. **Processes and Threads:** Processes, threads, interprocess communication, scheduling, IPC problems.	U1 - 01 - Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc. U1 - 02 - Analyze Processes & threads	**CO1** Analyze the structure and functions of operating systems. **CO2** Understand role of operating system as process manager, resource manager, file system manager, 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 efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization,	U4 - 01 - Understanding the different types of hypervisors U4 - 02 - Analyzing different processor systems U4 - 03 - Evaluate between multiprocessors, multicomputers & distributed	

SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems**: Multiprocessors, multicomputers, distributed systems.	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.

SHETTY M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-93

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: **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.	U4 - 01 - Understand 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.	

SIES (N.E.S.) SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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

SIES (N.A.V.) COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

		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: **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 - 01 - Learning and Understanding the different ways of presentation process . U5 - 02 - Creating and applying the graphics to your presentation .	

Course Outcomes

Course: USIT201 Object oriented Programming FYBSC IT – SEM 2 2019-20

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT - I **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:** OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing	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. 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.

SIR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

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, Static Functions, this Pointer, abstract classes, virtual destructors.	U3 -01- Understands the concept of overloading. U3 -02- Analyze the Virtual functions.	
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:**	U5 -01- Understand the concept of Templates. U5 -02- Working and creating various files	

Introduction, File Operations, Various File Modes, File Pointer and their Manipulation		

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	U2-01 Learning interfacing of IO Devices Concepts, U2-02 Distinguishing memory mapped IO and peripheral mapped IO. U2-03 Programming using	

SHETHALIA & SIR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

Programming: The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program. Introduction to 8085 Instructions: Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.	8085 assembly language. Learning U2-4 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-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:	U4-01 Learning code conversion techniques. U4-02 Application of code conversion techniques. U4-03 Learning advanced instructions and its applications. U4-04 Understanding Assemblers, cross assemblers. U4-05 Analyzing Vectored Interrupts	

The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.		
UNIT-5:The Pentium and Pentium Pro microprocessors: Introduction, Special Pentium registers, Memory management, Pentium instructions, Pentium Pro microprocessor, Special Pentium Pro features. 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	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.

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

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.		
UNIT – II HTML5 Page layout and 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	U2 - 01 - Learning the creation of navigational aids , bars , image map , semantic tags , 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 .	

M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

multimedia basics, embedding video clips, incorporating audio on 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, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut,	U3 - 01 - Understanding and learning of Java Scripts and its objective , operations and values . U3 - 02 - Understanding and learning statements and various functions . U3 - 03 - Learning and application of documents and its objects .	

SHETTY & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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	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

V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (WEST)
MUMBAI-58

Taylor Series: The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty		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 Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.	U2 - 01 - Learning and Understanding various methods such as The Regula-falsi method , Newton - Raphson method , along with this the learning of 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	U3 - 01 - Solving and Analyzing the solutions for various algebraic equation, numerical differentiation and Integration , Taylors series and Simpsons rule .	

SHELAR M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

Method for 1st and 2 nd Order Differential Equations.		
UNIT – IV Least-Squares Regression: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Nonlinear Regression Linear Programming: Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution	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 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 Convention, North America: The United States, Canada, Australia, Europe,	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.

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

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, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.	U3 -01- Learning and analyzing the Global Impact of local actions. U3 -02- Learning to use electronic device instead of paper and going paperless.	
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,	U4 -01- Understanding the concept of why recycling is important. U4 -02- Analyze the use of hardware products.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

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		
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 ExpressionsValues 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

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

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 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.	U2 -01- Understand the concept of functions and type conversion. U2 -02- Learning and understanding the concept of looping and counting.	
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	U4 -01- Understanding the concept of Regular Expressions. U4 -02- Learning the overview of OOP U4 -03- Learning and creating a thread	

SHETH T. J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

(Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding 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	and synchronizing thread. 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	U1 -01- Understand the concept of Data Structure and classification of data structure. U1 -02- Learning about data types,	CO1 Ability to analyze algorithms and algorithm correctness. CO2 Ability to summarize searching and sorting

V. COLLEGE OF SCIENCE & COMMERCE • SHETH L.U.J. ANDHERI (EAST) MUMBAI-69.

Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. Array:Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General MultiDimensional Arrays, Sparse Arrays, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.	algorithms and arrays. U1 -03- Learning about various type of notations.	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	U2 -01- Understand types of linked lists. U2 -02- Learning about the concept of linked list.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE * SHETH LULLA * ANDHERI (EAST) MUMBAI-69.

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		
UNIT – III Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion. Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue,Some special kinds of queues, Deque,Priority Queue, Application of Priority Queue, Applications of Queues.	U3 -01- Understand the concepts of Stack Memory Representation 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,	U4 -01- Understanding about binary trees like property, algorithms and representation. U4 -02- Learning about Advanced Tree Structures.	

SIES (NERUL) COLLEGE OF SCIENCE & COMMERCE
SIR M. V. COLLEGE OF SCIENCE & TECHNOLOGY
ANDHERI (EAST) MUMBAI-69.

Heap Sort. Advanced Tree Structures:Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.		
UNIT -V Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic,Double hashing, Buckethashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	U5 -01- Understand about hashing techniques. 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 model. Introduction to Physical layer:Data and signals, periodic analog signals, digital signals,	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 various sectors of user community. CO7 Knowledge about various protocols used in computer network.

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

transmission impairment, data rate limits, performance. Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.		CO8 Demonstrate different routing and switching algorithms.
UNIT – II Bandwidth Utilization: Multiplexing and SpectrumSpreading: Multiplexing, Spread Spectrum Transmission media:Guided Media, Unguided Media Switching: Introduction, circuit switched networks, packet switching, structure of a switch. Introduction to the Data Link Layer:Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.	U2 -01- Understanding about Bandwidth Utilization 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	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.	

H.T. & S.I.W.S. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-99

ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs.		
UNIT – IV Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing:Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	U4 -01- Understand the basic concept of Network Layer. U4 -02- Get to know about Unicast Routing. U4 -03- Learning about Next generation IP.	
UNIT -V Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols:World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.	U5 -01- Understanding the basic concepts of Transport layer. U5 -02- Learning Standard Client0Server Protocols	

SHRI. M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-93.

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 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	U1 - 01 - Understanding and learning the Introduction of Database and transaction . U1 - 02 - Understanding and application of Data Models . . U1 - 03 - Learning about ER diagram.	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.
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,	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 .	

SIES (NERUL) COLLEGE OF ARTS, SCIENCE & COMMERCE
SIR M. V. COLLEGE OF SCIENCE & TECHNOLOGY
ANDHERI (EAST) MUMBAI-93.

grouping and ungrouping,relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vsalgebra,computational capabilities		
UNIT – III Constraints, Views and SQL Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views,comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	U3 - 01 - Learning the application of constraints , views and sql . 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	U5 - 01 - Learning and Understanding the basic concept of PL-SQL U5 - 02 - Application of different data types , procedures and clauses .	

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

and composite data types, Procedures and Functions, Exceptions Handling,Packages,With Clause and Hierarchical Retrieval,Triggers.		

Course: USIT305 Applied Mathematics

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
UNIT – I 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 functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic	U1 -01- Get to know about Inverse of a matrix, Properties of matrices. 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.

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

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 equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	U2 - 01 - Get to know about the concept of equation of the first order and the first degree , with it different methods . U2 - 02 - Understanding and application of Linear Differential Equations with Constant Coefficients. U2 - 03 - Understanding and application of Particular integral	

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 Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function),	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 .	
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

S.I.E.S. (SIR M.V. COLLEGE OF SCIENCE & COMMERCE) ANDHERI (EAST) MUMBAI-69.

Course: USIT401 Core Java

SYBSC IT – SEM 4
2019-2020

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, 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 - 01 - Introduction to History, architecture and its components,Java Class U1 - 02 - Understanding and Learning of Data Types and its different operators and properties .	CO1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 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 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	U2 - 01 - Understanding and Learning of Control Flow Statements . U2 - 02 - Learning and application of Iterations i.e loops and statements .	

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

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, 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.	U2 - 02 - Learning about the classes and its different objects , methods , attributes , and values .	
UNIT – III Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package	U3 - 01 - Detailed study of Interance and understanding its object , classes and interfaces . 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	U4 - 01 - Detailed study of arrays and introduction and understanding its types .	

SHETKARI SHIKSHAN MANDAL'S M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Elements, Searching For Elements In A Vector, Working With The Size of The Vector. Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file	U4 - 02 - Understanding and learning of multi threading and its various properties . 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	U1 - 02 - Understanding and	CO1 To have knowledge about the basic working of a

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

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.	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.	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 .	

S.T.J. & S.R.M.V. COLLEGE OF SCIENCE & COMMERCE
NIDHER (EAST)

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 (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.	U5 - 01 - Understanding and 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	U1 - 01 - Learning the concept of tendencies and its different types of notation .	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

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

,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles,Software and Measures of Central Tendency. 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 - 02 - The detailed study of The Standard Deviation and Other Measures of Dispersion . U1 - 03 - Learning and understanding the concept of deviation and studying the same in detail.	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 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,	U2 - 01 - Understanding and Learning the concept of Moments, Skewness, and Kurtosis .	

SIES (N.K.T.) & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation,Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to n!,Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability. Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di ff and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.	U2 - 02 - Detailed study of the concept Software Computation of Skewness and Kurtosis. U2 - 03 - Analyzing the concept of Euler or Venn Diagrams and Probability and Elementary Sampling Theory	
UNIT – III Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, E ffiEstimates cient , Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules,Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special	U3 - 01 - Learning and understanding the concept of Statistical Estimation Theory. U3 - 02 - Remembering and Learning and the theory of Statistical Decision .	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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 - 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, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe ffi Contingency, Correlation of Attributes, Additive Property of chisquare.	U4 - 01 - Understanding and Analyzing the Small Sampling Theory . U4 - 02 - Remembering the concept of The Chi-Square Test and its properties .	
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,	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 .	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

Explained and Unexplained Variation, Coe ffi, cient of Correlation Remarks Concerning the Correlation Coe ffi, cient Product-Moment Formula for the Linear Correlation Coe ffientci, Short Computational Formulas, Regression Lines and the Linear Correlation Coe ffi, Correlation of Time cient Series, Correlation of Attributes, Sampling Theory of Correlation Sampling Theory of Regression.		

Course: USIT404 Software Engineering

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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.

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

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 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 - 01 - Introduction to Architectural Design and its system and styles . U3 - 02 - Learning and Understanding of User Interface Design . U3 - 03 - Analyzing and creating Quality Management .	

SIR M. V. COLLEGE OF SCIENCE & TECHNOLOGY
ANDHERI (EAST) MUMBAI-69

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, 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	U5 - 01 - Analyze and creating the process of Improvement i.e product , quality etc .	

Course: USIT405 Computer Graphics and Animation

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES

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

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) 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 - 01 - Introduction to Computer graphics and its application and software description . U1 - 02 - Learning and understanding the concepts of scan conversion , algorithms , ellipse , and clipping .	CO1 To familiarize students with basic principles and techniques for computer graphics. CO2 To Provide knowledge of interactive computer graphics with techniques of clipping, three dimensional graphics and three dimensional 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,	U2 - 01 - Understanding and learning of Two-Dimensional Transformations and matrices .	

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

A Geometric 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,	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 .	

SHETH L.U.J. & SHRI J.V. COLLEGE OF SCIENCE & COMMERCE • ANDHERI (EAST) MUMBAI-69. • SHETH

Parametric Representation of a Hyperbola, Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces		
UNIT -V 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 2019-2020

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?	U1 -01- Understanding Why is Software Project Management Important.	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

M. V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-69

Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. An Overview of Project Planning:Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step	U1 -02- Learning the basic concept of project. U1 -03- Understanding and learning about what is management. U1 -04- Learning about Overview of Project Planning.	not just theory subject to pass, instead it will help them live their professional life with ease. 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.

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

4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning		
UNIT – II 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	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.	

M.V. COLLEGE OF SCIENCE & COMMERCE ANDHERI (EAST) MUMBAI-93

Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.		
UNIT – III 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. Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost.	U3 -01- Learning about how to plan, when to plan and proper project schedules. U3 -02- Understanding about risk management. U3 -03- Analyzing the Resource Allocation. U3 -04- Analyzing the Cost Schedules	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST), MUMBAI-69.

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 Management, Health and Safety, Some Ethical and Professional Concerns.	U4 -01- Understanding Monitoring and Control. U4 -02- Learning about how to manage contracts. U4 -03- Understanding Behaviour, Organizational Behaviour	
UNIT – V Working in Teams: Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality: Introduction, The Place of	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.	

SHRI L.R.T.I. & SHRI M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-93.

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.		

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.	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

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

Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.		everything which you use in day-to-day life). 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,	U3 -01- Understanding how to prototype the physical design. U3 -02- Learning the basic concept of Laser	

SHETHLOJ N.M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.	cutting. U3 -03- Understanding the concept of Scrapping, comet. polling and other protocols.	
UNIT – IV Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries,Debugging. Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, be a Key Resource, Provide Infrastructure: Sensor Networks, take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	U4 -01- Understanding what is memory management. U4 -02- Learning the basic concept of Business Model. U4 -03- Learning about Venture Capital, Government Funding, Crowdfunding, Lean Startups.	

SHETHLULIA V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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 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	U1 -01- Understanding what exactly .NET framework is. U1 -02- Learning about Types, Objects, and Namespaces. U3 - 03- Learning about values types and reference type.	CO1 To familiarize students with Microsoft .Net, C#, and ASP.NET technologies. 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.

S.I.E.S. (N.) S.I.W.S. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Programming.		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, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	U2 -01- Understanding the basic concept of Web form fundamentals. U2 -02- Learning about Form controls. U2 -03- Understanding Validation and how to Use Validation Controls.	
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	U4 -01- Understanding the fundamentals of ADO.NET. U4 -02- Learning about Data Binding. U4 -03- Learning about the basic concept of Data controls.	

SHETHLOLA & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Access, Using Disconnected Data Access. Data Binding: Introducing Data Binding, Using Single-Value Data 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 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	U1 -01- Understanding about Red Hat Enterprise Linux. U1 -02- Analyzing and Working with the Bash Shell. U1 -03- Learning about System Administration Tasks	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 CO4 To make Students Install Apache, Send Mail. CO5 Write Shell Scripts in Linux.

M.H.B. & M.H.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69

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		
UNIT – II Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access	U2 -01- Learning about how to configure and manage storage. U2 -02- Understanding NetworkManager, 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.	



Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes		
UNIT – III 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 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,	U3 -01- Learning about Securing Server with iptables U3 -02- Learning how to set up a firewall.	

SHRI J.T.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-93

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 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	U4 -01- Understanding how to configure DNS and DHCP. U4 -02- Learning how to configure authentication and setting up authentication with .htpasswd.	
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,	U5 -01- Learning about Bash Shell Scripting. U5 -02- Understanding Variables, Variables, Subshells, and Sourcing. U5 -03- Learning High-Availability Clustering.	

ANDHERI EAST MUMBAI

Configuring booting with GRUB. High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File		

Course: USIT506 Enterprise Java

UNIT NO & NAME	UNIT OUTCOMES	COURSE OUTCOMES
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,	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.

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

TheServletLifeCycle, ASimpleWelcomeServlet WorkingwithServlets: GettingStarted, UsingAnnotationsInsteadofDeploymentDescriptor. Working with Databases: WhatIsJDBC? JDBCArchitecture, AccessingDatabase, TheServletGUI and DatabaseExample.		CO4 The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. 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.	U3 -01- Understand about Java Server pages. U3 -02- Learning about LifeCycle of a JSP Page. U3 -03- Understanding about Action Element.	



PassingParametersforotherActions, LoadingaJavabean. Implicit Objects, Scopeand ElExpressions: 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? Object/RelationalMapping, Introduction to JavaPersistence API: TheJavaPersistenceAPI, JPA,ORM,DatabaseandtheApplication,	U5 - 01 -Introduction and learning about Persistence, Object/Relational Mapping And JPA in detail with its meaning . U5 - 02 - Understanding and learning of JavaPersistence API	

DR. M. V. COLLEGE OF SCIENCE ANDHERI (EAST) MUMBAI-69

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.	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
2019-2020

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	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

SHETH T.J. & SIR M.V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-59

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, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects?Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.		management CO3 Recognise the importance of software quality assurance CO4 Know about quality improvement, cost control and contribute toward efficient delivery of software solutions
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	U2 - 01 - To learn the basic testing techniques. U2 - 02 - Develop knowledge of testing process and features.	

SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing		
UNIT – III Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary ValueTesting, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path	U3 - 01 - To learn Boundary value analysis. U3 - 02 - Develop knowledge of the Testing techniques.	

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

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 planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities	U4 - 01 - Analyze Verfication and Validation. U4 - 02 - Introduce V - Model and Testing during test	
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	U5 - 01 - understanding the levels of testings.	

K. M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-93

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 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	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.

SHETH L.U.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-93.

Practices for Network Defense.		
UNIT – II Authentication and Authorization: Authentication, Authorization Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding DatabaseLevel Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring	U2 - 01 - classify Authentication and Authorization U2 - 02 - analyze cryptography, 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 Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure	U3 - 01 - Learn Firewall Capabilities, Firewall Design. U3 - 02 - Learn Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	

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

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 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.	U5 - 01 - Introduce Cloud computing. U5 - 02 - Analyze application Security, Remote Administration Security.	

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	U1 - 01 - Describe the concepts and components of Business Intelligence (BI). U1 - 02 -Critically evaluate use of BI for supporting decision making in an	CO1 Ability to use decision support system for BI Applications CO2 Ability to develop and use mathematical models for data mining and data preparations

SHETHLUL & VISHNU V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

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	organisation. U1 - 03 - Understand and use the technologies and tools that make up BI.	CO3 Know how and when to apply classification and clustering techniques for solving BI problems 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 Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	U2 - 01 - define development of a model, representation of input data ,data mining process, analysis methodologies, data validation, data transformation, data reduction 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	U5 - 01- To be well-versed with Organizational Learning and Transformation, Knowledge Management Activities, Artificial intelligence Versus Natural Intelligence,	

SHETHLA Y.K.P.S. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-69.

Management Activities, Approaches to Knowledge Management, Information 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	basic structure and 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 Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects,	U1 - 01 -Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T). 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

SHEIKH LUL & V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST) MUMBAI-69.

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) 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.	U2 - 01 -Demonstrate organizational skills in file and database management. U2 - 02 -Give examples of interdisciplinary applications of Geospatial Information Science and Technology.	
UNIT – III Spatial Referencing and Positioning Spatial Referencing:	U3 - 01 -Apply GIS analysis to address geospatial problems and/or research questions. U3 - 02 -Demonstrate proficiency in	

M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-93

Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data	the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.	
UNIT – IV 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 computations,	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.	

SHETTY L.J. & SIR M. V. COLLEGE OF SCIENCE & COMMERCE
ANDHERI (EAST)
MUMBAI-59

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,	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,

ANDHERI (EST) MUMBAI-93

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.		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 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	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	
UNIT – III Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition	U3 - 01 - Students will be able to develop and evaluate alternate managerial choices and identify optimal solutions U3 - 02 - Analyse the role of 'services' and their implications within both service-dominant and product-dominant firms	

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

Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management. Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	and businesses. U3 - 03 - Understand and evaluate the role of co-production within the services process and design of services systems.	
UNIT – IV Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation Service Operation Processes:Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. Challenges, Critical Success factors and risks:Challenges, Critical Success factors, Risks	U4 - 01 - Assess the options for delivering effective service quality as the basis for sound business performance by a service firm in the private or public sector. 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	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	

ANDHERI (EAST) MUMBAI-58.

Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and 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	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.	

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