

MCA I AND II SEMESTER SYLLABUS
2023-2024

MCA I Semester

23PCA101C	Mathematical Foundations for Computer Applications	Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

UNIT-I	10 Hrs.
<p>Set Theory: Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Principles of Inclusion and Exclusion, Permutations and Combinations with repetition. Fundamentals of Logic : Basic Connectives and Truth Tables, Logic Equivalence- the laws of Logic, Logical Implications, Rules of Inference, The use of Quantifiers, Quantifier Definitions, Proofs of Theorems.</p>	
UNIT-II	10 Hrs.
<p>Functions: Cartesian products and Relations, Functions-Plain and One-to-One, Onto Functions, Stirling Numbers of the Second Kind, Special functions, The Pigeon-hole principle, Function composition and inverse functions. Relations : Properties of Relations, Computer recognition- Zero One Matrices and Directed graphs, Posets and Hasse Diagrams</p>	
UNIT-III	10 Hrs.
<p>Linear Algebra: Introduction, types of matrices, elementary row operations, row echelon matrix, rank, consistency of a system of linear equations. Eigen values and eigen vectors. Largest eigen value using power method. Cayley-Hamilton theorem (without proof) – inverse of a matrix using Cayley-Hamiltonian theorem. Algorithms to solve system of linear algebraic equations: Gauss elimination, Gauss seidel and Jacobi iterative procedures.</p>	
UNIT-IV	10 Hrs.
<p>Statistics: Introduction, Measures of central tendency (Arithmetic mean, Geometric mean, Harmonic mean, Median, Quartiles, Mode). Measures of dispersion (Range, Quartile deviation, mean deviation and standard deviation). Random variable and probability distribution Concept of random variable, discrete probability distributions, continuous probability distributions, Mean, variance and co-variance and co-variance of random variables. Binomial and normal distribution, Exponential and normal distribution with mean and variables and problems.</p>	
Reference Books *	
<p>1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics And Applied Introduction, 4th Edition, Pearson Education, 2003.</p>	

2. Richard A Johnson and C.B Gupta "Probability and statistics for engineers" Pearson Education.
3. Dr. K. S. Chandrashekhar, Engineering Mathematics- IV, Sudha Publications

Course Outcomes**

After completion of the course student will be able to

1. Apply the fundamentals of set theory and mathematical logic to perform various set operations and logic to the real world problems.
2. Apply the concept of relations and functions on sets to determine their types and compositions.
3. Acquire ability to work with matrices.
4. Acquire ability to represent the data and calculate the measures of central tendency and dispersion.
5. Identify and list the different applications of discrete mathematical concepts in computer science.

23PCA102C	Python Programming	Credits: 04
Hrs/Week:L:T:P:S 4:0:0:0		CIEMarks:50
Total Hours/Week: 52 Hrs		SEEMarks:50

UNIT-I		13 Hrs.
Basics of Python Programming: Features of python, writing and executing first python program, Literal constants, variables and identifiers, data types, input operation, comments, reserved words, indentation, operators and expressions, operations on strings. Decision control statements. Data Structures: Creating, accessing, cloning, add, updating of lists, list methods. Introduction to Tuples. Dictionary & Set methods.		
UNIT-II		13 Hrs.
Functions: Introduction, Function Definition, Function Call, Variable scope and lifetime, the return statement, more on defining functions. Lambda functions. Modules: The from...import statement, Name of Module, Making your own Modules, The dir() function. Regular Expressions: The match() function, The search() function, The sub() function, The findall(), finditer() functions, Meta characters in regular expressions, groups.		
UNIT-III		13 Hrs.
Classes and Objects: Introduction, Classes and Objects, class method and self argument, The init method, Class Variables and Object Variables, The del() method, Other special methods, Public and Private data members, Private Methods, Calling a class method from another class methods, Static methods. Operator Overloading: Introduction, Concept of Operator Overloading, Reverse adding.		
UNIT-IV		13 Hrs.
File Handling: Introduction, File Path, Types Of Files, Opening And Closing Files, Reading And Writing Files, File Positions, Renaming And Deleting Files, Directory Methods, Methods From OS Module. Working with Database: Connecting to a SQLite database, execute select statements, execute insert, update, and delete statements. Introduction to PySimpleGUI.		
Reference Books *		
1. Reema Thareja, "Python Programming using problem solving approach", Oxford University Press, 2017. 2. Paul Gries, Jennifer Campbell, Jason, Practical Programming, An introduction to Computer Science using Python 3.6, 3 rd Edition, Pragmatic Bookshelf.		

3. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition.

Course Outcomes**

After completion of the course student will be able to

1. Demonstrate core elements of Python Programming
2. Apply the knowledge of functions in building the python programs
3. Understand the basic concepts of object oriented programming
4. Demonstrate the concepts of file handling
5. Apply the knowledge in real time applications

23PCA103C	Web Programming	Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

UNIT-I	10 Hrs.
Fundamentals of Web and XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup; Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML4,HTML 5 and XHTML, Introduction to HTML5.0 form elements and validations.	
UNIT-II	10 Hrs.
CSS Introduction: Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The and <div> tags; Conflict resolution. JavaScript: Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions; Errors in scripts; Examples.	
UNIT-III	10 Hrs.
Dynamic Documents with JavaScript: The JavaScript execution environment; The Document Object Model; Element access in JavaScript. Events and Event Handling: Handling events from the Body elements, Button elements, Text box and Password elements. The DOM 2 event model. Introduction to AJAX: Overview of AJAX, The basics of AJAX, Rails with AJAX. Introduction to PHP: Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files.	
UNIT-IV	10 Hrs.
Session Handling with PHP: Tracking users, Cookies, Sessions. CRUD Operations using database and Handling XML. Introduction to Ruby on Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching. Introduction to Rails: Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.	

Reference Books *
<ol style="list-style-type: none">1. Robert W. Sebesta, Programming the World Wide Web, 4th Edition, Pearson Education, 2008.2. Chris Bates, Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.3. Eric Ladd, Jim O' Donnell using HTML 4,XML and Java, Prentice Hall of India-QUE,1999.
Course Outcomes**
<p>After completion of the course student will be able to</p> <ol style="list-style-type: none">1. Illustrate the fundamentals of web programming.2. Apply the mark-up and layout design to build web applications.3. Analyze appropriate content and scripting language concepts.4. Design and implement user interactive web applications.5. Apply the knowledge of web and can give solutions to the real world problems.

23PCA104C	Operating Systems & Shell Programming	Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week:40Hrs		SEEMarks:50

UNIT-I		10 Hrs.
<p>Introduction to Operating Systems: What Operating Systems do? Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Kernel data structures, Computing environments and Open source operating systems.</p> <p>System Structures: Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Operating System debugging, Operating System generation; System boot.</p>		
UNIT-II		10 Hrs.
<p>Process Management: Process concept; Process scheduling Multi-Threaded Programming: Overview; Multi-core programming, Multithreading models; Thread Libraries; Implicit threading, threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Thread scheduling, Multiple-Processor scheduling; Real time CPU scheduling. Process Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Mutex locks, Semaphores; Classical problems of synchronization; Monitors.</p>		
UNIT-III		10 Hrs.
<p>Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection, recovery from deadlock.</p> <p>Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Segmentation, Paging; Structure of page table.Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.</p>		
UNIT-IV		10 Hrs.
<p>Essential UNIX/LINUX commands: User Names and Groups, Logging In, Correcting Typing Mistakes, Format of Linux Commands, Changing Your Password.Unix files: Naming files,Basic file types/categories, Organization of files, Hidden files, Standard directories, Parent child relationship, The home directory and the HOME variable, Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames.Directory commands – pwd, cd, mkdir, rmdir commands. The dot(.) and double dots (..) notations to represent presentand</p>		

parent directories and their usage in relative path names. **File related commands** – cat, mv, rm, cp, wc and od commands, File attributes and permissions and knowing them, The ls command with options. **Changing file permissions:** the relative and absolute permissions changing methods, Recursively changing file permissions, Directory permissions.

Reference Books *

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 9th edition, Wiley-India, 2016.
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 2nd Edition, Tata McGraw-Hill, 2002.
3. SumitabhaDas: Your UNIX The Ultimate Guide; TMH.

Course Outcomes**

After completion of the course student will be able to

1. Explore the core structure and functionality of the Operating Systems.
2. Interpret the various process management and synchronization mechanisms.
3. Analyze the knowledge of occurring deadlock concepts and apply wide range of problem solving methods to solve deadlocks.
4. Identify and analyze the performance of different memory management techniques, page replacement and disk scheduling algorithms.
5. Demonstrate the basic UNIX commands.

23PCA105C	Computer Networks	Credits: 04
Hrs/Week:L:T:P:S 3:0:2:0		CIEMarks:50
Total Hours/Week:52 40Hrs + 12Hrs		SEEMarks:50

UNIT-I	10 Hrs.
<p>Introduction:Uses of Computer Networks, Network Hardware.Network Software: Protocol Hierarchies, Design Issues for the Layers.Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.Physical Layer- Guided Transmission Media, Digital Modulation and Multiplexing.</p>	
UNIT-II	10 Hrs.
<p>Data Link Layer-Data link Layer Design issues, Framing, Flow Control and Error Correcting and Detection codes, Sliding Window Protocols (Stop and Wait, Go-Back-N (GBN) and Selective Repetitive (SR)), Medium Access Control-The Channel Allocation Problem, Multiple Access Protocols, and Ethernet.Data Link Layer Switching: Uses of bridges, repeaters, hubs, switches, routers and gateways.</p>	
UNIT-III	10 Hrs.
<p>The Network Layer:Network Layer Design issues, Routing algorithms- The Optimality Principal, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Congestion Control Algorithms, Quality of Service, Internetworking.</p> <p>The Network Layer in the Internet:The Network Layer in the internet- IP version 4 Protocol(IPv4), The Main IPv6 Header, Extension Headers, Internet Control Protocols: ICMP, ARP, DHCP.</p>	
UNIT-IV	10 Hrs.
<p>The Transport Layer -The Transport Service: Services Provided to the Upper Layers, Berkeley Sockets, Elements of Transport Protocols, Internet transport protocols- TCP: Introduction to TCP, The Service Model, Protocol, Segment Header, UDP.</p> <p>The Application Layer-The Domain Name System, Electronic Mail, The World-Wide-Web, Streaming Audio and Video.</p>	
Reference Books *	

1. Andrew S. Tanenbaum, David J Wetherall, "Computer Networks", Pearson Education, Pearson Publication, 5th Edition, 2012.
2. Behrouz A Forouzan, Firouz Mosharraf, "Computer Networks A Top-Down Approach", Tata McGraw-Hill Education Pvt. Ltd, 2011.
3. William Stallings, "Data and Computer Communication", 8th edition, Pearson Publications, 2007.

LIST OF LABORATORY ASSIGNMENTS:

Simulate the following experiments using the NS2 simulators.

1. Three node point to point network with duplex link between them.
2. Four node point to point network using TCP/UDP.
3. Different types on internet traffic such as FTP, Telnet and Analyze throughput.
4. Transmission of ping messages over network topology consisting of six nodes.
5. Ethernet LAN using N nodes (6 to 10), change error rate and data rate and also compare throughput.

Implement the following programs using C/C++ language:

6. Error detection using CRC-CCITT(16-bits).
7. Bits stuffing and de-stuffing of Binary data.
8. Distance vector algorithm to find a suitable path for transmission.
9. Congestion control using leaky bucket algorithm.
10. Demonstrate converting normal text to cipher text using simple techniques.

Course Outcomes**

1. To comprehend basics of data communication system.
2. Enumerate the layers of the OSI, TCP/IP model and demonstrate functions of each layer and comprehend the concept of data link protocols.
3. To exhibit the ability to apply different error detection and correction technique to solve communication problem.
4. To exhibit the ability to understand issues related to transport layer and protocols.
5. Demonstrate the concept of internetworking, routing techniques of network layer.

23PCA106C	Research Methodology & IPR	Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

UNIT-I	10 Hrs.
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.	
UNIT-II	10 Hrs.
Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, improving research methodology, Broadening knowledgebase in research area, enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	
UNIT-III	10 Hrs.
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.	
UNIT-IV	10 Hrs.
Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of 02.03.2021 updated 17/ 104 Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999.	

Reference Books *
<ol style="list-style-type: none">1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.2. Research Methodology a step-by- step guide for beginners. Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.3. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.
Course Outcomes**
<ol style="list-style-type: none">1. Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.2. Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.3. Explain various research designs, sampling designs, measurement and scaling techniques.4. Perform the data collection from various sources segregate the primary and secondary data.5. Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions.

23PCA107C	Introduction to Programming Languages	Credits:NA
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:100
Total Hours/Week: 40 Hrs		SEEMarks: NA

UNIT-I	10 Hrs.
<p>Overview of C: Features of C, Structure of C program, process of compiling and executing the C program. Constants, Variables and Data types: Introduction, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Example programs. Operators and Expressions: Overview of operators, Evaluation of expressions, Type conversion in expressions. Managing Input and Output Operations: Formatted and Unformatted input and output statements Decision making and Branching: Decision making with if, if-else, Nesting of if-else statements, else-if ladders, switch statement, Conditional Operator ?:, goto statement.</p>	
UNIT-II	10 Hrs.
<p>Looping: while statement, do-while statement, for statement, jumps in loops. Arrays: Introduction, One dimensional arrays, declaration and initialization of one-dimensional arrays, Two dimensional arrays, declaration and initialization of two-dimensional arrays. Operations on arrays. Strings: Introduction, Declaring and initializing string variables, String-handling functions, Array of String.</p>	
UNIT-III	10 Hrs.
<p>User defined functions: Introduction, Elements of user defined function, Category of functions: Based on call by value, call by reference, recursive functions. Structures: Defining a structure, Declaring structure variables, Accessing structure members, Initialization.</p>	
UNIT-IV	10 Hrs.
<p>Pointers: Introduction, Accessing the address of a variable, Declaring and initialization of pointer variables, Pointers as function arguments. Classes and Object-Based Programming in C++: Introductions to Object Oriented programming concepts (OOPS), Declaration, creation of class and object using C++, Accessspecifiers of a Class, Constructors and Destructors in a Class, Nested Classes.</p>	
Reference Books *	
1. E. Balaguruswamy, Programming in ANSI C, 7 th Edition, Tata McGraw Hill Publications, 2017.	

2. E. Balagurusamy,, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd, Fourth Edition 2010.
3. K R Venugopal, Rajkumar Buyya and T. Ravishankar, Mastering C++, Tata McGraw-Hill, 2006.

Course Outcomes**

After completion of the course student will be able to:

1. Demonstrate the key concepts introduced in C programming by writing and executing the programs.
2. Demonstrate the concepts of structures and pointers for the given application/problem.
3. Implement the single/multi-dimensional array for the given problem.
4. Explore user-defined data structures like structures and pointers in implementing solutions like heterogeneous data processing.
5. Design and Develop Solutions to problems using modular/object oriented programming constructs using functions.

23PCA108L	Python Programming Laboratory	Credits: 1.5
Hrs/Week:L:T:P:S 0:0:3:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

1. Program on Decision Control Structure Statements.
2. Program on List and Dictionary of data.
3. Program on User Defined Functions.
4. Program on Regular Expressions.
5. Program on Object Oriented Concepts.
6. Program on Overloading Operator.
7. Program on File Handling Mechanism.
8. Program on Working with database.
9. Program on Exception Handling.
10. Creation of GUI application.

Course Outcomes (COs):

After completion of the course student will be able to:

1. Understand the basic programming elements of Python.
2. Apply and analyze the different python data structures.
3. Understand the concepts of OOPS using Python.
4. Implement and debug the real world applications using GUI, file handling and Database.

23PCA109L	Web Programming Laboratory	Credits: 1.5
Hrs/Week:L:T:P:S 0:0:3:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

1. Design and develop a static web page using basic HTML tags to demonstrate use of different color, font, table format, bold, italic etc.
2. Design and develop a web page to demonstrate different types of style sheets.
3. Design and develop external CSS style sheet to create a registration form and validate using JavaScript.
4. Write a JavaScript to demonstrate use of alert, prompt and confirm message box by considering general feedback form.
5. Using HTML and JavaScript design a web page to calculate a payroll of an employee.

Note:

1. Read employee details such as employee id, name, designation, dept, DOJ and basic salary.
2. Read deduction in percentage such as PF (Employee side), LIC.
3. Read allowance in percentage such as PF (Employer side), DA, and HRA.
4. Calculate gross and net salary of an employee as output.
6. Demonstrate use of hyperlink to pass parameters and validate those parameters in second page using JavaScript.
7. Design and develop a Registration and login page. Forward the request to success and failure page by validating user credentials through AJAX.
8. Create an HTML form with Student Name, USN, DOB, Branch, Sem, Address and E-mail fields, on submitting the page store them in MySQL table. Retrieve and display the data based on USN using PHP.
9. Using Rails and MySQL, develop a program to accept book Information viz. Accession number, title, authors, edition and Publisher from a web page and store the information in a database And to search for a book with the title specified by the user and to Display the search results with proper headings.
10. Design and develop a responsive web site by considering any real time scenario.

Course Outcomes (COs):

After completion of the course student will be able to:

1. Design and develop static web pages.
2. Demonstrate use of different types of CSS.
3. Apply the knowledge of JavaScript/AJAX to develop interactive web pages.
4. Design and develop dynamic web pages using PHP.

23PCA110S	Seminar	Credits: 02
Hrs/Week:L:T:P:S 0:0:0:2		CIEMarks:50
Total Hours/Week: 28 Hrs		SEEMarks:50

Seminars are used as a course delivery mode to gather current trends in technology, research literature and self learn topics of their interests. Student has to search a technical topic, make presentation and give a detailed document on their findings in consultation with the guide.

Course Outcomes (COs):

At the end of the course student should be able to:

1. Identify seminar topics based on contemporary technical, societal and environmental issues.
2. Conduct literature survey in the selected domain.
3. Explore advanced concepts and technologies.
4. Make oral and written technical presentation.

SEMINAR ASSESMENT:

CIE and SEE marks Award : Shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide and HoD nominee

CIE and SEE marks Evaluation: Based on technical papers, application development, emerging technology etc.

Presentation skill : 50% of Marks

Report Writing : 25% of Marks

Question and answering : 25% of Marks

MCA II SEMESTER SYLLABUS

23PCA201C	Data Structures and Algorithms	Credits: 03
Hrs/Week:L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50

UNIT-I	10 Hrs.
<p>Introduction to data structures: Information and meaning Stack: Definition and examples Primitive operation, Example, Testing for exceptional conditions, implementing the push operation. Example: Infix, postfix and prefix, Basic definitions and examples. Evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix. Recursion: Recursive definition and processes, Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithms, Towers of Hanoi problem. Queue: The queue and its sequential representation, C implementation of queues, Priority queue, Array implementation of a priority queue, circular queue and its implementation, deque (doubly ended queue) implementation.</p>	
UNIT-II	10 Hrs.
<p>Lists: Linked lists, Inserting and removing nodes from a list, Linked implementation of stacks, Getnode and free node operations, Linked implementation of queues, Linked list as a data structure, Example of list operation, Header nodes, Array implementation of lists, Limitations of array Implementation, Allocating and freeing dynamic variables, Linked lists using dynamic variable, Non integer and non-homogeneous lists. Other list structures, Circular lists, Stack as a circular list, Queue as circular list, Primitive operations on circular lists, doubly linked lists.</p>	
UNIT-III	10 Hrs.
<p>Binary Trees: Binary trees, Operations on binary trees, Applications of binary trees. Binary tree representation, Node representation of binary tree, Internal and external nodes, implicit array representation of binary trees, choosing a binary tree representation, binary tree traversal using C, threaded binary trees. Tree traversals using a father field, heterogeneous binary tree, Representing list as binary tree: finding the k^{th} element, deleting an element, finding minimum and maximum element in a tree, evaluating general expressions using trees.</p>	
UNIT-IV	10 Hrs.
<p>Sorting: Exchange sort: Bubble sort, Quick sort. Selection sort and Tree sorting: Straight selection sort, Binary tree sorts, sorting using a heap. Insertion sorts: Simple Insertion, Shell sort, Merge and Radix sorts. Searching: Sequential searching, Indexed sequential search, Binary</p>	

search, Interpolation search. Tree Searching: Insertion into a Binary search tree, Deleting from a Binary search tree. Optimum search trees, Balanced trees.

Reference Books *

1. Data structures using C by Yedidyah Langsam and Moshe J. Augenstein and Aaron M. Tenenbaum, PHI.
2. Mark Allen Weiss, data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia.
3. Anany Levitin, Introduction to design and analysis of algorithms, Pearson Education, 2003

Course Outcomes**

After completion of the course student will be able to:

1. Understand the basic concepts of data structures like stack and queue
2. Analyze the logical representation of linked lists
3. Understand the working procedure of binary trees
4. Design and analyze sorting and searching techniques
5. Be able to compare functions and describe the relative merits of worst-, average-, and best-case analysis.

23PCA202C	Java and J2EE	Credits: 04
Hrs/Week:L:T:P:S 4:0:0:0		CIEMarks:50
Total Hours/Week: 52 Hrs		SEEMarks:50

UNIT-I	13 Hrs.
An Overview of Java: The Java Class Libraries, Data Types, Variables, Introducing to Object Oriented programming concepts Encapsulation using Classes: Class Fundamentals, data members, Declaring Objects, Assigning Object Reference Variables, Introducing to Polymorphism using Constructors and Methods, Abstract Classes and methods.	
UNIT-II	13 Hrs.
Inheritance: Types of Inheritance, Using overloading and overriding of constructors and methods , this and super keywords , Interfaces, Exception Handling. J2EE-Overview: Enterprise Architecture Types-Single tier, 2-tier,-3-tier, n-tier, objectives of Enterprise Applications, features of J2EE, introduction to servers-web servers vs Application servers. Working with Servlets 3.1: Exploring the features of servlet 3.1, request and response model, servlet with API-packages, web directory structure-packaging, deploying and running web applications, servlet-lifecycle, working with ServletConfig and ServletContext Objects, HttpServletRequest and HttpServletResponse Interfaces.	
UNIT-III	13 Hrs.
Handling Sessions in Servlet 3.1: Describing the session, Introduction to session tracking, Exploring session tracking mechanisms – using cookies, Hidden Form Fields, URLRewriting, session creation and tracking. Java Server Pages 2.3(JSP): Introduction to JSP technology, advantages of JSP over servlet, architecture of JSP- Model-1,Model-2,life cycle of JSP, JSP Basic tags – scripting , directive , action tags, JSP implicit objects , Java Beans API, Bean properties, declaring beans in JSP Pages, bean components.	
UNIT-IV	13 Hrs.
JDBC 4.0: Introducing JDBC- architecture, features , JDBC Driver Types, JDBC API- sql Packages, A Brief Overview of the JDBC process with java.sql packages- JDBC Database Connection; Associating the JDBC/ODBC Bridge with the Database, Describing Classes and Interfaces- Driver Manager class, Driver Interface, Connection Interface, Statement Interface, Prepared Statement ,Callable Statement Interface, Result Set, Batch Updates. Transaction Processing; Metadata, Data types; Exceptions. J2EE Design Patterns: Introducing Design Patterns, Role of design patterns, types of design patterns. Spring Framework: Introduction to Spring	

framework, Features and Spring framework architecture- core module, AOP module, ORM Module.

Reference Books *

1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2020.
2. Kogent Learning Solutions Inc and Dreamtech Press: Java Server Programming Java EE 7 Black Book, 2020
3. Keogh, Jim (2002). J2EE: the complete reference. New Delhi : Tata McGraw-Hill.

Course Outcomes**

After completion of the course student will be able to:

1. Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs.
2. Understand J2EE framework and technologies (Servlet/JSP).
3. Work with Java.sql.* package to design, implement and debug database applications.
4. Develop reusable software components using Java patterns.
5. Understand Spring framework and Develop Web based applications successfully.

23PCA203C	Database Management System	Credits: 04
Hrs/Week:L:T:P:S 3:0:2:0		CIEMarks:50
Total Hours/Week: 40 Hrs + 12 Hrs		SEEMarks:50

UNIT-I	13 Hrs.
<p>Databases and Database Users: Introduction, An Example, Characteristics of the Database Approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS approach, A brief history of database applications, When not to use a DBMS, Database System Concepts and Architecture: Data models, schemas and instances, Three-schema architecture and data independence, Database language and interfaces, The database system environment. Data Modeling Using the Entity-Relationship(ER) Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship Types, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues.</p>	
UNIT-II	13 Hrs.
<p>The Relational Data Model and Relational Database Constraint: Relational Model Concepts, Relational Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations. Relational Algebra and Relational Calculus: Unary Relational Operations, Relational Algebra Operations from Set Theory, Binary Relational Operations, Additional Relational Operations; Examples of Queries in Relational Algebra. Relational Database Design Using ER and EER to-Relational Mapping: Relational Database Design Using ER to Relational Mapping. SQL-99: Schema Definition, Constraints, Queries and Views: SQL Data Definition and Data types, Specifying Constraints in SQL, Schema Change statement in SQL, Basic Queries in SQL, More Complex SQL Queries, Insert, Delete and Update Statements in SQL, Specifying Constraints as Assertion and Triggers, Views (Virtual Tables) in SQL, Additional Features of SQL.</p>	
UNIT-III	13 Hrs.
<p>Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions, Algorithms for Relational Database Schema Design; Multi-valued Dependencies and fourth normal form, Join Dependencies and fifth normal form, Inclusion Dependencies; Other Dependencies and Normal Forms. Overview of Query Evaluation The System Catalog: Information in the Catalog;</p>	

Introduction to Operator Evaluation: Three Common Techniques, Access Paths; Algorithms for Relational Operations: Selection, Projection, Join, Other Operations; Introduction to Query Optimization: Query Evaluation Plans, Multi-operator Queries, Pipelined Evaluation, The Iterator Interface; Alternative Plans: A Motivating Example: Pushing Selections, Using Indexes; What a Typical Optimizer Does: Alternative Plans Considered, Estimating the Cost of a Plan.

UNIT-IV

13 Hrs.

Overview of Transaction Management: The ACID Properties: Consistency and Isolation, Atomicity and Durability; Transactions and Schedules; Concurrent Execution of Transactions: Motivation for Concurrent Execution, Serializability, Anomalies due to Interleaved Execution, Schedules Involving Aborted Transactions; Lock- Based Concurrency Control: Strict Two-Phase Locking, Deadlocks; Performance of Locking; Transaction Support in SQL: Creating and Terminating Transactions, What Should We Lock? Transaction Characteristics in SQL: Introduction to Crash Recovery: Stealing Frames and Forcing Pages, Recovery - Related Steps during Normal Execution, Overview of ARIES recovery algorithm, Atomicity: Implementing Rollback. Database Security, Introduction to Database Security; Access Control; Discretionary Access Control: Grant and Revoke on Views and Integrity Constraints; Mandatory Access Control: Multilevel Relations and Poly instantiation, Covert Channels, DoD Security Levels.

Reference Books *

1. R. Elmasri and S. Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Education 2011.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill 2003.
3. Silberschatz, Korth and Sudarshan, Database System Concepts, Fourth Edition, McGraw-Hill.

Course Outcomes**

After completion of the course student will be able to

1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
3. Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
4. Develop application to interact with databases, relational algebra expression.
5. Develop applications using tuple and domain relation expression from queries.

DBMS Laboratory Assignments:

1. Demonstration of basic queries like create, update, drop and select (with aggregate and group functions)
2. Design and demonstration of ER Module.
3. Use of Intermediate SQL queries based on inner queries, working on constraints, different types of JOIN, filters etc.
4. Demonstrate use of subroutines
5. Demonstrate use of stored procedures.
6. Demonstrate use of triggers.
7. Database design and normalization.
8. Queries on database backup and Revoke.
9. User creation and authentication.
10. Use of advanced data types such as BLOB, Timestamp, Binary etc.

Course Outcomes (COs):**At the end of the course student should be able to:**

1. Understand the fundamental concepts like data, information, DBMS, Data Models.
2. Design and Create Databases.
3. Implement and Manipulate the data.
4. Optimize query performance.

23PCA204C	Technical Communications	Credits: 03
Hrs/Week:L:T:P:S 2:2:0:0		CIEMarks:50
Total Hours/Week: 40Hrs		SEEMarks:50

UNIT-I	10 Hrs.
Fundamentals of Technical Communication: Technical Communication: Features; Distinction between General and Technical Communication; Levels of Communication: Extrapersonal Communication, Intrapersonal Communication, Interpersonal Communication, Organizational Communication and Mass Communication. The Flow of Communication: Downward Communication, Upward Communication, Lateral or Horizontal Communication, Diagonal or Crosswise Communication, The Importance of Technical Communication.	
UNIT-II	10 Hrs.
Listening Skills: Types of Listening, Traits of a Good Listener, and Barriers to Effective Listening. Effective Presentation Strategies: Introduction, Defining Purpose, Analyzing Audience and Locale, Organizing Contents, Introduction Main Body, Conclusions, Preparing an Outline, Kinesics, Personal Appearance: Posture, Gesture, Facial Expression, Eye Contact, Proxemics, Paralinguistics, Quality, Volume, Pace/Rate, Pitch, Articulation Pronunciation, Voice Modulation, Pauses, Chronemics.	
UNIT-III	10 Hrs.
Letter Writing and Email: Business Letters, Significance, Purpose, Structure Layout, Principles, Types and Samples. Emails: Advantages and Limitations, Style, Structure, and Content. Technical Reports: Introduction, Importance of Reports, Objectives of Reports, Characteristics of a Report, Categories of Reports, Formats, Prewriting, Structure of Reports (Manuscript Format), Types of Reports, Writing the Report, Revising, Editing, and Proofreading.	
UNIT-IV	10 Hrs.
Introduction to business ethics and values: Meaning, Nature of business ethics, Importance of business ethics, Factors influencing business ethics, Arguments for and against business ethics, Types of ethical dilemmas. Values: Meaning, Types of values. Introduction to Corporate Governance: Definition and Conceptual Framework of Corporate Governance, Business Ethics – an important dimension to Corporate Governance, Fair and Unfair Business Practices. Theoretical Basis of Corporate Governance, Mechanism- Corporate Governance Systems, Indian Model of Governance, Good Corporate Governance.	

Reference Books *

1. Meenakshi Raman, Technical Communication Oxford University Press, 2017.
2. C.S.V. Murthy, Business Ethics, Himalaya Publishing House; Mumbai, 2007.
3. Andrew Crane and Diark Matten, Business Ethics, Oxford Publication, New Delhi, 2007.

Course Outcomes**

After completion of the course student will be able to:

1. Understand the fundamental principles of effective technical communications.
2. Understand the fundamental principles of good listening skills and effective presentation strategies.
3. Develop various types of technical reports/letters/emails and practice in their professional life.
4. Understand the Business Ethics and corporate governance.
5. Imbibe the ethical issues in corporate governance and to adhere to the ethical codes.

23PCA205L	Data Structures Laboratory	Credits: 2
Hrs/Week:L:T:P:S 0:0:4:0		CIEMarks:50
Total Hours/Week:25Hrs		SEEMarks:50

1. Write a C Program to demonstrate Stack operations using arrays.
2. Write a C Program to evaluate postfix expression, postfix expression contains single digit integers and the operators +,-,*and /.
3. Write a C Program to convert infix to postfix expression.
4. Write a C Program to demonstrate Queue operations using arrays.
5. Write a C Program to demonstrate different operations on singly linked list.
6. Write a C Program to demonstrate different operations on circular doubly linked list.
7. Write a C program to implement the following operation on binary tree using array:
 - i. Insert
 - ii. Delete
 - iii. Tree traversal
8. Write a C program to demonstrate binary search using recursion.
9. Write a C Program to perform the Merge sort.
10. Write a C Program to perform the Quick sort.

Course Outcomes (COs):

At the end of the course student should be able to:

1. Evaluate the Expressions like postfix, prefix conversions.
2. Implementing various data structures viz. Stacks, Queues, Linked Lists, and Trees.
3. Implementing various searching techniques.
4. Implementing various sorting techniques.

23PCA206L	Java and J2EE Laboratory	Credits: 2
Hrs/Week: L:T:P:S 0:0:4:0		CIEMarks:50
Total Hours/Week: 25Hrs		SEEMarks:50

1. Write a JAVA program to demonstrate use of class members and object members.
2. Write a JAVA program to demonstrate polymorphism using constructor and methods
3.
 - a) Write a JAVA program to demonstrate abstract class concept.
 - b) Write a JAVA program to demonstrate the inheritance concept.
4. Write a Servlet program to demonstrate the basic servlet using doGet(), doPost() and service() methods.
5. Write a servlet program to demonstrate session tracking.
6. Write a JSP script to demonstrate scripting, directive and expression tags.
7. Write a JSP script to demonstrate bean concept.
8. Write a Servlet/JSP to demonstrate CRUD operations using JDBC.
9. Write a J2EE application to demonstrate complete login process.
10. Write a program to demonstrate spring framework.

Course Outcomes (COs):

At the end of the course student should be able to:

1. Demonstrate OOPS concepts.
2. Demonstrate simple web applications using servlet and JSP.
3. Design and develop web applications to solve real world problems.
4. Demonstrate the basic use of spring framework.

23PCA207P	Mini Project	Credits: 02
Hrs/Week: L:T:P:S 0:0:4:0		CIEMarks:50
Total Hours/Week: `25 Hrs		SEEMarks:50

Students are expected to take up mini project with a team size not exceeding three. The objective of this course is to develop real time mini projects using latest technologies.

Course Outcomes (COs):

At the end of the course student should be able to:

1. Apply the technical knowledge gained through different courses to solve the real world problems.
2. Exhibits the presentation and communication skills.
3. Prepare a technical report based on work carried out.
4. Exhibit the responsibilities in a team.

Mini Project Assessment:

CIE and SEE marks Award : Shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide and HoD nominee

CIE and SEE marks Evaluation :

Application development, Presentation skill : 50% of Marks

Report Writing : 25% of Marks

Question and answering : 25% of Marks

Professional Elective-I		Professional Elective-II	
Subject Code	Subject	Subject Code	Subject
23PCC208E	Data Mining	23PCC212E	Introduction to AI
23PCC209E	Cloud Computing	23PCC213E	DevOps
23PCC210E	Mobile Application Development	23PCC214E	Android Programming Concepts
23PCC211E	Computer Vision	23PCC215E	Natural Language Processing

23PCC208E	Data Mining	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction to data mining: Definition of Data Mining, Motivating Challenges of DM, Data Mining Tasks. Data: Data Attributes, Types of Data, Quality of Data and Data Preprocessing, Measures of Similarity and Dissimilarity.		
UNIT-II		10 Hrs.
Association Analysis: Definition of Association Analysis, Frequent Item Set Generation, Rule Generation, Compact Representation of Frequent Item Sets. Alternate Method of Generating Item Sets, FP Growth Algorithms, Evaluation of Association Pattern.		
UNIT-III		10 Hrs.
Classification: Preliminaries, General Approach To Solving Classification Problem, Decision Tree Based Classifier, Rule Based Classifier, Nearest Neighbor Classifier. Cluster Analysis: Overview, K-means, DBSCAN.		
UNIT-IV		10 Hrs.
Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.		
Reference Books *		
1. “Introduction to Data Mining”, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education. 2. “Data Mining – Concepts and Techniques”, Jiawei Han and Micheline Kamber, Morgan Kaufman, 2006, 2nd Edition. 3. “Introduction to Data Mining with Case Studies”, G K Gupta, PHI.		
Course Outcomes**		
After completion of the course student will be able to: 1. Comprehend the fundamentals of Data mining. 2. Apply data preprocessing techniques. 3. Apply association rule mining techniques like a priori, FP tree and ECLAT and analyze the usefulness of rules. 4. Apply classification methods like decision tree, rule based and nearest neighbor, cluster analysis, K-MEANS etc. 5. Comprehend advanced mining applications and algorithms like web mining, search engines etc.,		

23PCC209E	Cloud Computing	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction to Cloud Computing: Eras of computing, The vision of Cloud Computing, Defining a cloud, A closer look, Cloud computing reference model, Historical developments: Distributed systems, Virtualization, Web 2.0; Service oriented computing; Utility oriented computing. Architectures for parallel and distributed computing: Parallel Vs Distributed computing, Elements of distributed computing, Technologies for distributed computing.		
UNIT-II		10 Hrs.
Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples: Xen: Para virtualization, VmWare: Full virtualization, Microsoft Hyper – V.		
UNIT-III		10 Hrs.
Cloud computing architecture: Introduction, Cloud reference model: Architecture, IaaS, PaaS, SaaS, Types of Clouds: Public, Private, Hybrid and Community clouds, Economics of the cloud, Open challenges.		
UNIT-IV		10 Hrs.
Cloud Access: authentication, authorization and accounting - Cloud Provenance and meta-data - Cloud Reliability and fault-tolerance - Cloud Security, privacy, policy and compliance- Cloud federation, interoperability and standards.		
Reference Books *		
1. Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelci, Mastering Cloud Computing, Tata McGraw Hill, New Delhi, India, 2013. 2. Barrie Sosinsky, “ Cloud Computing Bible” John Wiley & Sons, 2010 3. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “Distributed and cloud computing from Parallel Processing to the Internet of Things”, Morgan Kaufmann, Elsevier – 2012		
Course Outcomes**		

After completion of the course student will be able to:

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
2. Understand and Identify the basic concepts of Virtualization and types.
3. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
4. Explain the core issues of cloud computing such as security, privacy, and interoperability.
5. Provide the appropriate cloud computing solutions and recommendations according to the applications used.

23PCA210E	Mobile Application Development	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction: Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Mobile Development Today - Mobile Myths - Third-Party Frameworks – Mobile Web Presence - Mobile Content -Mobile Browsers - Mobile Applications – Marketing. Web Services for Mobile Applications: What Is a Web Service? - Examples of Web Services - Advantages of Web Services - Web Services Languages (Formats) - eXtensible Markup Language (XML) - JavaScript Object Notation (JSON) - Transferring Non-textual Data - Creating an Example Web Service - Using the Microsoft Stack - Using the Linux Apache MySQL PHP (LAMP) Stack - Debugging Web Services - Tools - Advanced Web Service Techniques.		
UNIT-II		10 Hrs.
MOBILE USER INTERFACE DESIGN: Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design. Mobile Websites: Choosing a Mobile Web Option - Adaptive Mobile Websites - Dedicated Mobile Websites - Mobile Web Apps with HTML5. MOBILE OPERATING SYSTEMS: Getting Started with Android Programming: Why Target Android? - Who Supports Android? - Android as Competition to Itself - Multiple Markets and Market Locks - Getting the Tools You Need - Installing Additional SDK Components – Development –Connecting to the Google Play - Android Development Practices- Building the Derby App in Android		
UNIT-III		10 Hrs.
Getting Started With iOS :The iPhone Craze - Apple in Its Beauty - Apple Devices - Getting the Tools You Need - Hardware - xCode and the iOS SDK - The iOS Human Interface Guideline - iOS Project - Anatomy of an iOS App - Getting to Know the xCode IDE - Debugging iOS Apps - The iOS Simulator - Debugging Code - Instruments - Objective-C Basics - Classes - Control Structures - Try Catch - Hello World App - Creating the Project - Creating the User Interface - Building the Derby App in iOS - User Interface - Team Roster- Details - Leagues and Team Names - Other Useful iOS Things - Offline Storage – GPS. Getting Started with Windows Phone : New Kid on the Block - Metro - Application Bar - Tiles - Tombstoning - Getting the Tools You Need - Hardware - Visual Studio and Windows Phone SDK - Windows Phone 7 Project - Silverlight vs. Windows Phone 7 - Anatomy of a Windows Phone 7 App - The Windows Phone 7 Emulator - Building the Derby App in Windows Phone 7 - Creating the Project - User Interface - Derby Names - Leagues - Distribution - Other Useful Windows Phone Things - Offline Storage - Notifications - GPS – Accelerometer - Web Services		
UNIT-IV		10 Hrs.
GETTING STARTED WITH MONOTOUCH AND MONO FOR ANDROID: The Mono Framework - MonoTouch - Mono for Android - Assemblies - Why MonoTouch/Mono for Android? - Downsides		

Xamarin Mobile - Getting the Tools You Need - Mono Framework - MonoTouch - Mono for Android - Getting to Know MonoDevelop - Debugging - MonoTouch Specifics - Mono for Android Specifics - Mono Projects - Anatomy of a MonoTouch App - Anatomy of a Mono for Android App - Building the Derby App with Mono - MonoTouch - Mono for Android - Other Useful MonoTouch/Mono Features - Local Storage – GPS.

Reference Books *

1. Jeff & Scott, “Professional Mobile Application Development “, Wrox Publications.
2. Wei-Meng Lee, “Beginning Android Application Development”, Wiley.

Course Outcomes**

After completion of the course student will be able to:

1. Understand Various Mobile Application Architectures. (Understand)
2. Develop applications using software development kits (SDKs), frameworks and toolkits.
3. Implement suitable platform for mobile devices
4. Design and develop open-source software based mobile application to the given problem.
5. Build and deploy competent mobile application to solve the societal/industrial problems.

23PCA211E	COMPUTER VISION	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction & Fundamentals: Origin of DIP, examples of fields that use DIP, fundamentals of DIP, components of an DIP system, Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening, Laplacian filter, Canny edge detector., image sampling and quantization, some basic relationships between pixels		
UNIT-II		10 Hrs.
Enhancements in Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Enhancements in Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphism Filtering.		
UNIT-III		10 Hrs.
Image Restoration: A Model of the Image Degradation/Restoration Process, Noise Models. Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.		
UNIT-IV		10 Hrs.
Morphological Image Processing and Segmentation: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation. Some Basic Morphological Algorithms, Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, RegionBased Segmentation.		
Reference Books *		
1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson Education. 2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education.		
Course Outcomes**		
After completion of the course student will be able to:		
1. Understand the concept of image formation, digitization and the role human visual system plays in perception of image data. 2. Acquire an appreciation for spatial and frequency-based techniques for enhancing the appearance of an image duly applying them in different applications.		

- 3.** Discern the difference between noise models, realize different spatial and frequency-based filtering techniques for reduction and removal of noise.
- 4.** Design and create practical solutions using morphological operators and segmentation techniques for common image processing problems.
- 5.** Apply image processing knowledge in building real time applications.

23PCA212E	Introduction to Artificial Intelligence	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem. Intelligent Agents: Agents & Environment, Nature of Environment, Structure of Agents, Goal Based Agents, Utility Based Agents, Learning Agents. Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs.		
UNIT-II		10 Hrs.
Search Techniques: Solving Problems by Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies. Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems.		
UNIT-III		10 Hrs.
Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation. Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction. Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge.		
UNIT-IV		10 Hrs.
Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory. Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning. Learning: Forms of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning.		
Reference Books *		
1. Stuart J. Russell, Peter Norwig, Artificial Intelligence –A Modern approach, 3 rd Edition, Pearson Education, 2016. 2. Rich E. & Knight K. “Artificial Intelligence”, 2nd Edition, TMH, New Delhi. 3. Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1st ed., PHI learning, 2015.		
Course Outcomes**		

After completion of the course student will be able to:

1. Understand the principles and approaches of artificial intelligence and different aspects of Intelligent agent.
2. Apply different search techniques for solving real world complex problems and select the most appropriate solution by comparative evaluation.
3. Design AI based systems and their components with reasoning even in the presence of incomplete and/or uncertain information.
4. Develop knowledge-based systems with proper representation schemes.
5. Analyze the pros and cons of different AI systems and their design.

23PCA213E	DevOps	Credits: 04
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50
UNIT-I		10 Hrs.
What is DevOps?, Why is DevOps is needed? How is DevOps different from traditional IT? Why is DevOps used?, DevOps Lifecycle, DevOps Work Flow, DevOps Vs Agile, DevOps Principles, Roles, Responsibilities, and Skills of a DevOps Engineer, Various DevOps Tools Amazon Web Services - Cloud Web Computing, Advantages, Types of Cloud Computing, Amazon Overview, Services Cloud Platform Features of Elastic Compute Cloud (EC2), AWS Services, AWS Management Console, AWS Command Line Interface, Region, availability Zone and edge location, Amazon EC2 root device volume, Creating and Launching EC2 windows and Linux Instances, Connecting to Linux and Windows Instances, Managing Security Group, Identity access Management (IAM), Create IAM users and Group, Assign policy to IAM users and Groups, Configure IAM roles to access AWS resources.		
UNIT-II		10 Hrs.
Version Control with Git - About Version Control, Local Version Control Systems, Centralized Version Control Systems, Distributed Version Control Systems, What is Git?, A Short History of Git, difference between Git and any other VCS, The Three States of Git - modified, staged, and committed, Why Git for your organization, Install and Using Git, Common commands in Git, Working with Remote Repositories Container Technology - Introduction to Containers? Benefits of Containerization, How Do Containers Work?, Virtual Machines vs Containers, brief intro to Container Terminology, Overview of Container Architecture, Installing Container engine tool, Creating Containerized Services, Provisioning Containerized Services.		
UNIT-III		10 Hrs.
Managing Containers - What is Container management, Benefits of Container management, Container management strategy, Pull Docker images from Docker hub, Managing the Life Cycle of Containers, Attaching Persistent Storage to Containers, Accessing containers, Managing Container Images - Accessing Registries (public and Private), Manipulating Container Images.		
UNIT-IV		10 Hrs.
Security and Monitoring: Security in Jenkins and VSTS, Monitoring Jenkins and Microsoft Azure, Monitoring Jenkins, Azure Web Apps troubleshooting and monitoring, Azure App Services- CPU and memory consumption, Azure App Services- Activity log, Azure Application Insights for application monitoring, Azure web application monitoring, Diagnostics logs.		
Reference Books *		

1. DevOps For Dummies 2nd IBM Limited Edition by Sanjeev Sharma and Bernie Coyne.
2. Deepak Gaikwad, Viral Thakkar, DevOps Tools: from practitioner's point of view, Wiley, 1st Edition, 2019.
3. Effective DevOps by Jennifer Davis & Katherine Daniels.

Course Outcomes**

After completion of the course student will be able to:

1. Illustrate the importance and principles of DevOps
2. Utilize Principles and techniques of DevOps to solve problems
3. Demonstrate the usage of Application Lifecycle Management tools
4. Apply security tools used in DevOps to cloud applications
5. Effective use of DevOps tools like Git, Docker etc in various aspects of DevOps delivery model.

23PCA314E	Android Programming Concepts	Credits:03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week :40Hrs		SEEMarks:50
UNIT-I		10Hrs.
Overview- BasicsofAndroid,MVC,GUI,Components,Events,LayoutManager,MultipleActivities,PassingDatabetw eenActivities, Transitions,Persistent.		
UNIT-II		10Hrs.
CreatingMenus,SQLite,ManagingDeviceOrientation,TouchesandSwipe,Graphics,Animations,Sounda ndGaming		
UNIT-III		10Hrs.
Fragments,UsingLibrariesandtheirAPIs,UsingGPSandLocationServices,UsingAnotherAppwithintheAp p		
UNIT-IV		10Hrs.
XMLandContantApps,AndroidWidget,In-AppAdvertising,SecurityandEncryption		
Reference Books*		
1.HerveFranceschi,“AndroidApplicationDevelopment“,JonesandBartlletLearning. 2.TrishCornezandRichardCornez,“AndroidProgrammingConcepts”,JonesandBartlletLearning.		
Course Outcomes**		
After completion of the course students will be able to: 1. Demonstrate the Understanding of fundamental of Android Programming. 2. Buildtheirabilitytodevelopsoftwarewithreasonablecomplexityonmobileplatform. 3. Discover the lifecycles of Activities, Applications, intents and fragments. 4. Design the Android apps by using Java Concepts. 5. Build and deploy mobile application.		

23PCA215E	Natural Language Processing	Credits: 03
Hrs/Week: L:T:P:S 3:0:0:0		CIEMarks:50
Total Hours/Week: 40 Hrs		SEEMarks:50
UNIT-I		10 Hrs.
Introduction to Natural Language Processing: Overview, What is Natural Language Processing, Origins of NLP, Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications, Some Successful Early NLP Systems, Information Retrieval		
Language Modelling: Introduction, Various Grammar-based Language Models, Statistical Language Model.		
Word Level Analysis: Chapter Overview, Introduction, Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of-Speech Tagging		
UNIT-II		10 Hrs.
Syntactic Analysis: Introduction, Context-Free Grammar, Constituency, Parsing, Probabilistic Parsing, Indian Languages.		
Semantic Analysis: Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation.		
Discourse Processing: Introduction, Cohesion, Reference Resolution , Discourse Coherence and Structure.		
UNIT-III		10 Hrs.
Natural Language Generation : Introduction, Architectures of NLG Systems, Generation Tasks and Representations, Applications of NLG		
Machine Translation: Introduction, Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Direct Machine Translation, Rule-based Machine Translation, Corpus-based Machine Translation, Semantic or Knowledge-based MT systems, Translation involving Indian Languages.		
Information Retrieval- Introduction, Design Features of Information Retrieval systems, Information Retrieval Models, Classical Information Retrieval Models, Non-classical models of IR, Alternative Models of IR , Evaluation of the IR System.		
UNIT-IV		10 Hrs.
Information Retrieval- Introduction, Natural Language Processing in IR, Relation Matching, Knowledge-based Approaches, Conceptual Graphs in IR, Cross-lingual Information Retrieval.		
Other Applications: Introduction, Information Extraction, Automatic Text Summarization, Question-Answering System.		
Lexical Resources: Introduction, WordNet, FrameNet, Stemmers, Part-of-Speech Tagger, Research Corpora, Journals and Conferences in the Area.		
Text Books *		
1. Tanveer Siddiqui, U.S.Tiwarly Natural Language Processing and Information Retrieval. 2. DanielJurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2009.		

3. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer Verlag London Limited 2007.

Course Outcomes**

After completion of the course student will be able to:

1. Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.
2. Analyze the syntax, and semantic using computational methods.
3. Understand the concepts Text mining.
4. Illustrate information retrieval techniques.
5. Analyse and apply knowledge of NLP in designing real time applications and research.