Program Name: Master of Computer Applications
Discipline : Computer Applications
(For those who join in June 2022 and after)

1) **Course Objectives :**

   MCA is a course exclusively designed to meet the IT requirements of IT Trained Students for various organizations. The well balanced course significantly emphasizes on planning, designing and building of complex commercial application software and system software. The course also places equal importance on the functional knowledge in various areas. A two years full-time MCA course is not just a postgraduate course; it is also a complete professional grooming for students for a successful career in the IT Industry.

2) **Eligibility for admission :**

   A pass in a recognized Bachelor's degree of minimum 3 years duration in **BCA, Bachelor Degree in Computer Science Engineering or equivalent degree or passed B.Sc / B.Com / B.A with Mathematics at 10 + 2 level or at Graduation level** and obtained atleast 50% marks(45% marks in case of candidates belonging to reserved category) in the qualifying degree examinations.

3) **Duration of the Course : 2 years**

Course Scheme:

Semester	Part	Subject	Hrs	Cr	Int+Ext= Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject code	Revised/ New/ No Change/ Interchanged. (If revised % of change)
I	Core 1	Digital Principles and Computer Organization	4	4	40+60=100				✔	✔				✔			**P22CAC11**/ P20CAC11	No Change
	Core 2	Java Programming	4	4	40+60=100				✔	✔						✔	**P22CAC12**	5% Revised
	Core 3	Open Source Technology	4	4	40+60=100				✔	✔						✔	**P22CAC13**/ P20CAC13	No Change
	Core 4	Software Engineering	4	4	40+60=100				✔	✔				✔			**P22CAC14**/ P20CAC14	Hours and Credit changed
	Elective I	Operating System / Computer Graphics / Distributed Operating Systems	5	5	40+60=100				✔	✔				✔			**P22CAE11**/ **P22CAE12**/ **P22CAE13** P20CAE12/ P20CAE13	40% Revised No Change No Change
	Core 5 – Lab	Lab: Java Programming	5	3	40+60=100				✔	✔						✔	**P22CAP11**/ P20CAP11	No Change
	Core 6 – Lab	Lab: Open Source Programming	4	2	40+60=100	✔			✔	✔						✔	**P22CAP12**	Hours and Credit changed 10% Revised
II	Core 7	Python Programming	4	4	40+60=100				✔	✔						✔	**P22CAC21**	5% Revised
	Core 8	Relational Database Management System	4	4	40+60=100				✔	✔				✔			**P22CAC22**	5% Revised
	Core 9	Data Communications and Networks	4	4	40+60=100				✔	✔				✔			**P22CAC23**/ P20CAC23	Hours and Credit changed
	Elective II	Mobile Computing/ Data Mining/ Cloud Computing	5	5	40+60=100	✔	✔		✔	✔				✔		✔	**P22CAE21**/ **P22CAE22**/ **P22CAE23** P20CAE21/ P20CAE22	No Change No Change 20% Revised
	NME	Internet and Web Designing	4	4	40+60=100				✔	✔						✔	**P22CAN21**	10% Revised
	Core 10 – Lab	Lab: Python Programming	4	2	40+60=100				✔	✔						✔	**P22CAP21**	Hours and Credit changed
	Core 11 – Lab	Lab: Relational Database Management System	5	3	40+60=100				✔	✔						✔	**P22CAP22**	20% Revised

SEMESTER - I

Course Title: Digital Principles And Computer Organization	**Total Hours: 60 Hours**
Course Code: P22CAC11/ P20CAC11	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	To obtain basic idea about digital logic design
CO2	To obtain knowledge arithmetic and combinational circuits.
CO3	To understand the basics of a computer
CO4	To understand the architecture of computer.
CO5	To obtain in-depth knowledge of micro programming.

Unit I **12 Hours**

Binary Systems - Digital Computers and Digital Systems; Binary Numbers; Number Base conversion; Octal and Hexadecimal numbers; Binary Codes.

Boolean Algebra and Logic Gates - Basic definitions; Axiomatic definition of Boolean Algebra; Basic theorems and properties of Boolean Algebra; Boolean functions; Canonical and standard forms; Other logic operations; Digital logic gates; IC digital logic families.

Unit II **12 Hours**

Simplification of Boolean Function - The map method;Two and Three variable maps;Four variable maps; Five and Six variable maps; Don't-care conditions.

Combinational logic - Introduction; Design procedure; Adders;Subtractors.

Combinational logic with MSI and LSI - Decoders; Multiplexers.

Sequential Logic - Introduction; Flip-Flops; Triggering of Flip-Flop.

Unit III **12 Hours**

Basic structure of Computers - Computer types; Functional units; Basic operational concepts; Bus structures; Software; Historical Perspective.

Machine instructions and programs - Memory location and addresses; Memory operations; Instructions and Instruction Sequencing; Addressing modes; Assembly language; Basic Input / Output Operations.

Unit IV **12 Hours**

Input / output organization - Accessing I / O devices; Interrupts; Direct Memory Access (DMA); Buses; Interface Circuits.

The memory system - Read Only Memories; Cache memories.

Unit V **12 Hours**

Basic Processing Unit - Some fundamental concepts; Execution of a complete instruction; Multiple-Bus organisation; Hardwired control; Micro Programmed Control.

Pipelining - Basic concepts;Data Hazards; Instruction Hazards.

Text Books

1) M.Morris Mano, "Digital Logic and Computer Design", Pearson Prentice Hall, Thirteenth Impression, 2011.

Unit I	Chapter 1 (1.1 to 1.4, 1.6) Chapter 2 (2.1 to 2.8)
Unit II	Chapter 3 (3.1 to 3.4, 3.8) Chapter4 (4.1 to 4.4) Chapter5 (5.5, 5.6) Chapter6 (6.1 to 6.3)

2) Carl Hamacher, ZvonkoVranesic, Safwatzaky, "Computer Organization", Tata McGraw Hill Education Private Limited, Fifth Edition, 2012.

Unit III	Chapter1(1.1 to 1.5, 1.8) Chapter2(2.2 to 2.7)
Unit IV	Chapter4(4.1, 4.2, 4.4 to 4.6) Chapter5 (5.3, 5.5)
Unit V	Chapter7(7.1 to 7.5) Chapter8(8.1 to 8.3)

Reference Books

1) Donald P.Leach, Albert Paul Malvino, Digital Principles and Applications, TMH 2001.
2) S.Salivaganan, S.Arivalagan, Digital Circuits and Design, Vikas Publishing House Pvt Ltd, Third Edition – 2007
3) M.Morris Mano, Computer System Architecture,Pearson Prentice Hall, Third Edition, 2006.

e – Resources

1. https://www.youtube.com/watch?v=3zvINQUdUns&t=124s
2. https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.htm
3. https://www.javatpoint.com/digital-electronics
4. https://docs.google.com/file/d/0B8-drkZsESDnN2NmYTQxYjQtYTMwZi00N2IzLTkxNjgtZjI1NTZiN2FjNDli/edit?resourcekey=0-Yk8bAsCt9I5epBNFTG8KMQ
5. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
6. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
7. https://nptel.ac.in/courses/106/106/106106092/

Course Title : Java Programming	**Total Hours :60 Hours**
Course Code : P22CAC12	**Total Credits : 4**

Course Outcomes

COs	CO Statement
CO1	Demonstrate the principles of object oriented programming concepts and solve simple problems using the fundamental syntax and semantics of the java programming language
CO2	Understand the behavior of primitive data types, operators and decision & iteration control structures.
CO3	Demonstrate the ability to use class and its types, constructor, overloading, overriding and arrays in a Java program.
CO4	Understand the concept of package, interface, multithreading, exception handling.

CO5	Acquire the knowledge about applet class and creating the applet animation programs.

Unit I **12 Hours**

An Overview of Java - Object Oriented Programming; A First Simple Program, A Second Short program; Two Control statements, Using Blocks of code, Lexical issues, The Java class libraries.

Data types, Variables and Arrays -Java is strongly typed language,– The Primitive types, Integers, Floating point types, Characters, Booleans, A closer look at Literals, Variables,Type conversion and Casting, Automatic type promotion in expressions, Arrays.

Unit II **12 Hours**

Operators -Arithmetic operators, The Bitwise operators, Relational Operators, Boolean logical operators, The Assignment operator, The ? operator, Operator precedence, Using parentheses.
Control Statements -Java's selection statements, Iteration statements, Jump statements.
Introducing Classes -Class fundamentals, Declaring Objects, Assigning Object reference variables, Introducing methods, Constructors, The this keyword, Garbage collection, The finalize( ) method.

A closer look at methods and classes -Overloading methods, Using object as parameters, A closer look at argument passing, Returning objects, Recursion, Introducing access control, Understanding static, Introducing final, Arrays Revisited; Introducing nested and inner classes, Exploring the String classes; Using command line arguments.

Unit III **12 Hours**

Inheritance -Inheritance basics, Using super, Creating multilevel hierarchy, When constructors are executed, Method overriding, Dynamic method dispatch, Using abstract classes, Using final with inheritance, The Object class.
Packages and Interfaces –Packages, Access Protection, Importing packages, Interfaces.

Unit IV **12 Hours**

Exception Handling -Exception handling fundamentals, Exception types, Uncaught exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's Built-in Exceptions, Creating your own Exception subclasses, Chained Exceptions, Tree Recently added Exceptions features; Using Exceptions.**String Handling** -The String constructors, String length, Special String operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion using valueOf( ), Changing the case of characters within a String, Joining strings; Additional string methods; String Buffer.

Unit V **12 Hours**

Multithreaded programming - The Java Thread model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive( ) and join( ), Thread priorities, Synchronization, Inter thread communication, Suspending, Resuming and Stopping Threads, Obtaining A Thread's State; Using Multithreading.
The Applet Class–Two types of Applets;Applet basics, Applet Architecture, An Applet skeleton, Simple Applet Display methods, Requesting Repainting, Using the status window, The HTML APPLET tag, Passing parameters to Applets, getDocumentBase( ) and getCodeBase( ), AppletContext and showDocument( ), The AudioClip Interface, The AppletStub Interface, Outputting to the console.

Text Book

Herbert Schildt, "The Complete Reference Java2"**,** Tata McGraw Hill edition, Ninth edition, 2015.

Unit I	Chapter2 (Pages 17 to 34) Chapter3 (Pages 35 to 58)
Unit II	Chapter4 (Pages 61 to 79) Chapter5 (Pages 81 to 108) Chapter6 (Pages 109 to 126) Chapter7 (Pages 129 to 154)
Unit III	Chapter8 (Pages 161 to 186) Chapter9 (Pages 187 to 207)
Unit IV	Chapter10 (Pages 213 to 232) Chapter16 (Pages 413 to 438)
Unit V	Chapter 11 (Pages 233 to 261) Chapter23 (Pages 747 to 767)

Reference Books

1. Steven Holzner et al, "Java 2 Programming Black book", Dreamtech press, 2008.
2. Rajkumar Buyya, S.Thamarai Selvi, Xingchen Chu, "Object Oriented Programming With Java", Tata McGraw Hill, 2009.
3. Dr. G.T. Thampi, "Object Oriented Programming in Java", DreamTech Press, 2009.

e -Resources

1. https://www.w3schools.com/java/
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.geeksforgeeks.org/types-references-java/
4. https://beginnersbook.com/java-tutorial-for-beginners-with-examples/
5. https://inst.eecs.berkeley.edu/~cs61b/fa14/book1/java.pdf
6. http://www.sietk.org/downloads/javabook.pdf

Course Title: Open Source Technology	**Total Hours: 60 Hours**
Course Code: P22CAC13/ P20CAC13	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	Learn the basic concepts in PHP and gain knowledge of dynamic website.
CO2	Learn arrays, strings and date functions in PHP.
CO3	Learn different types of functions and its uses in PHP
CO4	Learn the basic design of database, table creation and modifications in MySQL
CO5	Learn to build Dynamic web site using PHP and Database connectivity.

Unit I **12 Hours**

PHP Crash Course- Before you begin; Creating a Sample Application; Embedded PHP inHTML; Adding Dynamic Content; Accessing form variables;Understanding identifiers;

Examining Variable types; Declaring and using Constants; Understanding Variable Scope; Using operators; Working out the form totals; Understanding precedence and Associativity– Using variable functions; Making Decisions with Conditionals; Repeating actions throughiteration; Breaking out of a Control Structure or Script; Employing Alternative ControlStructure Syntax.

Unit II **12 Hours**

Using Arrays - Array; Numerically indexed arrays; Arrays with different indices; Array operators; Multidimensional Arrays.

String Manipulation and Regular Expressions - Creating a sample application: Smart FormMail; Formatting Strings; Joining and Splitting Strings with String Functions; ComparingStrings.

Managing the Date and Time - Getting the date and Time from PHP; Converting betweenPHP and MySQL Date formats; Calculating Dates in PHP; Calculating Dates in MySQL; Using Microseconds.

Unit III **12 Hours**

Reusing Code and Writing Functions - The Advantages of Reusing code; Using require()and include(): Filename extensions and require(); Using require() for website templates;Using Functions in PHP; Defining your own functions; Examining Basic FunctionStructure; Using Parameters; Understanding Scope; Passing by reference versus Passingby value; Using the return Keyword; Implementing Recursion.

Unit IV **12 Hours**

Creating Your Web Database - Creating Databases and Users; Setting Up Users andPrivileges; Introducing MySQL's Privilege System; Setting up a user for the web; Usingthe Right Database; Creating Database Tables.

Working with Your MySQL Database–SQL; Inserting Data into the Database; Retrieving Data from Database; Updating Records in the database; Altering Tables after Creation;Deleting Records from the Database; Dropping Tables; Dropping the whole Database.

Unit V **12 Hours**

Accessing Your MySQL Database from the web with PHP: How web DatabaseArchitectures work – Querying a Database from the web.

Using Session Control in PHP: Session Control; Understanding Basic sessionFunctionality;Implementing simple sessions; Creating a session Example; ConfiguringSession Control; Implementing Authentication with session.

Interacting with the File System and the Server: Uploading files.

Text Book

1. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", Pearson Education, Fourth Edition(2010).

Unit I	Chapter1 (Page number 13 to 56)
Unit II	Chapter3 (Page number 81 to 88) Chapter4 (Page number 107 to 120) Chapter21 (Page number 469 to 480)
Unit III	Chapter5 (Page number 133 to 141, 143 to 156)
Unit IV	Chapter9 (Page number 222 to 229) Chapter10 (Page number 243 to 264)
Unit V	Chapter11 (Page number 267 to 276)

	Chapter23 (Page number 509 to 517) Chapter19 (Page number 431 to 438)

Reference Books

1. VikramVaswani, "A Beginner"s Guide PHP", Tata Mcgraw Hill Education Private Limited, 2009.
2. Larry Ullman, "PHP 6 and MySQL 5", Pearson Education, 2008.

e - Resources

1. https://www.w3schools.com/php/default.asp
2. https://www.php.net/
3. https://www.codecademy.com/catalog/language/php
4. https://www.tutorialspoint.com/php/index.htm
5. https://www.geeksforgeeks.org/php-tutorials/

Title : Software Engineering	**Total Hours: 60 Hours**
Course Code : P22CAC14/ P20CAC14	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	Understand and demonstrate basic knowledge in software engineering.
CO2	Understand various life cycle models of software engineering.
CO3	Be familiar with the concepts such as software project management techniques and requirements analysis and specification.
CO4	Learn Virtual Storage Organization and its Management Strategies.
CO5	Apply testing principles on software project and understand the maintenance concepts.

Unit I **12 Hours**

Introduction - Evolution-From an Art form to an Engineering Discipline; Software Development Projects; Emergence of Software Engineering; Computer System Engineering.

Software Life Cycle Models -Waterfall Model and its Extensions; Rapid Application Development (RAD); Agile Development Models; Spiral Model-A Comparison of DifferentLife Cycle Model

Unit II **12 Hours**

Software Project Management -Responsibilities of a Software Project Manager; Project Planning; Metrics for Project Size Estimation; Project Estimation Techniques; Empirical Estimation Techniques; COCOMO.

Requirements Analysis and Specification - Requirements Gathering and Analysis; Software Requirements Specification (SRS); Formal System Specification

Unit III **12 Hours**

Software Design - Overview of the Design Process; Cohesion and Coupling; Layered Arrangement of Modules.

Function-Oriented Software Design -Structured Analysis; Developing the DFD Model of a System; Structured Design.

Unit IV **12 Hours**

Object Modelling Using UML -UML Diagrams; Class Diagrams; Interaction Diagrams; Activity Diagrams; State Chart Diagrams.

Software Reuse -Basic Issues in any Reuse Program; A Reuse Approach; Reuse at Organization Level.

Unit V **12 Hours**

Coding and Testing –Coding; Code Review; Software Documentation; Testing; Unit Testing; Black-Box Testing; White-Box Testing; Debugging; Integration Testing; System Testing.

Software Maintenance -Characteristics of Software Maintenance; Software Reverse Engineering; Software Maintenance Process Models; Estimation of Maintenance Cost.

Text Book

Rajib Mall, "Fundamentals of Software Engineering", PHI Publication, Fourth Edition, 2016.

Unit I	Chapter 1 (1.1, 1.2, 1.4, 1.6) Chapter 2 (2.2 to 2.6)
Unit II	Chapter 3 (3.2 to 3.7) Chapter 4 (4.1 to 4.3)
Unit III	Chapter 5 (5.1, 5.3, 5.4) Chapter 6 (6.2, 6.3, 6.4)
Unit IV	Chapter 7 (7.3, 7.5, 7.6, 7.7, 7.8) Chapter 14 (14.3, 14.4, 14.5)
Unit V	Chapter 10 (10.1 to 10.8, 10.10, 10.12) Chapter 13 (13.1 to 13.4)

Reference Books

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill, Seventh Edition, 2010.
2. Sommerville, "Software Engineering", Addison Wesley-Longman, Sixth Edition, 2004.

e – Resources

1. https://www.vssut.ac.in/lecture_notes/lecture1423904473.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf
3. https://iare.ac.in/sites/default/files/lecture_notes/IARE_SE_Lecture%20Notes.pdf
4. https://www.slideshare.net/sivaayyakutti5/software-engineering-lecture-notes
5. https://www.youtube.com/watch?v=Ln_LP7c23WM&list=PLbRMhDVUMngf8oZR3DpKMvYhZKga90JVt

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ELECTIVE - I

Title : Operating System	**Total Hours: 75 Hours**
Course Code : P22CAE11	**Total Credits: 5**

Course Outcomes

COs	CO Statement
CO1	Get an introduction about Operating System and Process Management concepts.
CO2	Learn about Asynchronous Concurrent Processes and Concurrent Programming.
CO3	Learn about Deadlock situations and precautions, Real Storage Management in System.
CO4	Learn Virtual Storage Organization and its Management Strategies.
CO5	Learn about Processor Scheduling algorithms and Disk Scheduling algorithms in detail.

Unit I **15 Hours**

Operating Systems - Introduction; What is an Operating System – Different Views on an operating systems; Computer Organization – Computer System Operation, Storage Structure, I/O Structure;Evolution of Operating Systems – Serial Processing, Batch Processing, Multiprogramming; Types of Operating Systems – Batch Systems, Multiprogramming Systems, Real-time Systems, Distributed Systems; Operating System Services; Operating System Operations – Dual Mode, Timer; Concepts of Operating Systems – Process, Deadlock, Memory Management, Files, I/O Management; User Operating-System Interface – Command-line Interface, Graphical User Interface; System Calls – Types of System Calls; System Programs; System Structure – Simple Structure, Layered Approach, Microkernels, Modules; Virtual Machines.

Process Management - Introduction ; Basic Concepts – The Process, Process States, Process Control Block; Process Scheduling; Operations on Processes – Creation, Termination; Overview of Interprocess Communication – Shared Memory Systems, Message Passing Systems.

Unit II **15 Hours**

Scheduling - Introduction; Scheduling Concepts; Scheduling Criteria; Scheduling Algorithms – FCFS Scheduling, SJF Scheduling, SRTN Scheduling, Priority Scheduling, HRN Scheduling, RR Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling; Multiple Processor Scheduling – Implementation of Ready Queue, Scheduling Approaches, Load Balancing, Process Affinity; Real-time Scheduling – Hard Systems, Soft Systems; Algorithm Evaluation.

Interprocess Communication - Introduction; Race Conditions; Critical Section; Hardware Solution; Semaphores; Classical IPC Problems – Producer Consumer Problem, Readers-Writers Problem, Dining-Philosophers Problem; Event Counters; Monitors; Message Passing.

Unit III **15 Hours**

Deadlock - Introduction; Deadlock Problem; Deadlock Characterization – Deadlock Conditions, Resource Allocation Graph; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance – Banker's Algorithm for a Single Resource, Banker's Algorithm for Multiple Resource; Detection of Deadlock – Single Instance of Each Resource Type, Multiple Instances

of a Resource Type; Deadlock Recovery – Terminating the Processes, Preempting the Resources.

Memory Management - Introduction; Background; Memory Management Strategies; Contiguous Memory Allocation – Single Partition, Multiple Partitions; Noncontiguous Memory Allocation – Paging, Segmentation; Swapping.

Unit IV **15 Hours**

Virtual Memory - Introduction; Concept; Demand Paging – Performance of Demand Paging; Process Creation – Copy-on-Write; Page Replacement – (FIFO, Optimal, LRU, Second Chance, Counting-Based Algorithm; Allocation of Frames – Allocation Algorithms, Global versus Local Allocation; Thrashing – Working Set Model, Page Fault Frequency.

Input Output Management - Introduction; Principles of I/O Hardware – I/O Devices, Device Controllers, Direct Memory Access; Principles of I/O Software – Goals of I/O Software, Programmed I/O, Interrupt-driven I/O; I/O Software Layers – Interrupt Handlers, Device Drivers, Device Independent I/O Software, User-level I/O Software.

Disks - Introduction; Magnetic Disk – Organization, Accessing Data; Disk Arm Scheduling Algorithms; Disk Formatting; Error Handling; Swap Space Management; RAID – Improving Performance and Reliability, RAID Levels.

Unit V **15 Hours**

File Systems - Introduction; Files – File Naming, File Attributes, File Operations, File Types, File Structure, File Access, Memory-Mapped Files;Directories – Single-Level, Two-Level, Hierarchical, Directory Operations; File-System Mounting.

File System Implementation - Introduction; File System Structure – Layout; Implementing Files – Contiguous Allocation, Linked List Allocation, Linked List Allocation using Index, I-nodes; Implementing Directories – In MS-DOS. In UNIX, Efficiency and Performance; Shared Files; Disk Space Management – Managing the Free Space; File System Performance; File System Reliability – Backup and Restore, Consistency Checking; Log-Structured File System.

Case Study: Windows 2000 - Introduction; Structure of Windows 2000 – Hardware Allocation Layer, Kernel, Executive; Process and Thread Management in Windows – Interprocess Communication, Scheduling; Memory Management – Paging, Handling Page Faults; File System – NTFS Physical Structure, Metadata Files, Directory Implementation; I/O Management in Windows 2000.

Text Book

Rohit Khurana, "Operating System", Vikas Publishing House Pvt. Ltd, First Edition, 2013.

Unit I	Chapter 1 (1.1 – 1.13) Chapter 2 (2.1 – 2.5)
Unit II	Chapter 4 (4.1 – 4.7) Chapter 5 (5.1 - 5.9)
Unit III	Chapter 6 (6.1 – 6.8) Chapter 7 (7.1 – 7.6)
Unit IV	Chapter 8 (8.1 – 8.7) Chapter 9 (9.1 – 9.4) Chapter 10 (10.1 – 10.7)
Unit V	Chapter 11 (11.1 – 11.4) Chapter 12 (12.1 – 12.9) Chapter 16 (16.1 – 16.6)

Reference Books

1. Silberschatz, Galvin, Gagne, "Operating System Concepts", Wiley India Pvt Ltd., 2012.
2. William Stallings, "Operating Systems ", Pearson Education Inc., 2015.

e – Resources

1. https://www.vssut.ac.in/lecture_notes/lecture1423726024.pdf
2. http://bcaraipur.blogspot.com/2014/05/operating-system-for-bca-full-refrence.html
3. http://www.svecw.edu.in/Docs%5CCSEOSLNotes2013.pdf
4. https://mrcet.com/downloads/digital_notes/CSE/II%20Year/OPERATING%20SYSTEMS%20%20NOTES%20R18.pdf
5. https://www.geeksforgeeks.org/last-minute-notes-operating-systems/

Course Title: Computer Graphics	**Total Hours : 75 Hours**
Course Code : P22CAE12/ P20CAE12	**Total Credits : 5**

Course Outcomes

COs	CO Statement
CO1	Understand the basic Graphics Applications and Graphic Devices.
CO2	Familiarize the algorithms for Graphical display.
CO3	Illustrate the 2D transformations.
CO4	Know the windowing and clipping algorithms.
CO5	Understand the techniques of 3D transformations and Animation.

Unit I **15 Hours**

Introduction to Computer Graphics – Introduction; Non interactive/Interactive Graphics; Uses of Computer Graphics; Classification of Applications; Programming Language, Graphics and Operating Software; Graphic Systems Configuration.

GraphicsSystems – Introduction; Cathode Ray Tube (CRT) Basics; Refresh Display; Direct View Storage Tube(DVST); Raster Display; Input Devices; Output Devices; Computer Graphics Software; Integration of Graphics Standard; Interactive Graphics Techniques; Graphical User Interface(GUI).

Unit II **15 Hours**

Output Primitives – Introduction; Representing Image; Straight Line; Line Drawing Algorithms; Differential Digital Analyser(DDA) Algorithm; Bresenham's Line Algorithm; Circle-Generating Algorithm; Bresenham's Circle Algorithm; Midpoint Circle Algorithm; Ellipse-Generating Algorithm; Midpoint Ellipse Algorithm; Polygon Filling Algorithm; Character or Text Generation; Aliasing and Antialising.

Unit III **15 Hours**

Two-Dimensional Transformations – Introduction; Representation of Points; Matrix Algebra and Transformation; Transformation of Points; Transformation of Straight Line; Midpoint Transformation; Transformation of Parallel Lines; Transformation of Intersecting Lines; Rotation,Reflection and Scaling of Straight Line or Polygons; Combined Transformation; Translation and Homogeneous Coordinates; Rotation about an Arbitrary Point; Reflection about an Arbitrary Line.

Unit IV **15 Hours**

Windowing and Clipping – Introduction; Viewing Transformation; Clipping; Point Clipping; Line Clipping; Cohen-Sutherland Line Clipping; Parametric Liang- Barsky 2D Line Clipping Algorithm; Polygon Clipping; Sutherland- Hodgman Algorithm; Curve Clipping; Text Clipping.

Unit V **15 Hours**

3D Concepts and Techniques – Introduction; 3D Transformation-Projection; Orthographic Projection; Isometric Projection; Oblique Projection; Perspective Projection.

Animation – Introduction; Devices for Producing Animation; Computer-Assisted Animation; Video Formats; Frame-by-Frame Animation Techniques; Real-Time Animation Techniques; Animation Software.

Text Book

1. Amarendra N Sinha and Arun D Udai, "Computer Graphics", Tata McGraw Hill Education Private Linited, New Delhi, Fifth Reprint 2011.

Unit I	Chapter1,2
Unit II	Chapter3
Unit III	Chapter4
Unit IV	Chapter5
Unit V	Chapter7 (7.1 - 7.2,7.7 - 7.11) , 15

Reference Books

1. Donald Hearn, M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2nd Edition, Eighth Impression,2009.
2. V. K.Pachghare, "Computer Graphics", Laxmi Publications(P) LTD, Second Edition,New Delhi,2007.

e- Resources

1. https://www.javatpoint.com/computer-graphics-tutorial
2. https://www.geeksforgeeks.org/introduction-to-computer-graphics/
3. https://www.edx.org/course/computer-graphics-2
4. https://www.britannica.com/topic/computer-graphics
5. https://nptel.ac.in/courses/106/106/106106090/
6. https://nptel.ac.in/courses/106/103/106103224/
7. https://nptel.ac.in/courses/106/102/106102065/
8. https://onlinecourses.nptel.ac.in/noc21_cs97/preview

Course Title : Distributed Operating Systems	**Total Hours : 75 Hours**
Course Code : P22CAE13/ P20CAE13	**Total Credits : 5**

Course Outcomes

COs	CO Statement
CO1	Provide the fundamental concepts of distributed operating system.
CO2	Familiarize message passing and synchronization techniques.
CO3	Analyze RPC models working and distributed shared memory.
CO4	Know the synchronization and resource management approaches.

CO5	Understand the process management and distributed file processing models.

Unit I **15 Hours**

Fundamentals - Distributed Computing System; Evolution of Distributed Computing Systems; Distributed Computing System Models; Distributed Computing Systems Gaining Popularity; Distributed Operating System; Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE).

Unit II **15 Hours**

MessagePassing – Introduction; Desirable Features of a Good Message–Passing System; Issues in IPC by Message Passing; Synchronization; Buffering; Multidatagram Messages; Encoding and Decoding of Message Data; Process Addressing; Failure Handling; Group Communication.

Unit III **15 Hours**

Remote Procedure Calls – Introduction; The RPC Model; Transparency of RPC; Implementing RPC Mechanism; Stub Generation; RPC Messages; Marshalling Arguments and Results; Server Management.

Distributed Shared Memory – Introduction; General Architecture of DSM Systems; Design and Implementation Issues of DSM; Granularity; Structure of Shared Memory Space.

Unit IV **15 Hours**

Synchronization - Mutual Exclusion; Deadlock; Election Algorithms.

Resource Management - Load-Balancing Approach; Load-Sharing Approach.

Unit V **15 Hours**

Process Management – Introduction; Process Migration; Threads.

Distributed File Systems – Introduction; Desirable Features of a Good Distributed File System; File Models; File-Accessing Models; File-Sharing Semantics; File-Caching Schemes; File Replication; Fault Tolerance.

Text Book

1. Pradeep K.Sinha, "Distributed Operating Systems", Prentice-Hall of India PrivateLimited, 2008.

Unit I	Chapter1 (1.1 – 1.7)
Unit II	Chapter3(3.1 – 3.10)
Unit III	Chapter 4(4.1 – 4.8), Chapter 5(5.1 – 5.5)
Unit IV	Chapter6(6.4 – 6.6), Chapter7(7.4, 7.5)
Unit V	Chapter 8(8.1 – 8.3), Chapter 9(9.1 – 9.8)

Reference Book

1. Andrew S.Tannenbaum, "Distributed Operating Systems", Pearson Education, 2001.

e - Resources

1. https://www.javatpoint.com/distributed-operating-system
2. https://teachcomputerscience.com/distributed-operating-system/

3. https://ecomputernotes.com/fundamental/disk-operating-system/distributed-operating-system
4. https://www.cs.swarthmore.edu/~newhall/readings/p419-tanenbaum.pdf
5. https://www.youtube.com/watch?v=NYBKXzl5bWU
6. https://www.youtube.com/watch?v=Cz4k2aH5CLs

Course Title : LAB: Java Programming	**Total Hours : 75 Hours**
Course Code : P22CAP11/ P20CAP11	**Total Credits : 3**

Course Outcomes

COs	CO Statement
CO1	Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity
CO2	Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
CO3	Demonstrate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
CO4	Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

List of Programme:

1. Sorting n numbers using command-line arguments.
2. Implement programs using selection statements.
3. Implement program using Iteration statements.
4. To perform Matrix Operations.
5. Program to implement method overloading.
6. Program to implement method overriding
7. Program to use the Keyword 'Super'.
8. Program for pre-defined Exception.
9. Program for a User-Defined Exception.
10. Program to implement multilevel inheritance.
11. Program to use interface.
12. Program to implement user defined packages.
13. Program to implement the concept of Multithreading.
14. Program for String Manipulation
15. Program for Applet Animation

Course Title: LAB: Open Source Programming	**Total Hours: 60 Hours**
Course Code: P22CAP12	**Total Credits: 2**

Course Outcomes

COs	CO Statement
CO1	To implement simple PHP Scripts
CO2	Toimplement functions in PHP
CO3	To perform MySQL Queries through PHP
CO4	To perform advanced PHP techniques such as File upload, sessions, and authentications.

List of Programmes:

1. Write a PHP Program to Implement Operators and Decision Making Statements.
2. Write a PHP Program to Implement Iterations.
3. Write a PHP Program to Implement Arrays.
4. Write a PHP Program to Implement Functions.
5. Write a PHP Program to Perform String Operations.
6. Write a PHP Program to Implement 'include' and 'require' functions.
7. Write a PHP program to Copy from one file to another file
8. Perform the Following Operations in MySQL.
   (i) Create Database
   (ii) Drop Database
   (iii)Select Database
9. Perform the Following Operations in MySQL.
   (i) Create Tables
   (ii) Drop Tables
   (iii)Insert Query.
10. Perform the Following Operations in MySQL.
   (i) Select Query
   (ii) 'Where' Clause
   (iii)Update Query
11. Perform the Following Operations in MySQL.
   (i) Delete Query
   (ii) 'Like' Clause
   (iii)Sorting Results
12. Write a PHP Program to Connect MySQL Database to Display the Details of Particular Student.
13. Develop a Student Information System in PHP to allow View, Delete, Insert, Updatethe details of students.
14. Create a Login Module to Implement Sessions in PHP.
15. Create your own dynamic website using PHP and MySQL.
16. Write a PHP program to implement File operations
17. Write a PHP Program to Upload and Download Images from MySQL Database.
18. Create dynamic e-commerce website using AJAX
19. Create an Library management system using HTML,CSS,PHP,AJAX.

SEMESTER – II

Title : Python Programming	**Total Hours: 60 Hours**
Course Code: P22CAC21	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	Understand the basic concepts such as data types, Operators, Control Statements in Python
CO2	Understand Arrays, Strings, and Functions in Python
CO3	Understand Classes and Objects, Inheritance
CO4	Understand Exceptions, Date and Time functions in Python
CO5	Work on Database Connectivity in Python and Data Science using in Python

Unit I **12 Hours**

Introduction to Python- Python; Features of Python; Execution of a Python Program; Viewing the Byte Code; Flavors of Python; Python Virtual Machine (PVM); Frozen Binaries; Memory Management in Python; Garbage Collection in Python

Datatypes in Python - How Python Sees Variables; Datatypes in Python; Built-in datatypes; bool datatype; Sequences in Python; Sets; Literals in Python; Determining the datatype of a variable; What about characters; User-defined Datatypes; Constants in Python; Identifiers and Reserved words; Naming Conventions in Pythons

Operators in Python - Operator; Arithmetic Operators; Using Python Interpreter as Calculator; Assignment Operators; Unary Minus Operator; Relational Operators; Logical Operators; Boolean Operators; Bitwise Operators; Membership Operators; Identity Operators; Operator Precedence and Associativity.

Unit II **12 Hours**

Input and Output- Output statements; Input statements; Command Line Arguments

Control Statements - Control Statement;The if Statement;A word on Indentation;The if..else Statement;The if..elif..else Statement;The while Loop;The for Loop;Infinite Loops;Nested Loops;The else suite;The break statement; The Continue Statement

Arrays in Python- Array;Advantages of Arrays;Creating an array;Importing the Array Module;Indexing and Slicing on Arrays;Processing the Arrays;Types of Arrays;Working with Arrays using numpy;Creating Arrays using array();Creating Arrays using linspace;Creating Arrays using logspace;Creating Arrays using arange() function;Creating Arrays using zeros() and ones() Functions;Mathematical Operations on Arrays;Comparing Arrays;Aliasing the Arrays; Viewing and Copying Arrays.

Unit III **12 Hours**

Strings and Characters- Creating Strings; Length of a String; Indexing in Strings; Slicing the Strings; Repeating the Strings; Concatenation of Strings; Checking Membership; Comparing Strings; Removing Spaces from a String; Finding Sub Strings; Counting Substrings in a String; Strings are Immutable

Functions - Difference between a Function and a Method;Defining a Function;Calling a Function;Returning Results from a Function;Returning Multiple Values from a Function;Functions are First Class Objects;Pass by Object Reference;Formal and Actual Arguments;Positional Arguments;Keyword Arguments;Default Arguments;Variable Length

Arguments;Local and Global Variables;The Global Keyword;Passing a Group of Elements to a Function; Recursive Functions

Classes and Objects - Creating a Class;The Self Variable;Constructor;Types of Variables;Namespaces;Types of Methods.

Unit IV **12 Hours**

Inheritance and Polymorphism- Constructors in Inheritance;Overriding Super Class Constructors and Methods;The Super() Method;Types of Inheritance; Method Resolution Order

Exceptions - Errors in a Python Program;Exceptions;Exception Handling;Types of Exceptions;The Except Block;The assert Statement;UserDefined Exceptions; Logging the Exceptions

Date and Time - The epoch;Date and Time Now;Combining Date and Time;Formatting Dates and Times;Finding Durations using 'timedelta';Comparing Two Dates;Sorting Dates;Stopping Execution Temporarily;Knowing the Time taken by a Program; Working with Calendar Module.

Unit V **12 Hours**

Python's Database Connectivity - DBMS;Advantages of a DBMS over Files;Types of Databases used with Python;Installation of MySQL Database Software;Verifying the MySQL in the Windows Operating System;Installing MySQLdb Module;Verifying the MySQLdb Interface Installation;Working with MySQL Database; Using MySQL from Python;Retrieving All Rows from a Table;Inserting Rows into a Table;Deleting Rows from a Table;Updating Rows in a Table;Creating Database Tables through Python;Installation of Oracle 11g;Verifying Oracle Installation in Windows Operating System;Installing Oracle Database Driver;Verifying the Driver Installation;Working with Oracle Database;Using Oracle Database from Python;Stored Procedures.

Data Science Using Python - Data Frame;Data Visualization.

Text Book

1. Dr.R.Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018.

Unit I	Chapter 1 Page No. 1 - 15 Chapter3 Page No. 49 - 69 Chapter4 Page No. 71 - 88
Unit II	Chapter5 Page No. 95 – 115 Chapter6 Page No.117 – 138 Chapter7 Page No. 151 – 182
Unit III	Chapter8 Page No. 207 – 221 Chapter9 Page No. 237 – 264 Chapter13 Page No. 351 - 367
Unit IV	Chapter14 Page No. 373 – 390 Chapter16 Page No. 421 – 439 Chapter20 Page No. 515 – 534
Unit V	Chapter 24 Page No.649 – 691 Chapter25 Page No. 693 - 712

Reference Books

1. Wesley J.Chun, "Core python programming", Pearson Education, 2001.
2. Allen B. Downey, "Think Python", O'Reilly Media, 2nd Edition, 2016

e -Resources

1. https://www.w3schools.com/python/

2. https://docs.python.org/3/tutorial/
3. https://en.wikipedia.org/wiki/Python_(programming_language)
4. https://www.guru99.com/python-tutorials.html

Course Title : Relational Database Management System	**Total Hours :60 Hours**
Course Code : P22CAC22	**Total Credits : 4**

Course Outcomes

COs	CO Statement
CO1	Draw the ER diagram for enterprise applications
CO2	Analyze the consequence of algebra in designing relational model and create database using query languages with constraints and security
CO3	Normalize databases to reduce cost due to redundancy constraints
CO4	Assess different types of scheduling and recovery techniques for concurrent transactions
CO5	Validate the query evaluation plan and optimize to reduce memory complexity

Unit I **12 Hours**

Introduction - Purpose of Database Systems; View of Data; Database Languages;Relational Databases; Database Design; Data Storage Querying; Transaction Management; Database Architecture; Database Users and Administrators.

Database Design and the E-R Model–TheEntity Relationship Model;Constraints; Entity Relationship Diagrams; Extended E-R Features; Specialization; Generalization

Unit II **12 Hours**

Introduction to the Relational Model - Structure of Relational Databases; Keys; Schema Diagrams; Relational Query Languages.

Formal Relational Query Languages - The Relational Algebra; The Tuple Relational Calculus; The Domain Relational Calculus.

Unit III **12Hours**

Introduction to SQL – Overview of the SQL Query Language; SQL Data Definition; Basic Structure of SQL Queries; Additional Basic Operations; Set Operations; Null values; Aggregate Functions; Nested Subqueries.

Intermediate SQL -Join Expressions; Views; Transaction; Integrity Constraints; Authorization.

Advanced SQL - Functions and Procedures; Triggers.

Unit IV **12 Hours**

Relational Database Design - Atomic domains and First Normal Form; Decomposition using Functional Dependencies; Keys and Functional Dependencies; Boyce Codd Normal Form; Third Normal Form, Functional Dependency Theory; Decomposition using Multivalued Dependencies; Multivalued Dependencies; Fourth Normal Form.

Unit V **12 Hours**

Transactions - Transaction Concept; A Simple Transaction Model – Transaction Atomocity and Durability; Serializability.

Concurrency Control - Lock Based Protocols; Deadlock Handling, Time Stamp Based Protocols; Validation Based Protocols.
Recovery System– Failure Classification; Storage; Recovery and Atomicity;Recovery Algorithm.

Text Book
Abraham Silberschatz, Henry F Korth, S. Sudharshan, "Database System Concepts", McGraw Hill, 6th Edition – 2016

Unit I	Chapter 1 (1.2 – 1.9, 1.12) Chapter 7 (7.2, 7.3. 7.5, 7.8.1, 7.8.2)
Unit II	Chapter 2(2.1, 2.3 - 2.5), Chapter 6 (6.1 – 6.3)
Unit III	Chapter 3 (3.1 – 3.8), Chapter 4 (4.1 – 4.4, 4.6), Chapter 5 (5.2, 5.3)
Unit IV	Chapter 8(8.2, 8.3.1, 8.3.2, 8.3.4, 8.4, 8.6.1, 8.6.2)
Unit V	Chapter 14 (14.1, 14.2, 14.4, 14.6), Chapter 15 (15.1, 15.2, 15.4, 15.5), Chapter 16 (16.1 – 16.4)

Reference Books
1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education / Addison Wesley, Sixth Edition, 2014.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition, 2004.

e -Resources

1. https://tamimdba.wordpress.com/relational-database-management-system-material/
2. https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
3. https://www.computersciencejunction.in/2019/11/24/relational-database-management-system/
4. https://www.vhnsnc.edu.in/e-content.php
5. https://www.jbiet.edu.in/coursefiles/cse/HO/cse2/DBMSI-III.pdf

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Course Title: Data Communications And Networks	**Total Hours: 60 Hours**
Course Code: P22CAC23/ P20CAC23	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	Identify the role of each layer in computer networks and its protocols.
CO2	Encode the data for transmission in wired and wireless medium.
CO3	Develop scheme for error detection and correction.
CO4	Select flow control algorithm at link to link level.
CO5	Evaluate the performance of various routing algorithms and Analyse the flow control and congestion control algorithms for QoS at end to end level.

Unit I **12 Hours**

Introduction -Data Communications; Networks; Network Types; Internet History; Standards and Administration.

Network Models - TCP/IP Protocol Suite;The OSI Model.

Introduction to Physical Layer- Data and Signals; Digital Signals - Bit rate, Bit length; Transmission Impairment; Data rate limits - Noiseless Channel: Nyquist Bit rate, Noisy Channel: Shannon Capacity; Performance - Bandwidth, Throughput, Latency.

Unit II **12 Hours**

Digital Transmission - Digital to Digital Conversion - Line Coding, Block Coding; Analogto Digital Conversion; Transmission Modes.

Analog Transmission - Digital to Analog Conversion - Amplitude Shift Keying, FrequencyShift Keying, Phase Shift Keying; Analog to Analog Conversion.

Bandwidth Utilization - Multiplexing.

Transmission Media - Guided Media - Unguided Media: Wireless.

Unit III **12 Hours**

Switching – Introduction; Circuit switched Networks; Packet switching.

Introduction to Data Link Layer - Link Layer Addressing - Three types of Addresses; Address Resolution Protocol.

Error Detection and Correction – Introduction - Types of Errors; Block coding – ErrorDetection; Cyclic Codes - Cyclic Redundancy Check; Polynomials; Cyclic Code Encoderusing Polynomials; Checksum - Concept.

Data Link Control - DLC Services; Data Link Layer Protocols.

Unit IV **12 Hours**

Media Access Control - Random Access; Controlled Access; Channelization.

Connecting Devices and Virtual LANs - Connecting Devices.

Introduction to Network Layer - Network Layer Services; Packet switching; IPV4addresses.

Unicast Routing - Routing algorithms.

Unit V **12 Hours**

Introduction to Transport Layer – Introduction - Transport Layer Services; Transport LayerProtocols.

Standard Client Server Protocols - World Wide Web and HTTP; FTP; Electronic Mail;Telnet; Domain Name System - Namespace, DNS in Internet.

Text Book

Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill,Fifth Edition, Ninth Reprint 2016.

Unit I	Chapter 1 (1.1 to 1.5) Chapter2 (2.2, 2.3) Chapter3 (3.1, 3.3.1, 3.3.2, 3.4, 3.5.1, 3.5.2, 3.6.1, 3.6.2, 3.6.3)
Unit II	Chapter4 (4.1.1, 4.1.3, 4.2, 4.3) Chapter5 (5.1.2 to 5.1.4, 5.2) Chapter 6 (6.1) Chapter7 (7.2, 7.3)
Unit III	Chapter8(8.1 to 8.3) Chapter9(9.2.1, 9.2.2)

	Chapter10 (10.1.1, 10.2.1, 10.3.1-10.3.3, 10.4.1) Chapter11(11.1, 11.2)
Unit IV	Chapter12(12.1, 12.2, 12.3) Chapter17 (17.1) Chapter 18(18.1, 18.2, 18.4) Chapter20(20.2)
Unit V	Chapter23(23.1.1, 23.2) Chapter 26(26.1 to 26.4, 26.6.1, 26.6.2)

Reference Books

1.William Stallings, "Data and Computer Communication", Pearson Education, Sixth Edition, 2000.
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003.

e - Resources

1. http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf
2. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
3. https://www.javatpoint.com/computer-network-tutorial
4. https://www.guru99.com/data-communication-computer-network-tutorial.html
5. https://www.geeksforgeeks.org/computer-network-tutorials/

ELECTIVE - II

Course Title : Mobile Computing	**Total Hours : 75 Hours**
Course Code : P22CAE21/P20CAE21	**Total Credits : 5**

Course Outcomes

COs	CO Statement
CO1	Provide the basic concepts of mobile computing.
CO2	Understand the working principles of GSM and SMS.
CO3	Familiarize the techniques of GPRS and WAP.
CO4	Classify the techniques of Wireless LAN and designing applications for handheld devices.
CO5	Know the evolution of IMS and security issues of mobile computing.

Unit I **15 Hours**

Introduction - Mobility of Bits and Bytes; Wireless-The Beginning; Mobile Computing; Networks; Middleware and Gateways; Applications and Services (Contents); Standard Bodies.
Mobile Computing Architecture - Architecture for Mobile Computing; Three-tier Architecture.
Emerging Technologies – Bluetooth; Radio Frequency Identification (RFID); Wireless Broadband (WIMAX); Mobile IP; Internet Protocol Version 6 (IPv6).

Unit II **15 Hours**

Global System for Mobile Communications (GSM) - Global For Mobile Communications; GSM Architecture; GSM Entities; Call Routing in GSM.
Short message Service (SMS) - Mobile Computing Over SMS; Short Message Service (SMS); Value Added Service Through SMS.

Unit III **15 Hours**

General Packet Radio Service (GPRS) – Introduction; GPRS and Packet Data Network; GPRS Network Architecture; GPRS Network Operations; Data Services in GPRS; Applications for GPRS; Limitations for GPRS.

Wireless Application Protocol (WAP) – Introduction; WAP; MMS; GPRS Application.

CDMA AND 3G - Third Generation Networks; Applications on 3G.

Unit IV **15 Hours**

Wireless LAN - Wireless LAN Advantages; IEEE 802.11 Standards; Wireless LAN Architecture.

Client Programming – Introduction; Moving Beyond the Desktop; A Peek Under The Hood: Hardware Overview; Mobile Phones; Features of Mobile Phones; PDA; Design Constraints In Applications For Handle Held Devices.

Unit V **15 Hours**

IP Multimedia Subsystem – Introduction; IMS and its Evolution; Benefits from IMS; Architecture of IMS Networks; Protocols used in IMS.

Security Issues in Mobile Computing – Introduction; Information Security; Security Techniques and Algorithms; Security Protocols; Public Key Infrastructure.

Text Book

1. Asoke.K.Talukder, Hasan Ahmed, Roopa.R.Yavagal, "Mobile Computing", McGraw Hill Education India Pvt Ltd, Second Edition, 2018.

Unit I	Chapter1 (1.1 - 1.3, 1.5 - 1.7, 1.11) Chapter2 (2.4, 2.5) Chapter4(4.2 - 4.6)
Unit II	Chapter5 (5.1 - 5.4) Chapter 6 (6.1 –6.3)
Unit III	Chapter 7 (7.1 – 7.7) Chapter 8 (8.1 - 8.4) Chapter 9 (9.6, 9.7)
Unit IV	Chapter10 (10.2 - 10.4) Chapter12 (12.1 - 12.7)
Unit V	Chapter19 (19.1 - 19.5) Chapter 20 (20.1 - 20.5)

Reference Books

1. Kumkum Garg, "Mobile Computing Theory and Practice", Pearson Education, 2010.
2. Sipra Dasbit, Biplab K. Sikdar, "Mobile computing", PHI Learning, 2009.

e- Resources

1. https://www.tutorialspoint.com/mobile_computing/mobile_computing_overview.htm/
2. https://annamalaiuniversity.ac.in/studport/download/sci/cis/resources/MCA-Second%20Year-Mobile%20Computing-MCAC403.pdf
3. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/mobile-computing
4. http://gecnilokheri.ac.in/GPContent/MOBILE%20COMPUTING%20UNIT-II%206th%20Sem%20CSE-converted.pdf
5. https://www.cet.edu.in/noticefiles/270_Lecture%20note%20@%20MC.pdf

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Course Title : Data Mining	**Total Hours : 75 Hours**
Course Code : P22CAE22/P20CAE22	**Total Credits : 5**

Course Outcomes

COs	CO Statement
CO1	Remember the concepts of the data mining techniques, algorithms, methods and tools.
CO2	Understand an application by using various data mining techniques to identify a pattern that evolves in various business domains.
CO3	Apply the patterns that can be extracted on application of data mining techniques in various domains.
CO4	Analyze the market needs by applying suitable OLAP operations.
CO5	Learn how data warehousing has become mainstream.

Unit I **15 Hours**

Introduction - Basic Data Mining Tasks; Data Mining Versus Knowledge Discovery in Databases; Data Mining Issues; Data Mining Metrics; Social Implications of Data Mining; Data Mining from a Database Perspective.

Related Concepts - Database/OLTP systems; Fuzzy sets and Fuzzy Logic; Information Retrieval; Decision Support Systems; Dimensional Modeling; Data Warehousing; OLAP; Web Search Engines; Statistics; Machine Learning; Pattern Matching.

Data Mining Techniques – Introduction; A Statistical Perceptive on Data Mining; Similarity Measures; Decision Trees; Neural Networks; Genetic Algorithms.

Unit II **15 Hours**

Classification – Introduction; Statistical-based Algorithms; Distance-based Algorithms; Decision Tree based Algorithms; Neural Network-based Algorithms; Rule-based Algorithms; Combining Techniques.

Clustering – Introduction; Similarity and Distance Measures; Outliers; Hierarchical Algorithms; Partitional Algorithms; Clustering Large Databases; Clustering with Categorical Attributes; Comparison.

Unit III **15 Hours**

Association Rules – Introduction; Large Itemsets; Basic Algorithms; Parallel and Distributed Algorithms; Comparing Approaches; Incremental Rules; Advanced Association Rule Techniques; Measuring the Quality of Rules.

Web Mining - Introduction; Web Content Mining; Web Structure Mining; Web Usage Mining.

Unit IV **15 Hours**

Spatial Mining – Introduction; Spatial Data Overview; Spatial Data Mining Primitives; Generalization and Specialization; Spatial Rules; Spatial Classification Algorithms; Spatial Clustering Algorithms.

Temporal Mining – Introduction; Modeling Temporal Events; Time Series; Pattern Detection; Sequences; Temporal Association Rules.

Unit V **15 Hours**

Data Warehouse - The Building Blocks - Defining Features; Data Warehouse and Data Marts; Architectural Types; Overview of the Components; Metadata in the Data Warehouse.

Trends in Data Warehousing - Continued Growth in Data Warehousing; Significant Trends; Emergence of Standards; Web-enabled Data Warehouse.

Text Books

1. Margaret H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education, 16th Impression, 2013.

Unit I	Chapter1(1.1 to 1.6) Chapter 2(2.1 to 2.11) Chapter 3(3.1 to 3.6)
Unit II	Chapter 4(4.1 to 4.7) Chapter 5(5.1 to 5.8)
Unit III	Chapter6(6.1 to 6.8) Chapter 7(7.1 to 7.4)
Unit IV	Chapter8(8.1 to 8.7) Chapter 9(9.1 to 9.6)

2. Paulraj Ponniah, "Data Warehousing Fundamentals for IT Professional", Wiley India Pvt. Ltd, 2nd Edition, 2015.

Unit V	Chapter 2 (Page 24 to 42) Chapter 3 (Page 46 to 69)

Reference Book

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Morgan Kaufmann Publisher, New Delhi, 2007.

e - Resources

1. https://www.talend.com/resources/what-is-data-mining/
2. https://www.vssut.ac.in/lecture_notes/lecture1428550844.pdf
3. https://www.ibm.com/cloud/learn/data-mining
4. https://www.sas.com/en_us/insights/analytics/data-mining.html#:~:text=Data%20mining%20is%20the%20process,relationships%2C%20reduce%20risks%20and%20more.
5. https://nptel.ac.in/courses/106/105/106105174/
6. https://onlinecourses.nptel.ac.in/noc20_cs12/preview

Title : Cloud Computing	**Total Hours: 75 Hours**
Course Code : P22CAE23	**Total Credits: 5**

Course Outcomes

COs	CO Statement
CO1	Understand cloud computing architecture, Advantages and Disadvantages.
CO2	Understand deployment models and Services Models.
CO3	Implement virtualization in cloud.
CO4	Illustrate networking and open source for cloud.
CO5	Know security and future of cloud computing.

Unit I **15 Hours**

Cloud Computing Fundamentals- Motivation for Cloud Computing; Defining CloudComputing; 5-4-3 Principles of Cloud computing; Cloud Ecosystem; Requirements forCloud Services; Cloud Application; Benefits and Drawbacks.

Cloud Computing Architecture and Management- Cloud Architecture; Anatomy of theCloud; Network Connectivity in Cloud Computing; Applications on the Cloud;Managing the Cloud; Migrating Application to Cloud.

Unit II **15 Hours**

Cloud Deployment Models- Introduction; Private Cloud; Public Cloud; CommunityCloud; Hybrid Cloud.

Cloud Service Models- Introduction; Infrastructure as a Service; Platform as a Service; Software as a Service; Other Cloud Service Models.

Unit III **15 Hours**

Technological Drivers for Cloud Computing- SOA and Cloud; Virtualization; MulticoreTechnology; Memory and Storage Technologies; Networking Technologies; Web 3.0.

Virtualization- Introduction; Virtualization Opportunities; Approaches to Virtualization; Hypervisors; From Virtualization to Cloud Computing.

Unit IV **15 Hours**

Software Development in Cloud- Introduction; Different Perspectives on SaaSDevelopment; New Challenges; Cloud-Aware Software Development Using PaaSTechnology.

Networking for Cloud Computing- Introduction; Overview of Data Center Environment; Networking Issues in Data Centers.

Cloud Service Providers – EMC; Google; Amazon Web Services; Microsoft.

Unit V **15 Hours**

Security in Cloud Computing- Introduction; Security Aspects; Platform-Related Security; Audit and Compliance.

Advanced Concepts in Cloud Computing- Intercloud; Cloud Management; MobileCloud; Media Cloud; Interoperability and Standards; Cloud Governance; ComputationalIntelligence in Cloud; Green Cloud; Cloud Analytics.

Text Book

1. K. Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2015.

Unit I	Chapter 2(2.1 to 2.7) Chapter 3(3.2 to 3.7)
Unit II	Chapter 4 (4.1 to 4.5) Chapter 5(5.1 to 5.5)
Unit III	Chapter 6 (6.2 to 6.6, 6.8) Chapter7 (7.1 to 7.5)
Unit IV	Chapter 9 (9.1 to 9.4) Chapter10 (10.1 to 10.3) Chapter 11(11.2 to 11.5)
Unit V	Chapter 13 (13.1 to 13.4) Chapter 14 (14.1 to 14.9)

Reference Books

1. V.K.Pachghare, "Cloud Computing", PHI Learning Private Limited, 2016.
2. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing by A PracticalApproach", Tata McGraw-Hill Education Private Limited, New Delhi, 2010 Edition, FifthReprint 2011.

e – Resources

1. https://www.iare.ac.in/sites/default/files/lecture_notes/CC%20LECTURE%20NOTES.pdf
2. https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/(R17A0527)%20Cloud%20Computing%20Digital%20Notes.pdf
3. https://web2.qatar.cmu.edu/~msakr/15319-s10/lectures/lecture02.pdf
4. https://krishnamoorthymca99.wordpress.com/cloud-computing/ https://annamalaiuniversity.ac.in/studport/download/engg/CSE_Engg/resources/B.E._CSE_4Y_8SEM_CLOUD%20COMPUTING%2006oE8021.pdf

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Title : Internet and Web Designing	**Total Hours: 60 Hours**
Course Code : P22CAN21	**Total Credits: 4**

Course Outcomes

COs	CO Statement
CO1	Understand the basic concepts of Internet and WWW.
CO2	Design web pages using HTML Basic Tags and understand the various sections.
CO3	Understand how to insert ordered and unordered lists within a web page.
CO4	Understand how to insert link and table within a web page.
CO5	Understand how to insert frames and forms within a web page.

Unit I **12 Hours**

Introduction to the Internet -Networking; Internet; Electronic Mai, Resource Sharing; Gopher; World WideWeb; Usenet; Telnet.

Introduction to HTML -Designing a Home Page; History of HTML; HTMLGenerations; HTML Documents; AnchorTag; Hyper Links.

Unit II **12 Hours**

Head and Body Sections - Header section; Title; Prologue; Links; Colorful web page; Comment lines.

Designing the body section - Heading printing; Aligning the Headings; Horizontal Rule; Paragraph; Tab settings; Images and Pictures; Embedding PNG Format Images.

Unit III **12 Hours**

Ordered and Unordered lists - Lists; Unordered list; Headings in a list; Ordered list; Nested lists.

Table handling -Tables; Table creation in HTML; Width of the table and cells; Cells spanning multiple rows/columns; Coloring cells; Column specification.

Unit IV **12 Hours**

Frames -Frameset definition; Frame Definition; Nested framesets.

Unit V **12 Hours**

Forms -Action attribute; Methodattribute; Enctype attribute; Drop Down List; Sample Forms.

Text Book

1. C.Xavier,"World Wide Web Design with HTML", Tata McGraw Hill Education Private Limited,First Edition, 2014.

Unit I	Chapter 1 (1.2 – 1.9) Chapter 4 (4.1 – 4.6)
Unit II	Chapter 5 (5.1 – 5.6) Chapter 6 (6.1 - 6.7)
Unit III	Chapter 7 (7.1 – 7.5) Chapter 8 (8.1 – 8.6)
Unit IV	Chapter 10 (10.1 – 10.3)
Unit V	Chapter 12 (12.1 – 12.5)

Reference Book

1. Ivan Bayross,"Web enabled commercial Application Development using HTML,JavaScript, DHTML and PHP", BPB Publications, Fourth Revised Edition, 2013.

e – Resources

1. https://www.tutorialspoint.com/html/html_tutorial.pdf
2. https://www.w3schools.com/html/
3. https://www.tutorialspoint.com/html/index.htm
4. https://html.com/
5. https://www.geeksforgeeks.org/html-tutorials/

Course Title : LAB: Python Programming	**Total Hours :60 Hours**
Course Code : P22CAP21	**Total Credits : 2**

Course Outcomes

COs	CO Statement
CO1	Create programs using the basic concepts such as data types, Control Statements in Python.
CO2	Create programs using the concepts such as Arrays, Strings, and Functions in Python.
CO3	Create programs using the concepts such as Classes and Objects, Inheritance
CO4	Create programs using Exceptions, Database Connectivity in Python.

1. A Python Program to Implement 'Basic Data types'.
2. A Python Program to Implement 'List'.
3. A Python Program to Implement 'Tuples'.
4. A Python Program to Implement 'Range'.
5. A Python Program to Implement 'Control Statements'.
6. A Python Program to Implement 'if..else Statement'.
7. A Python Program to Implement 'Arrays'.
8. A Python Program to Implement 'Strings and Characters'.
9. A Python Program to Implement 'Functions'.
10. A Python Program to Implement 'Classes and Objects'.
11. A Python Program to Implement 'Inheritance and Polymorphism'.
12. A Python Program to Implement 'Exceptions'.
13. A Python Program to Implement 'Date and Time'.
14. A Python Program to Implement 'Python's Database Connectivity' using Oracle.
15. A Python Program to Implement 'Python's Database Connectivity' using MySQL.

Course Title : LAB: Relational Database Management System	**Total Hours : 75 Hours**
Course Code : P22CAP22	**Total Credits : 3**

Course Outcomes

COs	CO Statement
CO1	Populate and query a database using SQL DML/DDL commands
CO2	Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
CO3	Do Programmes on PL/SQL including stored procedures, stored functions, cursors and packages
CO4	Design and build a GUI application using any programming language as front end

1. Data Definition Language
2. Data Manipulation Language
3. Data Control Language
4. Transaction Control Language
5. Set Operators
6. Join Operations
7. Views and Indexes
8. Nested Queries
9. SQL Built-in Functions
10. PL/SQL Simple Programs
11. PL/SQL – Cursors
12. PL/SQL - Triggers

Course Name: Master of Computer Applications

Discipline : MCA

Rules and regulations, Course Scheme and Scheme of Examinations

(For those who join in June 2021 and after)

1) Course Scheme :

Semester	Part	Subject	Hour	Credit	Int+Ext = Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of revision
III	Core 12	Cryptography and Network Security	4	4	40+60=100				✔	✔						✔	P20CAC31	New / 100%
	Core 13	Principles of Compiler Design	4	4	40+60=100	✔	✔	✔		✔						✔	P20CAC32	New / 100%
	Core 14	Artificial Intelligence	3	3	40+60=100				✔	✔						✔	P20CAC33	New / 100%
	Core 15	Internet of Things	4	4	40+60=100				✔	✔						✔	P20CAC34	New / 100%
	Elective III	Software Project Management/ Theory of Computation/ Soft Computing	5	5	40+60=100			✔	✔	✔				✔		✔	P20CAE31/ P20CAE32/ P20CAE33	New / 100% New / 100% New / 100%
	Core 16 – Lab	LAB :Android Programming	5	3	40+60=100				✔	✔						✔	P20CAP31	No Change
	Core 17 – Lab	LAB : Dot Net Programming	5	3	40+60=100				✔	✔						✔	P20CAP32	New / 100%
IV	Core 18	R Programming	4	4	40+60=100				✔	✔						✔	P20CAC41	New / 100%
	Core 19	LAB : Angular JS	4	2	40+60=100				✔	✔						✔	P20CAP41	New / 100%
	Project and Viva-voce	Project and Viva-voce	-	6	100+100=200				✔	✔				✔			P20CA4PV	New / 100%

Core 12 - Cryptography and Network Security

Contact Hours per Week: 4 **Credits : 4**
Contact Hours per Semester: 48 **Subject Code : P20CAC31**

Course Outcome:
Students, after successful completion of the course, will be able to:

CO1:	To understand the fundamentals of Cryptography.
CO2:	To acquire Knowledge on standard algorithms used to provide confidentiality, integrity and authentication.
CO3:	To understand the various key distribution and management schemes.
CO4:	To understand how to deploy encryption techniques to secure data in transit across data networks.
CO5:	To design security applications in the field of information technology.

Unit I **10 Hrs**

Introduction: Security Goals – Cryptographic Attacks – Services and Mechanism – Techniques for security Goals Implementation.

Traditional Symmetric-Key Ciphers: Symmetric -Key Ciphers - Categories of Traditional Ciphers – Stream and Block Ciphers.

Introduction to Modern Symmetric-Key Ciphers: Modern Block Ciphers – Components of a Modern Block Cipher - Two classes of Product Ciphers - Attacks Designed for Block Ciphers - Modern Stream Ciphers.

Unit II **10 Hrs**

Data Encryption Standard (DES): History of Data Encryption Standard (DES) – DES Structure – Security of DES.

Advanced Encryption Standard (AES): History of Advanced Encryption Standard (AES) – Transformations used by AES – Key Expansion – The AES Cipher – Analysis of AES.

Unit III **8 Hrs**

Asymmetric-Key Cryptography: Difference between Symmetric-Key and Asymmetric-Key Cryptosystems – RSA Cryptosystem.

Message Integrity and Message Authentication: Message Integrity – Random Oracle Model – Message Authentication.

Unit IV **10 Hrs**

Digital Signature: Comparison – Process – Services – Attacks on Digital Signature – Digital Signature Schemes.

Entity Authentication: Entity Authentication and Message Authentication – Passwords-based Authentication – Challenge-Response Protocols – Zero-Knowledge Protocols-Biometrics.

Unit V **10 Hrs**

Key Management: Symmetric-Key Distribution – Kerberos – Symmetric-Key Agreement. **Security at the Application Layer**: E-mail System – Secure/Multipurpose Internet Mail Extension (S/MIME).

System Security: Description of the System – Malicious Programs – Intrusion Detection Systems (IDS).

Text Book:

Behrouz A Forouzan, Debdeep Mukhopadhyay. ***Cryptography and Network Security*.** Third Edition; Tata McGraw Hill Education Private Limited; Fifth reprint 2017.

Unit I : Chapter 1, 3, 5
Unit II : Chapter 6 (Page No: 137 - 150, & 156, 157),
Chapter 7 (Page No: 169 - 190 & 192 - 195)
Unit III : Chapter 10 (Page No: 259 - 276, Chapter 11
Unit IV : Chapter 13(Page No: 347 - 365), Chapter 14
Unit V : Chapter 15(Page No: 389 - 402),
Chapter 16 (Page No: 417 – 419, 438 - 447),
Chapter 19 (Page No: 525, 526, 535 - 547)

Reference Books:

1. Atul Kahate. ***Cryptography and Network Security***. Third Edition; McGraw Hill Education Private Limited, Eighth Reprint 2017.
2. William Stallings. ***Cryptography and Network Security***.PHI; 2008.

Core 13 - Principles of Compiler Design

Contact Hours per Week: 4 **Credits : 4**
Contact Hours per Semester: 48 **Subject Code : P20CAC32**

Course Outcomes :

CO1:	To understand the functionality of each phase involved in Compilation process.
CO2:	Implement the parsing techniques including Bottom-up and Top-down parsing for the given programming construct described in Context Free Grammar.
CO3:	To Constructing the different parsing table.
CO4:	To Generate the intermediate code and the implementation of symbol table
CO5:	To Apply the optimization techniques and generate the machine code.

Unit I **10 Hrs**

Introduction to Compilers: Compilers and translators – Why do we need translators – The structure of a compiler – Lexical Analysis – Syntax Analysis – Intermediate Code Generation – Optimization – Code Generation – Bookkeeping – Error Handling – Compiler Writing Tools.

Finite Automata and Lexical Analysis: The role of the lexical analyzer – A simple approach to the design of lexical analyzers – Regular Expressions – Finite automata.

Unit II **10 Hrs**

The Syntactic Specification of Programming Languages: Context free Grammars – Derivations and parse trees.

Basic Parsing Techniques: Parsers – Shift reduce parsing – Operator precedence parsing – Top down parsing – Predictive parsers.

Unit III **10 Hrs**

Automatic Construction of Efficient Parsers: LR parsers – The canonical collection of LR(0) items – Constructing SLR parsing tables – Constructing canonical LR parsing tables – Constructing LALR parsing tables – Using ambiguous grammars – An automatic parser generator – Implementation of LR parsing tables.

Unit IV **10 Hrs**

Syntax-Directed Translation: Syntax directed translation schemes – Implementation of Syntax directed translators – Intermediate code – Postfix notation – Parse trees and syntax trees – Three address code, quadruples and triples.

Symbol Tables: The contents of a symbol table – Data structures for symbol tables.

Unit V **8 Hrs**

Error Detection and Recovery: Errors – Lexical phase errors – Syntactic phase errors – Semantic errors.

Introduction to Code Optimization: The principal sources of optimization – Loop optimization – The DAG representation of basic blocks.

Code Generation: Object programs – Problems in code generation – A Machine Model – A simple Code generator – Peephole optimization.

Text Book:

Alfred V.Aho, Jeffrey D.Ullman, ***Principles of Compiler Design,*** Narosa Publishing House, 2002.

Unit I: Chapter 1, Chapter 3(3.1 to 3.4)
Unit II: Chapter 4(4.1& 4.2), Chapter 5
Unit III: Chapter 6 (6,1 to 6.8)
Unit IV: Chapter 7(7.1 to 7.6), Chapter 9(9.1,9.2)
Unit V: Chapter 11, Chapter 12(12.1 - 12.3), Chapter 15(15.1 - 15.4, 15.7)

Reference Book:

Alfred V.Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, ***Compilers Principles, Techniques and Tools***, Second edition, Pearson Publications, 2007.

Core 14 - Artificial Intelligence

Contact Hours per Week: 3 **Credits : 3**
Contact Hours per Semester: 36 **Subject Code : P20CAC33**

Course Outcome:
Students, after successful completion of the course, will be able to:

CO1:	Understand the basics of Artificial Intelligence
CO2:	Gain knowledge on Search Techniques.
CO3:	Understand how to encode knowledge.
CO4:	Learn problem solving by collecting evidence
CO5:	Learn advance concepts in Artificial Intelligence

Unit I **8 hrs**

What is Artificial Intelligence? : The AI problems – The underlying assumption – What is an AI technique? – The level of the model – Criteria for success.

Problems, Problem Spaces and Search: Defining the problem as a state space search – Production systems – Problem characteristics – Production system characteristics – Issues in the Design of search programs – Additional problems.

Unit II **6 hrs**

Heuristic Search Techniques: Generate-and-Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint satisfaction – Means-Ends analysis.

Unit III **8 hrs**

Knowledge Representation Issues: Representations and Mappings – Approaches to knowledge representation – Issues in knowledge representation – The frame problem.

Using Predicate Logic: Representing simple facts in Logic – Representing instance and Isa relationships – Computable Functions and predicates – Resolution – Natural deduction

Unit IV **7 hrs**

Statistical Reasoning: Probability and Bayes theorem – Certainty factors and rule-based systems – Bayesian Networks – Dempster-Shafer theory – Fuzzy logic.

Unit V **7 hrs**

Game Playing: Overview – The Minmax search procedure – Adding Alpha-Beta cutoffs – Additional Refinements – Iterative deepening.

Expert Systems: Representing and using domain knowledge – Expert System Shells – Explanation – Knowledge Acquisition.

Text Book:

Elaine Rich and Kevin Knight, ***Artificial Intelligence***, Tata McGraw Hill Publishing Company Limited, 21st reprint 2001.

Unit I : Chapter 1, Chapter 2
Unit II: Chapter 3
Unit III: Chapter 4, Chapter 5
Unit IV: Chapter 8
Unit V: Chapter 12 (12.1 – 12.5), 20 (20.1 – 20.4)

Reference Books:

1. Stuart Russell, Peter Norvig, ***Artificial Intelligence: A Modern Approach***, Pearson education, Third edition, 2014.
2. Richard E Neapolitan, ***Artificial Intelligence: With an Introduction to Machine Learning***, CRC Press, Second Edition, 2018.

Core 15 - Internet of Things

Contact Hours per Week: 4 **Credits : 4**
Contact Hours per Semester: 48 **Subject Code : P20CAC34**

Course Outcomes:
Students, after successful completion of the course, will be able to:

CO1:	Understand the concepts of Internet of Things.
CO2:	Determine the Market Perspective of IoT and Data Management in IoT.
CO3:	Design IoT applications in different domain and be able to analyze their performance
CO4:	Implement basic IoT applications on embedded platform.
CO5:	Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints

Unit I **10 Hrs**

Introduction to IoT: Introduction - Physical design of IoT - Logical design of IoT - IoT enabling Technologies - IoT Levels & Deployment templates.

Domain Specific IoTs: Introduction - Home Automation – Cities – Environment – Energy – Retail – Logistics - Agriculture – Industry – Health & Lifestyle.

Unit II **10 Hrs**

IoT & M2M: Introduction – M2M - Difference between IoT and M2M - SDN and NFV for IoT.

IoT System Management with NETCONF-YANG: Need for IoT Systems Management – SNMP – Network Operator Requirements – NETCONF – YANG - IoT System Management with NETCONF-YANG.

Unit III **8 Hrs**

IoT Platforms Design Methodology: Introduction - IoT Design Methodology - Case Study on IoT System for Weather Monitoring - Motivation for using Python.

Case studies illustrating IoT Design: Cities

Unit IV **10 Hrs**

IoT Systems – Logical Design using Python: Introduction - Installing Python - Python Data types & Data Structures - Control Flow – Functions – Modules – Packages - File Handling - Date/ Time Operations – Classes - Python Packages of Interest for IoT.

Unit V **10 Hrs**

IoT Physical Devices & Endpoints: What is an IoT Device - Exemplary Device: Raspberry Pi - About the Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python – Other IoT Devices.

IoT Physical Servers & Cloud Offerings: Amazon Web Services for IoT.

Text Book:

Arshdeep Bahga, Vijay Madisetti,. ***Internet of Things : A Hands-On Approach*** Universities Press (India) Private Limited; First Edition, 2019.

Unit I: Chapter 1, 2
Unit II: Chapter 3, 4
Unit III: Chapter 5, 9 (9.3)
Unit IV: Chapter 6
Unit V: Chapter 7, 8 (8.6)

Reference Books:

1. Waltenegus Dargie,Christian Poellabauer. ***Fundamentals of Wireless Sensor Networks:Theory and Practice***, WILEY Publication; First Edition 2010.
2. Francis daCosta. ***Rethinking the Internet of Things: A Scalable Approach to Connecting Everything***, Apress Publications; First Edition,2013

Elective III - Software Project Management

Contact Hours per Week: 5 **Credits : 5**
Contact Hours per Semester: 60 **Subject Code : P20CAE31**

Course Outcomes:

Students, after successful completion of the course, will be able to:

CO1:	To Understand the practices and methods for successful software project management.
CO2:	To Identify techniques for requirements, policies and decision making for effective resource management
CO3:	To Apply the evaluation techniques for estimating cost, benefits, schedule and risk
CO4:	To Devise a framework for software project management plan for activities, risk, monitoring and control
CO5:	To Devise a framework to manage people.

Unit I **12 Hrs**

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 – Stakeholders - Setting Objectives - Business Case - Project Success and Failure - What is Management? - Management Control - Traditional versus Modern Project Management Practices.

An Overview of Project Planning: Introduction to step wise project planning – Step 0 : Select project – Step 1: Identify project scope and objectives – Step 2: Identify Project Infrastructure – Step 3: Analyse project characteristics – Step 4: Identify Project products and activities – Step 5: Estimate effort for each activity – Step 6: Identify activity risks – Step 7: Allocate Resources – Step 8: Review/publicize plan – Steps 9 and 10 : Execute plan/ lower levels of planning.

Unit II **15 Hrs**

Project evaluation and Programme management: Introduction **–** A Business Case **–** Project Portfolio Management - Evaluation of Individual Projects - Cost Benefit Evaluation Techniques - Risk Evaluation - Programme Management - Managing the allocation of resources within programmes – Benefits Management.

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 – The Backward Pass - Identifying critical path - Activity Float - Shortening the Project Duration – Identifying Critical activities - Activity on Arrow Networks.

Unit III **12 Hrs**

Risk Management: Introduction - Risk - Categories of Risk - A framework for dealing with Risk - Risk Identification - Risk assessment - Risk planning - Risk management.

Monitoring and control: Introduction - Creating the Framework - Collecting the Data – Review - Project Termination Review - Visualizing Progress - Cost Monitoring - Earned Value Analysis - Prioritizing Monitoring - Getting Project Back To Target - Change Control - Software Configuration Management.

Unit IV **10 Hrs**

Managing Contracts: Introduction – Types of contract – Stages in contract placement – Typical terms of 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 - Health and Safety – Some ethical and professional concerns.

Unit V **11 Hrs**

Working In Teams: Introduction - Becoming a Team - Decision Making – Organization and team structures – Leadership.

Software Quality: Introduction – The place of software quality in project planning – The importance of software quality – Defining software quality – Product versus process quality management – Quality management systems – Process capability models – Techniques to help enhance software quality - Testing

Text Book:

Bob Hughes, Mike Cotterell, Rajib Mall, ***Software Project Management,*** Fifth Edition, Tata McGraw Hill Education, Sixth Reprint 2013.

Unit I: Chapter 1, 3
Unit II: Chapter 2 (2.1 – 2.8, 2.13), 6
Unit III: Chapter 7 (7.1 – 7.8), 9
Unit IV: Chapter 10, 11
Unit V: Chapter 12 (12.1 - 12.4, 12.9), 13 (13.1 – 13.4, 13.7 – 13.11)

Reference Books:

1. PankajJalote, ***Software Project Management in Practise***, Pearson Education, 2002.
2. Robert T. Futrell, Donald F. Shafer, Linda I. Safer, ***Quality Software Project Management***, Pearson Education, Asia, 2002.

Elective III - Theory of Computation

Contact Hours per week : 5 Hrs **Subject Code : P20CAE32**
Contact Hours per Semester: 60 Hrs **Credits: 5**

Course outcomes:

Students, after successful completion of the course, will be able to:

CO1:	To Design finite state automata and regular expression for a language specification and convert one form to another form
CO2:	To Learn to write Context Free Grammars and normalize.
CO3:	To Design push down automata (PDA) for languages and convert CFG to PDA and vice versa
CO4:	To Construct Turing machine by applying different techniques
CO5:	To Find undecidability in languages

Unit I **12 Hrs**

Finite Automata: Deterministic Finite Automata: Definition of a Deterministic Finite Automaton – How a DFA Processor Strings – Simpler Notations for DFA's – Extending the Transition Function to Strings – The Language of a DFA.

Nondeterministic Finite Automata: An Informal View of Nondeterministic Finite Automata –Definition of Nondeterministic Finite Automata – The Extended Transition

Function – The Language of an NFA – Equivalence of Deterministic and Nondeterministic Finite Automata.

Finite Automata with Epsilon-Transitions: Uses of Epsilon-Transitions – The Formal Notation for an Epsilon-NFA – Epsilon-Closures – Extended Transitions and Languages for Epsilon-NFA's – Eliminating Epsilon-Transitions.

Regular Expressions: The Operators of Regular Expressions – Building Regular Expression – Precedence of Regular-Expression Operators.

Finite Automata and Regular Expressions: From DFA's to Regular Expressions – Converting DFA's to Regular Expressions by Eliminating States – Converting Regular Expressions to Automata.

Unit II **12 Hrs**

Proving Languages Not to Be Regular: The Pumping Lemma for Regular Languages – Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure of Regular Languages Under Boolean Operations – Reversal – Homomorphisms – Inverse Homomorphisms.

Equivalence and Minimization of Automata: Testing Equivalence of States – Testing Equivalence of Regular Languages.

Context-Free Grammars: Definition of Context-Free Grammars – Derivation using a Grammar – Leftmost and Rightmost Derivations.

Parse Trees: Constructing Parse Trees – The Yield of a Parse Tree – Inference, Derivations, and Parse Trees.

Ambiguity in Grammars and Languages: Ambiguous Grammars – Removing Ambiguity from Grammars.

Unit III **12 Hrs**

Definition of the Pushdown Automaton: Informal Introduction – The Formal Definition of Pushdown Automata – A Graphical Notation for PDA's – Instantaneous Descriptions of a PDA.

Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata – From PDA's to Grammars.

Deterministic Pushdown Automata: Definition of a Deterministic PDA – Regular Languages and Deterministic PDA's.

Normal Forms for Context-Free Grammars: Eliminating Useless Symbols – Eliminating Epsilon-Productions – Eliminating Unit Productions – Chomsky Normal Form.

The Pumping Lemma for Context-Free Languages: Statement of the Pumping Lemma – Applications of the Pumping Lemma for CFL's.

Unit IV **12 Hrs**

The Turing Machine: Notation for the Turing Machine – Instantaneous Descriptions for Turing Machines – Transition Diagrams for Turing Machines –The Language of a Turing Machine – Turing Machines and Halting.

Programming Techniques for Turing Machines: Storage in the State –Multiple Tracks - Subroutines.

Extensions to the Basic Turing Machine: Multitape Turing Machines – Equivalence of One-Tape and Multitape TM's – Nondeterministic Turing Machines.

Unit V **12 Hrs**

Undecidable Problems About Turing Machines: Reductions – Turing Machines That Accept the Empty Language – Rice's Theorem and Properties of the RE Languages.

Post's Correspondence Problem: Definition of Post's Correspondence Problem – The "Modified" PCP – Completion of the Proof of PCP Undecidability.

The Classes P and NP: Problems Solvable in Polynomial Time – Polynomial-Time Reductions – NP-Complete Problems.

Text Book:

John E.Hopcroft, Rajeev Motwani, Jeffery D.Ullman, ***Introduction to Automata Theory, Languages, and Computation,*** Pearson Education., 3rd Edition, 2009.

Unit I : Chapter 2: **2.2:** 2.2.1 – 2.2.5, **2.3:**2.3.1 – 2.3.5, **2.5:** 2.5.1 – 2.5.5
Chapter 3: **3.1:** 3.1.1 – 3.1.3, **3.2:** 3.2.1 – 3.2.3
Unit II : Chapter 4: **4.1:**4.1.1 – 4.1.2, **4.2:**4.2.1 – 4.2.4, **4.4:**4.4.1 – 4.4.2
Chapter 5: **5.1:** 5.1.2 – 5.1.4,**5.2:** 5.2.1 – 5.2.3, **5.4:** 5.4.1 – 5.4.2
Unit III : Chapter 6: **6.1:** 6.1.1 – 6.1.4, **6.3:**6.3.1 – 6.3.2, **6.4:** 6.4.1 – 6.4.2
Chapter 7: **7.1:** 7.1.1, 7.1.3 – 7.1.5, **7.2:** 7.2.2, 7.2.3
Unit IV: Chapter 8: **8.2:**8.2.2– 8.2.6**, 8.3:** 8.3.1 – 8.3.3, **8.4:**8.4.1,8.4.2, 8.4.4.
Unit V : Chapter 9: **9.3:**9.3.1 – 9.3.3, **9.4:**9.4.1 – 9.4.3
Chapter 10: **10.1:** 10.1.1,10.1.5,10.1.6

Reference Book:

Harry R.Lewis,Christos H.Papadimitriou, ***Elements Of The Theory Of Computation***, Dorling kindersley (India) Pvt. Ltd., 2nd Edition, 2008.

Elective III - Soft Computing

Contact Hours per week : 5 Hrs **Subject Code : P20CAE33**
Contact Hours per Semester: 60 Hrs **Credits : 5**

Course Outcome:

Students, after successful completion of the course, will be able to:

CO1:	Learn the basic concepts of Soft Computing and gain knowledge of Artificial Neural Network.
CO2:	Learn associative memory and unsupervised learning
CO3:	Learn fuzzy sets and its representations
CO4:	Learn Classical Logic, Fuzzy Logic and decision making
CO5:	Learn Genetic algorithms and pattern recognition.

Unit I **12 Hrs**

Introduction: Introduction to Soft Computing **–** Evolutionary Computing – Hard Computing Vs Soft Computing – Soft Computing Methods - Recent Trends in Soft Computing. **Fundamentals of Artificial Neural Network:** Introduction – Model of Biological Neuron – Mathematical Model of Neuron- ANN Architecture- Learning Rules – Learning Paradigms – Perceptron Network -Adaline and Madaline Networks - Applications of Neural Network.

Unit II **12 Hrs**

Associative Memory: Introduction – Autoassociative Memory – Hetero-associative Memory – Bidirectional Associative Network - Applications of Associative Memory.

Unsupervised Learning: Introduction – Winner-Takes-All Network – Learning Vector Quantization – Self-organization Map - Adaptive Resonance Theory – Neocognitron – Applications of Unsupervised Learning.

Unit III **12 Hrs**

Associate Models: Hopfield Network – Boltzmann Network – Simulated Annealing – Application of Networks.

Classical Sets and Fuzzy Sets: Crisp Sets – Fuzzy Sets: History and Origin – Fuzzy Sets: Basic Concepts – Paradigm Shift – Representation of Fuzzy Sets.

Unit IV **12 Hrs**

Classical Logic and Fuzzy Logic: Logic – Interval Analysis – Fuzzy Numbers – Fuzzy Logic.

Fuzzy Decision Making: Introduction – Individual Fuzzy Decision Making – Multiperson Decision Making - Multicriteria Decision Making – Multistage Decision Making.

Unit V **12 Hrs**

Genetic Algorithms: History of Evolutionary Computing – Crossover and Mutation Properties -Genetic Algorithm Cycle – Fitness Function – Applications of Genetic Algorithm. **Application of Soft Computing Techniques:** Pattern Recognition – Image Processing – Application of Soft Computing in Real Estate.

Text Book:

B.K. Tripathy, J. Anuradha , ***Soft Computing Advances and Applications,*** 2015.

Unit I: Chapter 1,2
Unit II: Chapter 4, Chapter 5
Unit III: Chapter 6, Chapter 7 (7.1 – 7.5)
Unit IV: Chapter 9, Chapter 11
Unit V : Chapter 13, Chapter 17 (17.1 – 17.3)

Reference Book:

Dilip K. Pratihar, ***Soft Computing Fundamentals and Applications***, 2015.

Core 16 LAB - Android Programming

Contact Hours per Week: 5 **Credits : 3**
Contact Hours per Semester: 60 **Subject Code : P20CAP31**

Course outcomes:
Students, after successful completion of the course, will be able to:

CO1:	Develop an Android application using Eclipse IDE
CO2:	Understand the tools used to develop a Android Application
CO3:	Develop an Android application using various tools

List of Programmes:

1. Develop a sample Android application using Eclipse.
2. Develop an Android application using Activities.
3. Develop an Android application using Intents. (Explicit)
4. Develop an Android application using Built-in Intents.
5. Develop an Android application using Fragments.
6. Develop an Android application using Action Bar.
7. Develop an Android application for registration form using Basic Views.
8. Develop an Android application using Picker Views.
9. Develop an Android application using List Views.
10. Develop an Android application using Spinner Views.
11. Develop an Android application for Gallery using Image Views.
12. Develop an Android application using Menus.(Option Menu and Context Menu)
13. Develop an Android application to save and retrieve user data using Preferences.
14. Develop an Android application using Databases.
15. Develop an Android application using Content Providers.
16. Develop an Android application using 'Messaging' and 'E-Mail'.
17. Develop an Android application using Maps.

Core 17 LAB: Dot Net Programming

Contact Hours Per Week : 5 Hrs. **Subject Code: P20CAP32**
Contact Hours Per Semester : 60 Hrs **Credits: 3**

Course outcomes:
Students, after successful completion of the course, will be able to:

CO1:	Work with various tools in the .Net Environment
CO2:	Develop Console and Windows applications using VB.Net
CO3:	Develop Console and Windows applications using C#.Net
CO4:	Develop web applications using ASP.Net

List of Programmes:

1. Write a program in VB.Net console application to perform Array List Operations.
2. Write a program in VB.Net console application to demonstrate Constructor Overloading.
3. Write a program in VB.Net windows application to design a Scientific Calculator.
4. Develop Departmental Store application in VB.Net windows application.
5. Write a program in VB.Net to perform Number checking (like Armstrong, Adam, Palindrome, Perfect)
6. Write a C#.net console application to implement Multi Level Inheritance
7. Write a C#.net windows application to implement Regular Expression.
8. Develop a simple animation using C#.net windows application
9. Develop C#.net windows application for library management system
10. Write an ASP .Net program to find the Factorial of a given number by using Function
11. Write an ASP .Net program to generate a Fibonacci series by using Subroutine
13. Write an ASP .Net program for form validation by using all validation controls
14. Create an Asp.net web application for employ payroll processing.

Core 18 - R Programming

Contact Hours per week : 4 Hrs **Subject Code : P20CAC41**

Contact Hours per Semester : 48 Hrs **Credits : 4**

Course Outcomes:

Students, after successful completion of the course, will be able to:

CO1:	To understand the basic concepts of R and gain knowledge on R programming.
CO2:	To gain knowledge on data storage in R Programming and to import and export other File formats to R Programming
CO3:	To gain knowledge on mathematical operations in R Programming.
CO4:	To understanding the graphical operations in R Programming.
CO5:	To gain knowledge on Customization of Plots.

Unit I **9 Hrs**

A short introduction to R: Introduction - Installing R - Getting started - Some information on R commands - Special values – Objects – Functions - Simple manipulations-Numbers and Vectors - Matrices and Arrays – Factors - Lists - Data Frames.

Programming using R: Introduction - Function creation – Scripts - Logical Operators - Conditional Statements - Loops in R - switch Statement.

Unit II **10 Hrs**

Lists and data frames: Introduction - Creating a List - Common List Operations - Recursive List - Creating a Data Frame - Common Data Frame Operations - Using lapply() and sapply() functions.

Import and Export: Introduction - Saving and Loading R data - Import and Export to CSV files - Import data from SAS - Import and Export via ODBC.

Unit III **10 Hrs**

Mathematical and Statistical Concepts: Introduction – Maximum and Minimum – Frequency Distribution – Frequency Distribution types - Measure of Central Tendency – Measure of Dispersion – Correlation.

Unit IV **9 Hrs**

Graphics: Introduction - Basic plots - Labeling and Documenting plots - Adjusting the Axes - Specifying Colors - Specifying Fonts - Specifying Sizes - Plotting Symbols.

Unit V **10 Hrs**

Customised Plotting: Introduction – Change of Plotting line style – Adding Items on a Plot - Higher Dimensional Data Display – Changing the Plot settings using par() function.

Text Book:

Sandip Rakshit. ***R For Beginners*.** McGraw Hill Education (India) Private Limited; First Edition, 2017.

Unit I: Chapter 1, 2
Unit II: Chapter 3, 6
Unit III: Chapter 7
Unit IV: Chapter 12
Unit V: Chapter 13

Reference Books:

1. Garrett Grolemund. ***Hands on Programming with R***, O'Reilly Media Inc.
2. Andrie de Vries. ***R for Dummies*,** John Wiley & Sons Inc, Second Edition, 2015
3. Kun Ren. ***Learning R Programming*,** Packt Publishing Ltd, First Edition, 2016

Core 19 – Lab : Angular JS

Contact Hours per week : 4 Hrs **Subject Code : P20CAP41**
Contact Hours per Semester : 48 Hrs **Credits : 2**

Course outcomes:
Students, after successful completion of the course, will be able to:

CO1:	Create a basic sample application in AngularJS.
CO2:	Develop an application using concepts such as models and controllers in AngularJS.
CO3:	Develop an application using built-in and custom directives.
CO4:	Develop a web application using Routing in AngularJS.
CO5:	Develop single page applications using AJAX with AngularJS.

List of Programmes:

1. Create a simple application using AngularJS.
2. Use of Directives in AngularJS.
3. Use of Expressions in AngularJS.
4. Creating Controllers in AngularJS.
5. Implementation of Filters in AngularJS.
6. Creating Tables in AngularJS.
7. Creating an AngularJS application with HTML DOM.
8. Creating Modules in AngularJS.
9. Creating AngularJS application using Forms.
10. Creating AngularJS application using Includes.
11. Creating AngularJS application using Scope.
12. Creating AngularJS application using Services.
13. Creating AngularJS application with AJAX.
14. Creating AngularJS Single Page Application using Views.

Project and Viva-Voce
(Industry/Institutional Based)

Credits : 6 **Subject Code : P20CA4PV**
Course Outcome:

CO1:	Students will have hands of experience of real life system development life cycle
CO2:	The students will learn to apply the technologies learnt during the course in real life projects
CO3:	Students will learn to work in real life project development environments involving deadlines and teamwork
CO4:	Students will learn to pick up and apply upcoming technologies in project development not covered during the course

Objectives:

- To solve real life problems in the In dustry/Academic Institutions/Computer science research.
- The Project and Viva-voce is one that involves practical work for understanding and solving problems in the field of computing.
- Students will do individually Commercial or Technical Project based on their Industry /Academic Institutions needs.
- With the known/needed technologies they can develop the software.

Course Name : Master of Computer Applications (MCA)
CHOICE BASED CREDIT SYSTEM
(For those who join in June 2018 and after)
Course Scheme:

Self-Learning Courses:

Subject	Credit	Ext =Tot	Subject Code
Software Testing	5	100 = 100	P19CASL31
XML	5	100 = 100	P19CASL32

SELF LEARNING

MCA - Software Testing

Subject Code : P19CASL31

Total Marks 100 **Credit: 5**

Objectives:

- To learn about the purpose and levels of software testing.
- To learn about the different types of testing.
- To identify the bugs and failures in the software.
- To find ways to solve the bugs and failures in the software.
- To implement the various testing methods in the software.

Unit I

Introduction: Software Structure and Software Testing – Purpose of testing – A model for testing.

Testing and Levels:- Testing levels – Unit Testing – Component Testing – Integration Testing – System Testing – Interoperability Testing – Performance Testing – Regression Testing – Acceptance Testing – Pilot or Field Testing – Installation or Product Testing.

Unit II

The Taxonomy of Bugs:- Mistakes, Bugs and Failures – A Taxonomy of Bugs – Consequences of Bugs.

Flow Graphs and Path Testing:- Path Testing Basics – Steps in Path Testing – Construct Control Flow Graph – Arrive at Test Paths – Providing Appropriate Inputs – Path Sensitizing – Path Instrumentation – Application of Path Testing – Effectiveness of Path Testing.

Unit III

Transaction Flow Testing:- Control Flow Chart and Structure, Data and Transaction Testing – Software Functionality and Transactions – Transaction Flow Structure – Transaction flow Testing Techniques.

Data Flow Testing:- Basics of data flow testing – Data Flow graphs and their representation – Data Object state and Usage – Data flow Anomalies – States of Data Objects and Data Flow Anomalous State Graph – Static Versus Anomaly Detection – Data Flow graph Testing Techniques – Strategies for Data flow Testing – Test Strategies – Application of Data Flow Testing.

Unit IV

Domain Testing:- Domains and Paths – Concepts of Domain, Open and Closed Domains – Nice Domains and Ugly Domains – Domain Testing – Domains and Interface Testing – Domains and Testability.

Paths, Path Products and Regular Expression:- Concepts of Path and Path Expressions – A Path Reduction Procedure – Applications – Regular Expression and flow Anomaly Detection.

Unit V

States, State Graphs and Transition Testing:- Object oriented systems and State Graphs – State Graph – General Properties of State Graphs – Good State Graph and Bad State Graphs – Bugs in State Graphs – The Role of State Graphs in Software Testing – Test Design Strategies for State Graph based Testing – Test Design Strategies for State Graph based Testing – State Graph based Test Design – An Example for Creating State Graph and Designing Test Cases – Testability Tips.

Graph Matrices and Applications:- Path Tracing Issues in Graph and Matrix Representation – Graph and the Matrix of a Graph – Terminology: The Matrix of a Graph – Examples on Matrix Representations – Cyclomatic Complexity – Graphs, Relations and Properties of Relations – The Powers of Matrix – Node Reduction Algorithm – Matrix Reduction Method.

Text Book:

Software Testing Techniques and Applications, Arunkumar Khannur, Pearson Education, First Impression 2011.

Unit I: Chapters 1 (1.1, 1.2, 1.4), 2
Unit II: Chapters 3, 4
Unit III: Chapters 5, 6
Unit IV: Chapters 7, 8
Unit V: Chapters 10, 11

Reference Book:

1. Software Quality and Testing – A Concise Study, S.A.Kelkar, PHI Learning Private Limited, 2012

XML

Subject Code : P19CASL32

Total Marks 100 **Credit: 5**

Objectives:

- Able to get an idea about XML.
- Able to know about XML Processing and Validation.
- To Creating and Processing XML Documents.

Unit I

XML: Of Data, Files, and Text- So What is XML - Origin of the XML -Where XML can be used, and what you can use it for.

Well Formed XML: Parsing XML – Tags and Text and Elements, oh My- Attributes- Empty elements – XML Declarations- Processing Instructions – Illegal PCDATA Characters- Errors in XML.

Unit II

XML Namespaces: Why we need Namespaces- How XML Namespaces Work- Understanding URIs- When to Use Namespaces.

Document Type Definitions: Running the Samples- Sharing Vocabularies – Anatomy of a DTD- Developing DTDs – DTD Limitations.

Unit III

XML Schemas: Benefits of XML Schemas- Do We Still Need DTDs? – XML Schemas- Creating a Schema from Multiple Documents- Documenting XML Schemas.

RELAX NG: XML and Compact Syntaxes- RELAX NG Patterns- Combining and Reusing Patterns and Grammars.

Unit IV

XSLT: What is XSLT- How an XSLT Processor Works – Running the Examples – Procedural Vs Declarative Programming – Foundational XSLT Elements – Getting Information from the Source Tree – Introducing the output with the <xsl:output> Element – Conditional Processing – The <xsl:for-each> element – The <xsl:sort> Element – XSLT Models – XSLT Variables and Parameters – Named Templates and the <xsl:call-template> Element – XSLT Functions – XSLT 2.0.

Unit V

XQuery, the XML Query Language: Why XQuery – XQuery Tools – Some XQuery Examples – The XQuery Data Model – Xquery Expressions – Xquery Functions – Using Parameters with Xquery – User defined Functions – Looking Ahead.

XML and Databases: Need for Efficient XML Data stores – Approaches to storing XML – Using Native XML Databases – XML in Commercial RDBMSs – XML in Open source RDBMSs – Choosing a database to store XML – Looking Ahead.

Text Book:

Beginning XML – Fourth Edition (2007) by David Hunter, Jeff Rafter, Joe Fawcett Wiley India Private ltd.

Unit I - Chapter 1,2
Unit II - Chapter 3,4
Unit III - Chapter 5,6 (Page No.:212 to 235)
Unit IV - Chapter 8
Unit V - Chapter 9,10

Reference Book:

XML Black Book 2nd Edition by Natanya Pitts, Dreamtech Press, 2001.

Program Name : Master of Computer Applications
Discipline : Computer Applications
(For those who join in June 2020 and after)

VALUE ADDED COURSES (PG Only)

Course Name	Internal Mark = Total Mark	Subject Code
Data Structure	100=100	V1CA7
Computer Algorithms	100=100	V1CA8
System Software	100=100	V1CA9

Value Added Course: Data Structure (PG Only)

Contact Hours per Semester: 30 Hrs **Subject Code:** V1CA7

Course outcomes:
Students, after successful completion of the course ,will be able to
CO1: Learn about concepts of Data Structures and Arrays.
CO2: Understand on Linked Lists, Stacks and its Operations.
CO3: Learn about Queues, Tables concepts, types and its Operations.
CO4: Learn more about concepts of trees, representations, operations and types of trees.
CO5: Learn about Graphs terminologies, Representations, Operations and Applications of Trees.

Unit I: **6 HRS**
Introduction and Overview: Concept of Data Structures – Overview of Data Structures.
Arrays: Definition – Terminology – One-dimensional Arrays – Multidimensional Arrays.

Unit II: **6 HRS**
Linked Lists: Definition – Single Linked List – Circular Linked List – Double Linked List – Circular Double Linked Lists.
Stacks: Introduction – Definition – Representation of Stack – Operations on Stacks.

Unit III: **6 HRS**
Queues: Introduction – Definition – Representation of Queues – Various Queue Structures.
Tables: Rectangular Tables – Jagged Tables – Inverted Tables – Hash Tables.

Unit IV: **6 HRS**
Trees: Basic Terminologies – Definition and Concepts – Representation of Binary Tree – Operations on Binary Tree – Types of Binary Trees: Expression Tree – Binary Search Tree – Heap Trees.

Unit V: **6 HRS**
Graphs: Introduction – Graph Terminologies – Representation of Graphs – Operations on Graphs – Applications of Graph Structures: Shortest Path Problem – Minimum Spanning Tree.

Text Book:

D.Samanta, Classic Data Structures, Prentice-Hall of India, 2008.

Unit I : Chapter 1.2, 1.3, Chapter 2.1 – 2.4
Unit II : Chapter 3.1 – 3.5, Chapter 4.1 – 4.4
Unit III : Chapter 5.1 – 5.4, Chapter 6.1 – 6.4 (6.4.1 – 6.4.4)
Unit IV : Chapter 7.1 – 7.5 (7.5.1 – 7.5.3)
Unit V : Chapter 8.1 – 8.5 (8.5.1, 8.5.3)

Reference Book:

Brijendra Kumar Joshi, Data Structures and Algorithms in C++, Tata McGraw Hill Education, 2010.

Value Added Course: Computer Algorithms (PG Only)

Contact Hour per Semester: 30 Hrs **Subject Code:** V1CA8

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO1: Understand the basic concepts of Algorithms.
CO2: Gain knowledge about data structures,
CO3: Gain knowledge about the Sorting techniques.
CO4: Understand the concepts of trees.
CO5: Gain knowledge about the backtracking techniques.

Unit I: **6 Hrs**

Introduction: What is an Algorithm? – Algorithm Specification – Performance Analysis – Randomized Algorithms.

Unit II: **6 Hrs**

Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Graphs.

Unit III: **6 Hrs**

Divide and Conquer: Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection

Unit IV: **6 Hrs**

The Greedy Method: The General Method – Container Loading – Knapsack Problem – Minimum-Cost Spanning Trees.

Unit V: **6 Hrs**

Backtracking: The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamilton Cycles – Knapsack Problem.

Text Book:

1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, ***Fundamentals of Computer Algorithms,*** University Press Private Limited, Second Edition, Reprint, 2008.

Unit I - Chapter 1.1, 1.2, 1.3, 1.4.
Unit II - Chapter 2.1, 2.2, 2.3, 2.4, 2.6.
Unit III - Chapter 3.3, 3.4, 3.5, 3.6, 3.7
Unit IV - Chapter 4.1 to 4.3, 4.6
Unit V - Chapter 7.2 to 7.6

Reference Books:

1) Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, ***Introduction to Algorithms,*** McGraw Hill Book Company, Second Edition, Fourth Printing, 2003.
2) Jon Kleinberg, Eva Tardos, ***Algorithm Design***, Pearson Education Inc, 2006

Value Added Course: System Software (PG Only)

Contact Hours per Semester : 30 hrs **Subject Code :** V1CA9

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO1: Cover the design and implementation of various types of system utilities software.
CO2: Illustrate how the utility software interacts with operating system.
CO3: Understand the assembler functions
CO4: Know about loader and linkers functions
CO5: Know the working of macro processor and Compiler

Unit I **10 Hrs**

Background: Introduction-System software and Machine Architecture – The simplified instructional Computer – Traditional Machines (only VAX Architecture) – RISC Machines (only UltraSPARC Architecture).

Unit II **8 Hrs**

Assemblers: Basic Assembler Functions – Machine-Dependent Assembler Features (only Program Relocation) – Machine- Independent Assembler Features – Assembler Design Options.

Unit III **5 Hrs**

Loaders and Linkers: Basic Loader Functions – Machine-Dependent Loader Features - Loader Design Options.

Unit IV **4 Hrs**

Macro Processors: Basic Macro Processor Functions - Macro Processor Design Options.

Unit V **3 Hrs**

Compilers: Basic Compiler Functions – Compiler Design Options.

Text Book:

Leland L. Beck, D. Manjula, ***System Software,*** 3rd Edition, Pearson Education, 2009.

Unit I - Chapter 1 (1.2-1.4 (1.4.1), 1.5(1.5.1))

Unit II - Chapter 2 (2.1, 2.2(2.2.2), 2.3, 2.4)

Unit III - Chapter 3 (3.1, 3.2, 3.4)

Unit IV - Chapter 4 (4.1, 4.3)

Unit V - Chapter 5 (5.1, 5.4)

Reference Book:

J. Nithyashri, ***System Software,*** 2nd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.