Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications Program

(Accredited by National Board of Accreditation)

MCA I – IV semester Syllabus
Two years Duration
(2020 – 2022)

Dr. Ambedkar Institute of Technology, Bengaluru – 560056

Master of Computer Applications

Institute - Vision and Mission

Vision

To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

Mission

- To offer state-of-the-art under graduate, post graduate and doctoral programs in the fields of Engineering, Technology and Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industrial requirements.
- To instil moral and ethical values with social and professional commitment.

DEPARTMENT - VISION AND MISSION

VISION

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- To create a Centre of Excellence through industry institute interaction.
- To prepare students for utilizing more creativity, innovativeness and leadership Qualities.
- To inculcate a sense of commitment to the students towards socio-economic development of the nation

Program Educational Objectives

PEO 1: Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.

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PEO 3: To provide an opportunity to students to learn the latest trends in computer technology and make them ready for life-long learning process with leadership skills and corporate social responsibilities.

Program Outcomes:

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PO 2: Graduates will be able to demonstrate with excellent programming, analytical, logical and problem solving skills.

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Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA FIRST SEMESTER (AUTONOMOUS) 2020-2022

Sl. No.	Course Code	Course Title	Teaching hours per week			Examination				Credits
			Lecture	Tutorial/ Seminar/ Assignment	Practical / Project	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	20MCA11	Object Oriented Programming using Java	4	-	-	3	50	50	100	4
2	20MCA12	Data structures and algorithms	4	-	-	3	50	50	100	4
3	20MCA13	Web Technologies	4	-	-	3	50	50	100	4
4	20MCA14	RDBMS	3	-	2	3	50	50	100	4
5	20MCA15	Mathematical and Statistical modelling for Computer Applications	4	-	-	3	50	50	100	4
6	20MCAL16	Object Oriented Programming using Java Lab	-	-	2	3	50	50	100	1
7	20MCAL17	Data structures and algorithms Lab	-		2	3	50	50	100	1
8	20MCAM18	Mini Project in Web Technologies	-	2	2	3	50	50	100	2
9	20MCAB19	Principles of Programming (Bridge Course – Non-credit)	3	-	-	3	50	50	100	0
Total			22	02	08	27	450	450	900	24

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SCHEME OF TEACHING AND EXAMINATION OF MCA SECOND SEMESTER

(AUTONOMOUS) 2020-2022

Sl. No.	Course Code	Course Title	Teaching hours per week			Examination				Credits
			Lecture	Tutorial/ Seminar/ Assignment	Practical / Project	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	20MCA21	Python Programming	4	-	-	3	50	50	100	4
2	20MCA22	Internet of Things	4	-	-	3	50	50	100	4
3	20MCA23	Software Engineering and Project Management	4	-	-	3	50	50	100	4
3	20MCA24	Research Methodology	3	-	-	3	50	50	100	3
5	20MCA25	Elective – 1	3		2	3	50	50	100	4
6	20MCA26	Elective - 2	3	-	-	3	50	50	100	3
7	20MCAL27	Python Programming Lab	-	-	2	3	50	50	100	1
8	20MCAL28	Internet of Things Lab	-		2	3	50	50	100	1
09	20MCAM29	Mini Project in Mobile Application Development	-	2	2	3	50	50	100	2
Total			21	02	08	27	450	450	900	26

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MCA SECOND SEMESTER ELECTIVE COURSES

Elective – 1

S.No	Course Code	Course Title
1.	20MCA251	Cybersecurity
2.	20MCA252	Software Testing and Automation
3.	20MCA253	Data Science using R
4.	20MCA254	Programming using C#
5.	20MCA255	Ethical Hacking

Elective – 2

S.No	Course Code	Course Title
1.	20MCA261	Data Mining and Business Intelligence
2.	20MCA262	Enterprise Resource Planning
3.	20MCA263	Supply Chain Management
4.	20MCA264	Storage Area Networks
5.	20MCA265	Distributed Operating Systems

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SCHEME OF TEACHING AND EXAMINATION OF MCA THIRD SEMESTER

(AUTONOMOUS) 2020-2022

Sl. No.	Course Code	Course Title	Teaching hours per week			Examination				Credits
			Lecture	Tutorial/ Seminar/ Assignme	Practical / Project	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	20MCA31	Machine Learning using Python	4	-	-	3	50	50	100	4
2	20MCA32	Advances in Java Programming	4	-	-	3	50	50	100	4
3.	20MCA33	Network Architecture and Programming	3	-	2	3	50	50	100	4
4	20MCA34	Elective – 3	3		2	3	50	50	100	4
5	20MCA35	Elective - 4	3		-	3	50	50	100	3
6	20MCAL36	Machine Learning using Python Lab	-	-	2	3	50	50	100	1
7	20MCAL37	Advances in Java Programming Lab	-	-	2	3	50	50	100	1
8	20MCAM38	Mini Project	-	-	4	3	50	50	100	2
9.	20MCAS39	Technical Seminar	-	-	2	-	-	50	50	2
Total			17	00	12	27	400	450	850	25

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MCA THIRD SEMESTER ELECTIVE COURSES

Elective – 3

S.No	Course Code	Course Title
1.	20MCA341	Digital Marketing
2.	20MCA342	Cloud Computing
3.	20MCA343	Big Data Analytics
4.	20MCA344	Programming using GOLang
5.	20MCA345	Fullstack Web Development

Elective-4

S.No	Course Code	Course Title
1.	20MCA351	Block Chain Technology
2.	20MCA352	5G Wireless Technologies
3..	20MCA353	Artificial Intelligence
4.	20MCA354	Software Architecture and Design Patterns
5.	20MCA355	Graph Theory

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SCHEME OF TEACHING AND EXAMINATION OF MCA FOURTH SEMESTER
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			Lecture	Tutorial	Practical / Seminar	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	20MCAI41	MOOC Course and Industry Internship	-	-	2	3	50	50	100	5
2.	20MCAP42	Project Work	-	-	4	3	150	100	250	20
Total			-	-	6	6	200	150	350	25
Grand Total						350				3000

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6	20MCA26	Elective - 2	3	-	-	3	50	50	100	3
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(AUTONOMOUS) 2020-2022

MCA Course Matrix

Components	Semester 1 (Credits)	Semester 2 (Credits)	Semester 3 (Credits)	Semester 4 (Credits)	Total (Credits)
Core Courses	**20**	**15**	**12**	**-**	**47**
Elective Courses	**-**	**07**	**07**	**-**	**14**
Lab Courses	**04**	**04**	**02**	**-**	**10**
Mini Project	**-**	**-**	**02**	**-**	**02**
Seminar	**-**	**-**	**02**	**-**	**02**
Internship	**-**	**-**	**-**	**05**	**05**
Project	**-**	**-**	**-**	**20**	**20**
Non-Credit Course	**1 course**	**-**	**-**		**1 course**
Total Credits	**24**	**26**	**25**	**25**	**100**
Total Marks	**900**	**900**	**850**	**350**	**3000**

I SEMESTER

OBJECT ORIENTED PROGRAMMING USING JAVA

Course Code:				**20MCA11**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practicals(P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Understand the different object oriented concepts and implement basic programs**
- **Develop applications using inheritance and interface concepts**
- **Apply multithreading programming concepts and handling errors efficiently**
- **Able to Design client server application in java**

MODULES	**TEACHING HOURS**
MODULE 1: Java Programming Fundamentals	**11 Hrs**
The Java Language, The Key Attributes of Object-Oriented Programming,The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifies in Java, The Java Class Libraries. **Introducing Data Types and Operators:** Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions. **Program Control Statement:** Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops**.** **More Data Types and Operators: Arrays**, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators. **String Handling:** String Fundamentals, The String Constructors, Three String-Related Language Features, The Length () Method, Obtaining the characters within a string, String comparison	
MODULE 2:Introducing Classes, Objects and Methods	**11 Hrs**
Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using	

Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword. **A Closer Look at Methods and Classes:**Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments. **Inheritance:** Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.	
MODULE 3: Interfaces	**11 Hrs**
Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. **Packages :**Package Fundamentals, Packages and Member Access, Importing Packages, Static Import **Exception Handling :**The Exception Hierarchy, Exception Handling fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.	
MODULE4:Multithreaded Programming	**11 Hrs**
Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads. **Enumerations, Auto boxing and Annotations :**Enumerations, Java Enumeration are class types, The Values () and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata), **Generics** **Applets:** Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets	
MODULE 5: Networking with Java.net	**08 Hrs**

Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class. **Exploring Collection Framework:** Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

Textbooks

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013.
2. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. (Chapter17)

Reference Books

1. Java 6 Programming, Black Book, KoGenT ,Dreamtech Press, 2012
2. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

COURSE OUTCOMES (CO):

CO1: Demonstrate the basic object oriented concepts & apply them to create java applications

CO2:Apply inheritance and interface concepts to design java applications

CO3: Design java applications with multithreading concepts and demonstrate the error handling concepts

CO4: Design client server applications.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO 1	PO1,PO2,PO3,PO4,PO5
CO 2	PO1,PO2,PO3,PO4
CO 3	PO2,PO3,PO4.PO5
CO 4	PO2,PO3,PO4,PO5,PO8,PO10,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	H	H	H							
CO2	M	H	M	H	H							
CO3		H	M	H	H							
CO4		H	M	M	H			M		L	L	

I SEMESTER
DATA STRUCTURES AND ALGORITHMS

Course Code:				**20MCA12**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Formulate and apply object-oriented programming using C++ to solve the engineering problems.**
- **Analyse data structures and algorithms to solve the problems and evaluate their solutions.**
- **Demonstrate different Applications of data structures.**
- **Study the algorithms or program code segments that contains iterative constructs**
- **Analyse the asymptotic time complexity of the algorithm or code segments.**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction To Data Structures And Algorithms	**12 Hrs**
Introduction to stacks, Applications of Stack. Queues and linked lists: Basic Operations, Implementation, List ADT, Applications, Complex Implementations. Singly Linked List. Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Example of list operations such as insert and delete an element before a key element, Header nodes, Array implementation of lists.: Circular Linked List: Inserting, deleting and searching elements in a lists, Double Linked List: Inserting and Deleting Nodes, Queue as doubly linked lists, such as insert into position, Delete an specified element	
MODULE 2: Trees	**10 Hrs**
Basic concepts, Binary trees and its properties, operations on binary trees, Binary tree traversals, Binary Search Tree: insertions, deletions, B-Tree, red-black trees, AVL Tree.	
MODULE 3: Algorithm AnalysisAnd Algorithmic Paradigms	**10 Hrs**
Introduction, Fundamentals of the Analysis of Algorithm Efficiency Notion of Algorithm, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms,Selection Sort and Bubble Sort. **Brute Force:**String Matching **Divide-and-Conquer:** Merge sort, Quicksort, Binary Search.	
MODULE 4: Algorithm Design Techniques	**10 Hrs**

The General method, Prim's Algorithm, Kruskal's Algorithm, Dijkstra'sAlgorithm, Huffman Trees. Dynamic Programming: Computing a binomialcoefficient, Warshall's and Floyd's Algorithms.	
MODULE 5: Graph Algorithms	**10Hrs**
The Knapsack Problem, **Decrease-and-Conquer: Depth** First and Breadth First Search, **Backtracking:** n-Queens problem.	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

Textbooks:

3. Richard F Gilberg and BehrouzAForouzan: Data Structures - A Pseudocode Approach with C,Cengage Learning, 6 the Indian Reprint 2009.
4. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition

Reference Books

3. YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenenbaum: Data Structures using C and C++, 2ndEdition, Pearson Education Asia, 2002.
4. NanjeshBennur, Dr.Manjaiaha DH, Dr. C.K. Subbaraya: C programming skills and Data Structures primer, First Edition, IPH Publication, 2017.
5. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI 1998.
6. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication 2001.

COURSE OUTCOMES (CO):

CO1: Demonstrate the implementation of Stack, Queue and List for real world applications.

CO2: Analyze algorithms and solve real time problems using various algorithm design techniques.

CO3: Apply the asymptotic notations to show the performance of the algorithm or code segments.

CO4: Solve the optimization problems by recommending an efficient algorithm.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO1, PO2, PO5**
CO2	**PO1,PO2**
CO3	**PO1,PO4,PO5**
CO4	**PO1, PO2, PO5**

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**			**M**							
CO2	**H**	**M**										
CO3	**H**			**M**	**L**							
CO4	**H**	**M**			**M**							

I SEMESTER
WEB TECHNOLOGIES

Sub Code				**20MCA13**		**CIE Marks**	**50**
Number of Lecture Hours per week				**4**		**SEE Marks**	**50**
Total number of Lecture Hours				**52**		**SEE Hours**	**3**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- To design web pages using Bootstrap framework
- To develop different approaches of Server side scripts using PHP and NodeJs
- To design Single page web applications using Angular
- To design asynchronous web applications using Ajax and Angular.

MODULES	TEACHING HOURS
MODULE 1: Bootstrap	**10 Hrs**
Introduction, **Layout**: Container, Grid, **Components**: Alerts, Badge, Card, Jumbotron, Buttons/Buttons group, Navs/Navbar, Pagination, Modal,Carousel, Collapse, Form, Input group, Progress bar	
MODULE 2: Introduction to PHP	**11 Hrs**
Overview of PHP, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files handlers. Building Web applications with PHP- Using databases, tracking users-cookies, sessions.	
MODULE 3: jQuery & Ajax	**10 Hrs**
jQuery: Basics, Selecting elements, Handling Events, jQuery effects Animation-show/hide, fade, animate, stop,Sending data with AJAX-load(),$.get() and $.post() methods AJAX principles, Creating Ajax applications, Adding Server-side programming, Sending data to the server using GET and POST.Connecting to Google suggest.	
MODULE 4: Angular	**11 Hrs**
Single Page Applications, Angular Introduction, MVC Architecture, Getting Started-How Angular Works, Writing Your First Angular Web Application, Data binding, Angular Directives, Forms, Services & Dependencies, and Routing.	
MODULE 5: NodeJs	**10 Hrs**
Introduction, NPM, REPL, Global objects, Developing Node.js web application, Call back concept, Node Modules-Local Module, HTTP Module, file system modules, ExpressJS.	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

TextBooks:

1. "Bootstrap Essentials",SnigBhaumik, PACKT publishing
2. Robert W. Sebesta: Programming the World Wide Web, 7th Edition, Pearson Education,2012.
3. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2011
4. "ng-book -The Complete Guide to Angular", Nate Murray, Felipe Coury, Ari Lerner, and Carlos Taborda, Fullstack.io

Reference Books

1. Amos Q. Haviv," MEAN Web Development",Packt Publishing,2014.
2. Nicholas C Zakas et al: Professional AJAX, Wiley India, publications

COURSE OUTCOMES (CO)

CO1: Demonstrate the concepts of user interface and server side framework for responsive web application development

CO2: Apply the knowledge of designing web application that use asynchronous communication.

CO3: Design Single page web applications using JavaScript frameworks.

CO4: Design an interactive web page with server side scripting language for real world problems.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	PO5,PO11
CO2	PO2,PO4,PO5,PO11
CO3	PO2,PO4,PO5,PO7,PO11
CO4	PO5,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					H						M	
CO2		M		H	H						L	
CO3		L		M	H		H				H	
CO4					M						H	

I SEMESTER
RDBMS

Sub Code:				**20MCA14**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**52**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**4 Hrs**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Understand and implement the processes of database management system.**
- **Apply the SQL Query , Database Design.**
- **Interpret RDBMS concept and managing multiple transactions , recovery techniques in case of transaction failures**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction: Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems, Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types.	**12 Hrs**
MODULE 2: Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries, Additional Basic Operations, Null values, Aggregate Functions, nested Sub queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints.	**10 Hrs**
MODULE 3: Database Design Informal Design Guidelines for Relation Schemas, Functionaldependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce Codd NormalForms, Stored Procedures andfunctions, Triggers.	**10 Hrs**
MODULE 4: Introduction To RDBMS Introduction to popular RDBMS product and their features, Difference between DBMS and RDBMS, Relationship among application programs and RDBMS	**10 Hrs**
MODULE 5: Transaction Management: Transaction Concept, A Simple Transaction Model,TransactionAtomicity	**10 Hrs**

and Durability, Serialisability, Transaction Isolationand Atomicity, Transaction Isolation Levels, Implementationof Isolation Levels.Concurrency Control: Lock Basedprotocols,Deadlock Handling. RecoverySystem: Failure Classification, Storage, Recovery and Atomicity, RecoveryAlgorithm.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison - Wesley, 2011
2. Silberschatz, Korth and Sudharshan Data base System Concepts,6th Edition, Tata McGraw Hill, 2011

Reference Books

1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education,2009.
2. Raghu Ramakrishnan and Johannes Gehrke: Database management Systems, 3rdEdition, McGraw-Hill, 2003.

COURSE OUTCOMES (CO)

CO1: Students are demonstrated on the fundamentals of data models and develop an ER diagram and relational database model for a given scenario

CO2: Students understand to query the database

CO3: Students apply the rules of normalization to Inference the database design in the real world entities

CO4: Students understand on processing multiple transactions, concurrency control techniques and recovery

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1
CO2	PO1, PO2,PO4
CO3	PO1, PO2,PO4,PO5,PO7
CO4	PO1, PO2,PO4,PO5,PO7, PO8

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**											
CO2	**M**	**L**		**H**								
CO3	**M**	**L**		**H**	**M**		**H**					
CO4	**M**	**L**		**M**	**H**		**H**	**H**				

I SEMESTER
MATHEMATICAL AND STATISTICAL MODELLING FOR COMPUTER APPLICATIONS

Course Code:				**20MCA15**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **The primary objective of this course is to provide mathematical background and sufficient experience on various topics of discrete mathematics**
- **Acquire Knowledge like matrix algebra, logic and proofs, combinatory, graphs, algebraic structures, formal languages and finite state automata. This course will extend student's Logical and Mathematical maturity**
- **Ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.**

MODULES	TEACHING HOURS
MODULE 1: **Matrix Algebra** Rank of a matrix - Solving system of equations – Eigen values and Eigenvectors Cayley - Hamilton theorem - Inverse of a matrix.	**12 Hrs**
MODULE 2: Basic Set Theory Basic definitions - Venn diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion – Partitions -Permutation and combination – Relations - Properties of relations – Matrices of relations - Closure operations on relations - Functions – Injective, subjective and objective functions.	**10 Hrs**
MODULE 3: Mathematical Logic Propositions and logical operators - Truth table - Propositions generated by a set - Equivalence and implication - Basic laws - Some more connectives - Functionally complete set of connectives - Normal forms - Proofs in propositional calculus - Predicate calculus.	**10 Hrs**
MODULE 4: STATISTICS Introduction-meaning and scope of statistics, collection of data, classification and tabulation, diagrammatic and graphical representation, measures of central tendency, measures of dispersions, skewness and kurtosis	**10 Hrs**

MODULE 5: CORRELATION, REGRESSION, AND PROBABILITY	**10 Hrs**
Basics of correlation and regression, partial correlation, multiple correlation, Theory of probability, theoretical distribution, Binomial distribution, Poisson distribution, Normal distribution, chi-square distribution, regression analysis, and curve fitting	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Textbooks:

1. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2006.
3. Hopcroft J.E and Ullman,J.D, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.
4. Venkataraman, M.K., "Engineering Mathematics", 2nd Edition, Volume-II, National Publishing Company, 1989.

Reference Books

1. Sengadir, T. "Discrete Mathematics and Combinatorics" Pearson Education, New Delhi, 2009.
2. Trembley, J.P. and Manohar, R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 2007.
3. N G Goudru. **"**Discrete Mathematical Structures"

COURSE OUTCOMES (CO)

CO1: Basic knowledge of matrix, set theory, functions and relations concepts needed for designing and solving problems.

CO2: Logical operations and predicate calculus needed for computing skill Design and solve Boolean functions for defined problems.

CO3: Apply the acquired knowledge of Statistical Analysis to the engineering areas

CO4: Implement knowledge of theory of probability and to design discrete and continuous problems to solve by computers.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

`Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO1, PO2, PO3**
CO2	**PO1, PO3, PO10**
CO3	**PO3, PO6, PO10**
CO4	**PO1,P03, PO5**

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**M**	**H**									
CO2	**M**		**H**							**L**		
CO3			**H**			**M**				**L**		
CO4	**L**		**M**		**H**							

I SEMESTER

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Sub Code:				**20MCAL16**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:						**SEE Hours:**	**3**
Lecture (L):	**0**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- **Design & Develop the fundamentals of Object-oriented programming in Java, including defining classes, invoking methods, using class libraries.**
- **Design & Develop exception handling and multithreading concepts.**
- **Develop efficient Java applets and applications using OOP concepts**

Sl. No	Program
1.	a) Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading. b) Write a JAVA Program to implement Inner class and demonstrate its Access protection.
2.	Write a program in Java for String handling which performs the following: i) Checks the capacity of String Buffer objects. ii) Reverses the contents of a string given on console and converts the resultant string in upper case. iii) Reads a string from console and appends it to the resultant string of (ii).
3.	a) Write a JAVA Program to demonstrate multi-level Inheritance. b) Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
4.	Write a JAVA program which has i) A Class called Account that creates account with 500Rs minimum balance, a deposit()method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than 500Rs. ii) A Class called LessBalanceException which returns the statement that says withdraw amount (Rs) is not valid. iii) A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a LessBalanceException take appropriate action for the same.
5.	Write a java program to handle the followingsystem exceptions **ArrayIndexOutOfBoundException** **FileNotFoundException** **NumberFormatException**

6.	a) Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept. b) Design a program to create two threads, one thread will print odd numbers and second thread will print even numbers between 1 to 10 numbers
7.	Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws).
8.	Complete the following: i. Create a package named shape. ii. Create some classes in the package representing some common shapes like Square, Triangle, and Circle. iii. Import and compile these classes in other program.
9.	Write a JAVA program which has i). A Interface class for Stack Operations ii). A Class that implements the Stack Interface and creates a fixed length Stack. iii).A Class that implements the Stack Interface and creates a Dynamic length Stack. iv). A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.
10.	Write a JAVA Program which uses FileInputStream / FileOutPutStream Classes.
11.	Write a JAVA applet program, which handles keyboard event.
12.	Write a JAVA program which uses Datagram Socket for Client Server Communication for multiple systems

INSTRUCTIONS:

In the practical Examination student has to execute one program from a lot of all the 12 questions

COURSE OUTCOMES (CO)

CO1: Design and Develop Java programming languageand runtime environment. Gain knowledge and skill necessary to write java programs. Learn the object oriented concepts and its implementation in Java implement the multithreading and client side programming

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1,PO2,PO3,PO4,PO5,PO10,PO11**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**H**	**H**	**H**	**H**					**M**	**M**	

I SEMESTER
DATA STRUCTURES AND ALGORITHMS LAB

Course Code:				**20MCAL17**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**26**		**SEE Hours:**	**3**
Lecture (L):	**0**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- **Design the programming codes for the implementation of data structures and algorithm concepts.**
- **Develop the codes to Analyse data structures and algorithms to solve the problems and evaluate their solutions.**

Sl. No	Program
1.	a) Design, Develop and Implement a menu driven program in C++ for the following operations on STACK of integers (Array implementation of stack with maximum size MAX) i. Push an element on to stack ii. Pop an element from stack. iii. Demonstrate how stack can be used to solve tower of Hanoi problem with n disks. iv. Demonstrate Overflow and Underflow situations on stack. v. Display the status of stack. vi. Exit. Support the program with appropriate functions for each of the above operations.
2.	Design, Develop and Implement a Program in C++ for the following Stack Applications Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
3.	Design, Develop and Implement a menu driven Program in C++ for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX). i. Insert an Element on to Circular QUEUE ii. Delete an Element from Circular QUEUE iii. Demonstrate Overflow and Underflow situations on Circular QUEUE iv. Display the status of Circular QUEUE v. Exit Support the program with appropriate functions for each of the above operations

4.	Design, Develop and Implement a menu driven Program in C++ for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Semester, Mobile number i. Create a SLL of N Students Data by using front insertion. ii. Display the status of SLL and count the number of nodes in it iii. Perform Insertion and Deletion at End of SLL iv. Perform Insertion and Deletion at Front of SLL v. Demonstrate how this SLL can be used as STACK and QUEUE vi. Exit
5.	Design, develop and Implement a menu driven Program in C++ for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo. i. Create a DLL of N Employees Data by using end insertion. ii. Display the status of DLL and count the number of nodes in it iii. Perform Insertion and Deletion at End of DLL iv. Perform Insertion and Deletion at Front of DLL v. Demonstrate how this DLL can be used as Double Ended Queue vi. Exit
6	Design, Develop and Implement a Program in C++ for create insert, delete and exit operations on Singly Circular Linked List (SCLL) with header nodes
7	Design, Develop and Implement a menu driven Program in C++ for the following operations on Binary Search Tree (BST) of Integers i. Create a BST of N Integers ii. Traverse the BST in Inorder, Preorder and Post Order iii. Search the BST for a given element (KEY) and report the appropriate message iv. Delete an element (ELEM) from BST v. Exit
8	Sort a given set of elements using Quick sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
9	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
10	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
11	Implement Floyd's algorithm for the All-Pairs- Shortest-Paths Problem.
12	Compute the transitive closure of a given directed graph using Warshall's algorithm.

13	Implement N Queen's problem using Back Tracking.

Course Outcome(CO)

CO1: Design, Develop and Analyze the performance of C/C++ programs that implementvarious data structures and their applications in fundamental algorithms

COURSE OUTCOMES	**MAPPING WITH PROGRAM OUTCOMES:**
Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P12
CO1	H	H	L	M	M						L	

I SEMESTER

MINI PROJECT IN WEB TECHNOLOGIES

Sub Code:				**20MCAM18**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:						**SEE Hours:**	**3**
Lecture (L):	**0**	**Practicals (P):**	**1**	**Tutorial (T):**	**1**	**Total Credits:**	**2**

COURSE LEARNING OBJECTIVES (CLO)

- **To design web pages using Bootstrap framework and add effects with jQuery.**
- **To develop different approaches of Server side scripts using PHP and NodeJs**
- **To design asynchronous web applications using Ajax and Angular.**

NOTE:

1. In the examination, one exercise from part A is to asked for 30 marks
2. Mini project student group size is limited to two students only.
3. The mini project under part B has to be evaluated for 20 marks.
4. Project report duly signed by the Guide and HOD , need to be submitted during examination.

PART –A

Sl.No	Program
6.	Design a webpage with Home tab and Sign In links using Tabs/navs. Apply modal for Sign In page and an image for Home tab.
7.	Design a web page for Photo Gallery using Bootstrap Carousel.
8.	Write jQuery program to solve the following : a) Limit character input in the text area including count. b) Based on check box, disable / enables the form submit button.
9.	a) Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page. b) Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
10.	Create HTML form with Name of License Holder, Fuel type, Vehicle Type, Registration Number, Make & Model, Year of Registration. On submitting, store the values in MySQL table. Retrieve and display the data based on name.
11.	Implement String Interpolation and Two-way Binding in Angular.
12.	Implement Structural Directives in Angular.
13.	Demonstrate the working of built-in module and local modules in NodeJS.

Note 1: Student has to pick one question from a lot of 6 questions

PART-B

Design and develop asynchronous/dynamic web application using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies, frameworks and databases. Host the developed project using any free web hosting provider.

NOTE:

1. In the examination, one exercise from part A is asked for 30 marks.
2. The mini project under part B has to be evaluated for 20 marks.
3. A team of two students must develop the mini project.

However during the examination, each student must demonstrate the project individually.

4. The team must submit a brief project report (25-30 pages) that must include the following
   - Introduction
   - Requirement Analysis
   - Software Requirement Specification
   - Analysis and Design
   - Implementation
   - Testing
5. The report must be evaluated for 5 Marks. Demonstration and Viva for 15 Marks.
6. Project report duly signed by the Guide and HOD need to be submitted during examination.

INSTRUCTIONS

1. All laboratory experiments from part A are to be included for practical examination.
2. Mini project has to be evaluated for 30 Marks.
3. Report should be prepared in a standard format prescribed for project work.
4. Students are allowed to pick one experiment from the lot.
5. Strictly follow the instructions as printed on the cover page of answer script.
6. Marks distribution:

a) Part A: Procedure + Conduction + Viva:5 + 20 +5 =30 Marks
b) Part B: Demonstration + Report + Viva voce = 10+05+05 = 20 Marks

COURSE OUTCOMES (CO)

CO1: Design and Develop interactive asynchronous web application with server side script.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

CO1	PO2, PO4, PO5, PO7,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO		L		M	M		S				S	

I SEMESTER
PRINCIPLES OF PROGRAMMING

Course Code:				**20MCAB19**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**03**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**0**

COURSE LEARNING OBJECTIVES (CLO)

- **Provide students with the formal notations for solving a problem and make them learn the syntax of C language, thereby writing code with good programming style.**
- **Understand and appreciate the use of arrays, strings, functions, structures and Union in C**
- **Exploring the pointers and data file processing**

MODULES	**TEACHING HOURS**
MODULE 1: Algorithms and Flowcharts Introduction to Algorithms, Definition of flowcharts, symbol of flowcharts, Algorithms & flowcharts using input statements, output statements, compute statements, and conditional statements and iterative statements.	**8 Hrs**
MODULE 2:Arrays and Strings Introduction to array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays, dynamic arrays, programming examples. Declaring and initializing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions, table of strings, other features of strings, programming examples	**8 Hrs**
MODULE 3: User Defined Functions Need for user defined functions, a multi-function program, elements of user defined functions, defining functions, return values and their types, function calls, function declaration, category of functions, no arguments and no return values, arguments but no return values, arguments withreturn values, no arguments with return value, function that return multiple values, nesting of functions, recursion, passing array to functions passing string to functions, programming examples	**8 Hrs**

MODULE 4: Structures and Unions Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures, bit fields, programming examples	**7 Hrs**
MODULE 5: Pointers and File Management Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, chain of pointers, pointer expressions, pointers and arrays, pointer and character strings, array of pointers, pointer as function arguments, functions returning pointers, pointers and structures, programming examples. Defining and opening a file, closing a file, input/output operation on files, error handling during I/O operations, random access files, command line arguments, programming examples.	**8 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Vikas Gupta:"Computer Concepts & C Programming",Dreamtech Press 2013. ISBN-13:9788177229981/ISBN-10:8177229982
2. Jacqueline Jones & Keith Harrow: Problem Solving with C, 1st Edition, Pearson 2011.
3. R S Bichkar, Programming with C, University Press, 2012.
4. V Rajaraman: Computer Programming in C, PHI, 2013.

Reference Books

1. Behrouz A Forouzan, Richard F Gilberg: Computer Science-A Structured Approach Using C, 3rd Edition, Cengage Learning,2013
2. M G Venkateshmurthy:Programming Techniques through C, Pearson Education, 2017
3. Ivor Horton: Beginning C from Novice to professional, 7th Edition, Springer, 2014

COURSE OUTCOMES (CO)

CO1: Design, write and execute C programs for simple applications

CO2: Formulateand appreciate the use of arrays, strings, functions, structures and unions in C

CO3: Design the pointers and data file processing

CO4: Design the pointers and data file processing

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	**Mapping with Program Outcome(PO)**
CO1	**PO1,PO2,PO3**
CO2	**PO1,PO2,PO4,PO9,PO12**

CO3	**PO1,PO2,PO4,PO9,PO12**
CO4	**PO1,PO2,PO4,PO9,PO12**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	M							H		
CO2	L	L		M					M			H
CO3	L	L		M					M			H
CO4	L	L		M					H			H

II SEMESTER
PYTHON PROGRAMMING

Sub Code:				**20MCA21**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

0. **Describe the Fundamentals of Python**
1. **Demonstrate the python data structure**
2. **Implement the data wrangling and data preprocessing**

- **Understand and learn data analytics concept using Numpy, pandas and data visualization.**

MODULES	TEACHING HOURS
MODULE 1: Python Basic Concepts and Programming	**10 Hrs**
Introduction to Python programming, Features of Python, Execution of a Python Program, Python Virtual Machine (PVM, Frozen Binaries, Memory Management in Python, Garbage Collection in Python, Comparisons between C and Python, Data types in Python, Control Statements , Functions.	
MODULE 2: Python Collections	**10 Hrs**
J2EE Strings: Creating and storing strings, string operations, formattingStrings. Lists: Basic List operations, Built in functions used on lists, List Comprehensions. Tuples and Sets: Basic Operations on Tuples, Functions to Process Tuples. Set Methods, set operations. Dictionaries: Operations on Dictionaries, Dictionary Methods.	
MODULE 3: :Files and Database Connectivity	**10 Hrs**
Exceptions Files: File Handling Object oriented Programming: Basics of oops, Encapsulation, Inheritance, polymorphism	
MODULE 4: Data Pre-processing and Data Wrangling	**10 Hrs**

Acquiring Data with python: Loading from different files, Accessing databases. Cleaning data with Python: Striping out extraneous information, Normalizing data and formatting data. Combining and merging Data sets-Reshaping and pivoting-Data Transformation – String Manipulation. Web scraping: Data Acquisition by scrapping web applications.	
MODULE 5: Numpy, Pandas and Data Visualization	**12 Hrs**
Numpy: The Numpy Array, N-dimensional array operations and manipulations. Data processing using arrays. Pandas: Essentional Functionality, Data frames, computing descriptive statistics, Time series analysis with pandas. Data Visualization: Matplotlibs package-plotting graphs-controlling Graph-Adding Text- More Graph types. Data Visualization with Seaborne.	
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
Text Books:	
1. Core Python Programming: 2017 Edition, R. Nageswara Rao, DreamTechPublication.	
2. Python for Data Analysis 2nd Edition, O'Reilly Publications	
3. Exploring Python, Timothy A. Budd, Mc Graw Hill Education	
4. Introduction to Python Programming ,Gowrihankar S, Veena A, CRC Press/Tyler and Francies	
Reference Books	
1. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.	
2. Python for Informatics: Exploring Information, Charles Severance.	
3. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication.	
4. Mastering Python Fundamentals with Ease, Asha Gowda Kare Gowda, Bhargavi K,Lambart Academic publishing.	
COURSE OUTCOMES (CO)	
CO1:Understand the Fundamentals of Python programming	
CO2: Demonstrate various features of python programming for building applications.	
CO3: Apply python programming for designing the applications efficiently.	
CO4:Design and Develop applications to be deployed in real world scenarios.	

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	**PO1,PO2,PO3,PO4,PO5,PO8**
CO 2	**PO1,PO2,PO3,PO4**
CO 3	**PO1,PO2,PO3,PO4,PO5**
CO 4	**PO1,PO2,PO3,PO4,PO5**

LEVEL OF CO-PO MAPPING TABLE

CO/ PO	**PO**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**H**	**H**	**M**	**S**							
CO2	**H**	**M**	**H**	**H**	**L**							
CO3	**M**	**M**	**H**	**H**	**L**					**M**	**M**	
CO4	**M**	**M**	**H**	**H**	**L**					**H**	**H**	

II SEMESTER

INTERNET OF THINGS

Sub Code:				**20MCA22**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**04**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**03**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**04**

COURSE LEARNING OBJECTIVES (CLO)

- **Learn the evolution of IOT from M2M to global Context.**
- **Understand IoT in managing data and knowledge.**
- **Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.**
- **Analyse the application areas of IOT .**
- **Design IoT projects to make the Real World work easy.**

MODULES	TEACHING HOURS
MODULE 1: Introduction to IoT	**6 Hrs**
Definition and characteristics of IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Modern day IoT applications, Physical and Logical design of IoT, IoT communicational model, IoT Challenges, The Core IoT Functional Stack.	
MODULE 2: Smart Things	**6 Hrs**
IoT Sensors, Actuators, IoT Networking, Connecting Smart Objects, Communications Criteria, IoT Access Technologies, Sensor Networks, IoT Access Technologies. IoT Enablers, Connectivity Layers, Baseline Technologies: M2M, CPS and WoT.	
MODULE 3: Embedded System Platform for IoT	**15 Hrs**
Embedded Devices: Introduction, Processor for things, Things design, Gateway design. **Arduino**: Introduction, Getting started with Arduino Feature of Arduino, Types of Arduino Board, Arduino IDE, Anatomy of Interactive devices, Blinking an LED. **Raspberry Pi**: Introduction, Essential of setting Raspberry Pi, Programming	

Raspberry with Python. **Mobile Application Development for IoT using Android:** Sending and Receiving Data via Bluetooth with an Android Device, Android application for Home Automation.	
MODULE 4: Communication Technologies	**15 Hrs**
Introduction,OSI and TCP/IP communication model for communication network.DataProtocol:MQTT,CoAP,AMQP,XMPP,WebSocket. **CommunicationProtocols:**IntroductiontoIEEE802.15.4,Zigbee,6LowPan, WirelessHART,Z –Wave, ISA 100, Bluetooth, NFC, RFID,LoRa. **Applications of IoT**: Smart Cities and Smart Homes, Connected Vehicles, Industrial Internet of Things, program practices. Problem statements for project work.	
MODULE 5: Big Data and Cloud Computing for IoT	**10 Hrs**
Big Data for IoT: Introduction, IoT platforms, The Eight main components of an IoT platform. IoT platform in Action: Use case for an appliance retailer. **Cloud Computing for IoT:** Sensor cloud, Fog Computing, Sending & Receiving Data to & from cloud, hands on example programs. **Examples of IoT platforms:**AWS IoT, Microsoft Azure IoT,IBM Watson, Cisco's IoT,SalesForce'sIoT,Carriots,Oracle Integrated Cloud, How to select the right IoT platform.	
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
TextBooks	
1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).	
2. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547).	

Reference Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things:Introduction to a New Age of Intelligence",1 stEdition,AcademicPress, 2014.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224).

COURSE OUTCOMES (CO)

CO1: Understand the concepts and application areas of IOT ·

CO2: Apply the concepts of IoT to different applications.

CO3: Analyze the IoT architecture and design along with functional/compute stack and data management.

CO4: Design and Implement IoT applications in different domains and embedded platform.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO5, PO10
CO2	PO2,PO3,PO4,PO5,PO8
CO3	PO2, PO3,PO4.
CO4	PO2, PO3, PO4, PO8, PO11, PO12.

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				M					H		
CO2		H	M	M	H			L				
CO3		H	M	H						L		
CO4		H	H	H	H			M			H	H

II SEMESTER

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Course Code:				**20MCA23**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**04**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3 Hours**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

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

- **Classify various software requirement process and tools**
- **Build software Design and Architecture using software notations and tools**
- **Understand, how to implement the software project using software tools and Methodologies**
- **Test the software and Measure the quality of Software**
- **Manage the software using software Management tools**

MODULES	TEACHING HOURS
MODULE 1: Requirements Engineering Software requirements Fundamentals, Requirements process, Requirements elicitation, Requirements Analysis, Requirements specification, Requirements validation, Practical consideration, Requirement tools	**10 Hrs**
MODULE 2: Software Architecture and Design Software Design Fundamentals, Key Issues in Software Design, Software structure and Architecture, User Interface design, Software design quality analysis and evaluation, Software design notations, Software design strategies and Methods, Software design tools	**10 Hrs**
MODULE 3: Software Implementation Methods and Tools Software implementation Fundamentals, Managing software Implementation, Practical considerations, software Implementation Tools, software implementation Technologies, Product Documentation, Formal software Implementation methods	**10 Hrs**

MODULE 4: Software Testing and Software Quality Software Testing: Software Testing Fundamentals, Test levels, Test Techniques, Test related measures, Test process, testing tools Software Quality: Software Quality fundamentals, Software quality management processes, practical considerations, Software Quality tools	**10 Hrs**
MODULE 5: Software Project Management Initiation and Scope definition, Software project planning, software project implementation plans, Review and evaluation, software closure activities, software engineering measurement, Software management tools	**12 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books:

1. Software Engineering, 10th Edition Ian Sommerville , University of St. Andrews, Pearson, 2016
2. Software Engineering: A Practitioner's Approach, 8/eby Bruce R. Maxim and Roger S. Pressman , 2019
3. Fundamentals of Software Engineering, Rajib Mall, 4th Edition, PHI, 2014

Identify, formulate and solve engineering problems in the domain of structural engineering field.

Reference Books

3. Object oriented software engineering, Stephan R .Schach, Tata McGraw Hill,2008
4. Applying UML and Patterns, Craig Larman, , 3rd edition, Pearson Education, 2005.
5. SWEBOK Guide 3.0 by Pierre Bourque , Richard E. (Dick) Fairley @ IEEE Computer Society

COURSE OUTCOMES (CO)

CO1: Identify, formulate and solve Software requirement Engineering problems

CO2: Design and Implement the software by using software design notations and design tools

CO3: Demonstrate various software tools for software testing and software Quality

CO4: Develop a Software using efficient software project management Techniques with sense of ethics, integrity and social responsibility

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES	
Course Outcomes (COs)	**Mapping with POs**
CO1	**PO1, PO2, PO9, PO11**
CO2	**PO2, PO3,PO5,PO8, PO10, PO11**
CO3	**PO4, PO5,PO6,PO10**
CO4	**PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11, PO12**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	M							H		M
C02		M	M		H			M		M	H
CO3				L	M	M				H	
C04			L	M	M	M	M	H	H	M	H

II SEMESTER

RESEARCH METHODOLOGY

Sub Code:				**20MCA24**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Understand basic concepts of research and its methodologies.**
- **To gain overview of a range of quantitative and qualitative approaches to data analysis.**
- **To Accurately collect, analyze and report data**
- **Be aware of the ethical principles of research, report writing and ethical challenges**

MODULES	TEACHING HOURS
MODULE 1: Overview of Research	**8 Hrs**
Research and its types, Research approaches, Significance of Research, Research Methods versus Methodology. Research Process. Criteria of Good Research. Identifying and defining research problem, Technique Involved in Defining a Problem.	
MODULE 2: Introduction to research designs.	**8 Hrs**
Essential constituents of Literature Review. Basic principles of experimental design, Primary data and Secondary Data, methods of primary data collection, classification of secondary data, designing questionnaires and schedules.	
MODULE 3: Sampling Methods	**8 Hrs**
Probability sampling: simple random sampling, systematic sampling, stratified sampling, cluster sampling and Multistage sampling. Non probability sampling: convenience Sampling, judgment sampling, quota sampling. Sampling distributions.	
MODULE 4: Processing &analysis of Data Statistical measures and their significance:	**8 Hrs**
Central tendencies, variation, skewness, Kurtosis, Correlation-Pearson Correlation and regression-Linear Regression, Testing of Hypotheses: Parametric test: z-test, t-test, Non parametric test-Chi Square.	

MODULE 5: Essential of Report writing and Ethical issues:	**7 Hrs**
Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Ethical issues related to Research, Plagiarism and self- Plagiarism, Publishing.	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

TextBooks:

3. Kothari C.R., Research Methodology Methods and techniques by, New Age International Publishers, 3rd Edition, 2013.
4. Levin RI and Rubin, "Statistics for Management ", 7th Edition, Pearson Education, New Delhi, ISBN : 9788177585841

Reference Books

1. Krishnaswami KN ,Sivakuma AI and Mathiarajan, " Management Research Methodology" , Pearson Education, 2009, ISBN : 9788177585636

COURSE OUTCOMES (CO)

CO1: Explain various research objectives and concepts of qualitative and quantitative research problems and report writing.

CO2: Apply appropriate method for data collection, process the complex data and prepare a report.

CO3: Analyse the real word data with quantitative techniques and interpret the results.

CO4: Formulate research methodology for real world problems.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(Cos)	**Mapping with Program Outcomes(POs)**
CO1	PO2, PO4, PO8
CO2	PO2,PO3,PO4,PO5
CO3	PO5,PO6
CO4	PO1,PO2,PO3,PO4,PO5,PO7,PO10

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S		M				L				
CO2		M		M				L				
CO3					M	S						
CO4	L	L	M	M	S		S			M		

II SEMESTER

PYTHON PROGRAMMING LAB

Course Code			**20MCAL27**			**CIE Marks**	**50**
Number of Practical Hours/Week			**02**			**SEE Marks**	**50**
Total Number of Lecture Hours:			**26**			**SEE Hours**	**3**
Lecture (L):	**0**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

Course Learning Objective(CLO) :

- **Learn basics concepts of python programming.**
- **Implement advanced programs in python based on the knowledge gained.**

List of Programs

1.	Demonstrate a python program on i) Control statements ii) Functions
2.	Demonstrate string operations
3.	Demonstrate list operations
4.	Demonstrate Set operations
5.	Demonstrate operations on Tuple
6.	Demonstrate operations on dictionary
7.	Demonstrate File handling
8.	Demonstrate Object oriented Concepts
9.	Implement a python program to demonstrate Importing Datasets , Cleaning the Data
10.	Data frame manipulation
11.	Implement a python program to demonstrate the following using NumPy a) Array manipulation, Searching, Sorting and splitting. b) broadcasting and Plotting NumPy arrays
12.	Write a Python program to demonstrate Time series analysis with Pandas.
13.	Implement a python program to demonstrate Data visualization with various Types of Graphs

Note 1: In the practical Examination each student has to pick one question from a lot of

all the 13 questions.

Course outcomes(CO): After completing the course the students are able to:

CO: Design and develop an applications using Python Programming for real world senario.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	**PO1,PO2,PO3,PO4,PO5,PO8,PO11**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO	**H**	**H**	**M**	**H**	**M**			**H**	**H**			

II SEMESTER

INTERNET OF THINGS LAB

Sub Code:			**20MCAL28**		**CIE Marks:**	**50**	
Number of Lecture Hours per week:			**2**		**SEE Marks:**	**100**	
Total number of Lecture Hours:			**26**		**SEE Hours:**	**3**	
Lecture (L):		**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**01**

COURSE LEARNING OBJECTIVES (CLO)

- **To design and implement IoT programs Arduino /Raspberry pi.**

PART-A

1.TO interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.

2. To interfaceDHT11 sensor with Arduino /Raspberry Pi and write a program to print temperature and humidity readings.
3. To interface motor using relay with Arduino /Raspberry and write a program to turn on Motor when push button was pressed.
4. To interface Bluetooth with Arduino /Raspberry and write a program to send sensor data to smartphone using Bluetooth.
5. Write a program on Arduino /Raspberry pi to to retrieve temperature and humidity data from things speak cloud.

PART-B

1. Designimplementation of IoT for Home Automation.
2. Design and implementation of IoT for Smart parking.

COURSE OUTCOMES (CO)

CO1: Implement IoT programs using Arduino /Raspberry pi.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO2,PO3,PO4,PO5**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		**M**	**M**	**H**	**H**							

II SEMESTER

MINI PROJECT IN MOBILE APPLICATION DEVELOPMENT

Course Code				**20MCAM29**		**CIE Marks**	**50**
Number of Practical Hours/Week and				**2**		**SEE Marks**	**50**
Number of Instructional Hours/Week				**2**			
Total Number of Lecture Hours				**26+13**		**SEE Hours**	**03**
Lecture (L):	**0**	**Practicals(P):**	**1**	**Tutorial (T):**	**1**	**Total Credits:**	**2**

Course Learning Objectives:

- **Learn the basics of mobile app development**
- **Build mobile applications using database**
- **Develop mobile app that uses GPS location information**
- **Students will learn to develop a mobile app project using multiple features learnt**

NOTE:

1. In the examination, one exercise from part A is to asked for 20 marks
2. Mini project student group size is limited to two students only.
3. The mini project under part B has to be evaluated for 30 marks.
4. Project report duly signed by the Guide and HOD , need to be submitted during examination.

PART - A

Program List	
1.	Exploring layouts
2.	Exploring widgets
3.	Android activity life cycle
4.	Intents in Android and Shared preferences
5.	Sending SMS and EMAIL
6.	Fragments in android
7.	Animations
8.	Databases and content providers
9.	Sensors and location based services
10.	Audio playback and image capture

Note 1: Student has to pick one question from a lot of 10 questions

MINI-PROJECT

Students should be able to build a complete mobile app using multiple features learnt in Part – A with user interfaces and database connectivity. The Project should be deployed on the cloud like any cloud tool (ex.MS Azure, AWS etc..).The project work should be carried out with team strength of maximum two.

NOTE:

1. In the examination, one exercise from part A is asked for 20 marks.
2. The mini project under part B has to be evaluated for 30 marks.
3. A team of two students must develop the mini project.

However during the examination, each student must demonstrate the project individually.

4. The team must submit a brief project report (25-30 pages) that must include the following
   - Introduction
   - Requirement Analysis
   - Software Requirement Specification
   - Analysis and Design
   - Implementation
   - Testing
5. The report must be evaluated for 5 Marks. Demonstration and Viva for 15 Marks.

6. Project report duly signed by the Guide and HOD need to be submitted during examination.

Course Outcome:

CO: Design and develop android mobile applications for real world senario.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	PO1,PO2,PO4,PO5,PO8,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1	PO12
CO	M	M	H	H	M	H	H					

II SEMESTER
CYBER SECURITY

Sub Code:				**20MCA251**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**		**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.**
- **To develop graduates that can identify, Analyse**
- **Remediate computer security breaches.**

MODULES	TEACHING HOURS
MODULE 1: Introduction, Cybercrime	**8 Hrs**
Definition and Origins of the word, Cyber crime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cyber cafe and Cybercrimes, Botnets, Attack Vector, The Indian IT ACT 2000.	
MODULE 2: Tools and Methods used in Cybercrime	**8 Hrs**
Introduction, Proxy Server and Anonymizers, Password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow	
MODULE 3: Phishing and Identity Theft:	**8 Hrs**
Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.	
MODULE 4: Phishing and Identity Theft	**8 Hrs**
Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell. NetCatCommands, Net Cat Uses, SSH, Data Pipe, Fpipe	
MODULE 5: Network Defense tools	**7 Hrs**
Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless VsStateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books:

5. SunitBelapure and Nina Godbole, "Cyber Security: Understanding cyber crimes, computer forensics and legal perspectives", Wiley India Pvt. Ltd, 2013
6. James Graham, Ryan Olson, Rick Howard, "Cyber SecurityEssentials", CRC Press 2010

Reference Books:

1. Bill Nelson, Amelia Philips and Christopher Steuart, "Guide to Computer Forensics and Investigations", 4th Edition, 2015
2. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
3. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.

COURSE OUTCOMES (CO)

CO1: To Create Solutions in Incident Handling and Implement Cyber security Best Practices and Risk Management

CO2: Communicate in a Written and Professional Manner to Strategize Identify and Implement Legal Ramifications

CO3: Integrate Network Monitoring and Present Real-Time SolutionsUnderstand Software Design and Secure Practices

CO4: Implement Cyber security concepts in real time projects

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO3, PO5
CO2	PO1, PO3, PO10
CO3	PO3, PO8, PO10
CO4	P03, PO5, PO8

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L		H		M							
CO2	M		H							L		
CO3			H					M		L		
CO4			M		H			L				

II SEMESTER

SOFTWARE TESTING AND AUTOMATION							
Course Code:				**20MCA252**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**	**1**	**Tutorial (T):**	**-**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **The process of Software Testing Life Cycle and Types of Testing**
- **Differentiate between Manual Testing and Automation in Testing**
- **Design Test Cases using the testing tool Selenium IDE and Web Driver.**
- **Identify different web Elements and apply them to design test cases.**

MODULES	TEACHING HOURS
MODULE 1: INTRODUCTION TO TESTING	
Introduction and Fundamentals of Testing, Myths and Facts of Software Testing, Quality Assurance and Quality Control, Testing Objectives, Software Testing Life Cycle (STLC), Test Planning, Test-case Design Technique. Types of Testing- White Box testing, Black Box Testing, Integration Testing, Regression Testing, Validation Testing, Alpha Testing, Beta Testing, Acceptance Testing. Defect Management: Defect Management Process, JIRA Defect Tracking Tools.	**10 Hrs**
MODULE 2: USER INTERFACE TESTING	**10 Hrs**
Software Test Automation: Fundamentals of Test Automation, Manual Testing Vs Test Automation, Terms used in Automation, Skills needed for Automation, Scope of Automation, Challenges in Automation. Selenium – WebDriver: Introduction to WebDriver , Installation of Selenium WebDriver, Creating the Scripts in WebDriver, Web Element Locators, Xpath , id, LinkText, CSS Selector, Class Name, TagName WebDriver Commands: Browser Commands, getUrl(), getTitle(), getPageSource(),close(),Quit(), Navigation Commands, backward(0,forward(),to(),refresh() WebElements Commands, Isselected(), IsEnabled(), getAttribute(), getText(),notify(), sendKeys(), submit(), wait().	
MODULE 3: HANDLING WEB ELEMENTS	**12 Hrs**
CheckBox and Radio Button Operation, DropDown and Multiple select Operations, Handle Alert in WebDriver : dismiss(), accept(), getText(), sendKey(), Popup window handling in Web Drivers, getWindowHandle(), Wait commands in Web Drivers, Mouse Event using Action commands, Handling Multiple Windows, and IFrames, Running Test in Invisible Mode, Handling Dynamic Web Pages. Running selenium WebDriver in different popular Browser	

MODULE4: APPLICATION PROGRAMMING INTERFACE(API) TESTING	**10 Hrs**
Introduction, API testing types, Command, tests on APIs, Advantages, Tasks involved, Tools used for API Testing, Challenges, Best Practices, Case study, Database Testing, Security Testing.	
MODULE5: ADVANCED TOPICS ON TESTING	**10 Hrs**
Cross Platform Testing, Coding Standards Overview, Code Coverage Metrics, Code freeze, Code Inspection, Code Review, Code Walkthrough, Code based testing, Code driven Testing. CUCUMBER framework, Test Driven Development (TDD), Behavioral Driven Development (BDD)	
Practical Session: The Above Concepts are demonstrated in the Lab.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TEXTBOOKS

1. Rex Black: Advanced Software Testing—Vol. 1, Shroff Publishers, 2011.
2. Srinivasan DesikanGopalaswamy: Software Testing Principles and Practices,5th Edition, Pearson Education, 2007.
3. Paul C. Jorgensen: Software Testing ACraftman's Approach, 3rd Edition, Auernac Publications, 2008
4. 4. David Burns: Selenium 2 Testing Tools: Beginner's Guide, PACKT PUBLISHING, 2012.

REFERENCE BOOKS

1. Rex Black: Advanced Software Testing—Vol. 2, Shroff Publishers, 2011.
2. GundechaUnmesh: Selenium Testing Tools Cook Book, PACKT PUBLISHING, 2012

COURSE OUTCOMES (CO)

CO1: Analyse the process of Software Testing Life Cycle and types of Testing.

CO2: Demonstrate Manual Testing and Automation in Testing

CO3: Design Test Cases for User Interface Testing.

CO4: Design Test Cases for Application Programming Interface (API) Testing and Data base Testing.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**

CO1	**PO1,PO3**
CO2	**PO1,PO2,PO3**
CO3	**PO1,PO2,PO3**
CO4	**PO1, PO2, PO3, PO4**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M									
CO2	M	M	M									
CO3	S	M	M									
CO4	M	M	M	L								

II SEMESTER

DATA SCIENCE USING R

Sub Code:				**20MCA253**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**03**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To understand the concepts of Data science.**
- **To analyse the sampling techniques for data classification.**
- **To implement modelling methods for machine learning problems.**
- **Analyzing data from files and Visualizing graphical presentations using R.**

MODULES	**TEACHING HOURS**
MODULE 1: Data Science Process	**10 Hrs**
Introduction, Evolution of data science, Data science process – roles, stages in data science project – components of the Data Science lifecycle, data analytics, exploring data – managing data – cleaning and sampling for modeling and validation	
MODULE 2: Exploring R Basics	**11 Hrs**
Introduction, R features basic data types, Vectors, Lists ,Arithmetic, logical & Matrix Operations, Control structures, Functions in R, Data frames ,Reading Data & cleaning data Data visualization techniques –Histograms, box plot, bar chart, scatter plot.	
MODULE 3: Statistical Measures In R	**10 Hrs**
Understanding Descriptive statistics, standard deviations, probability distribution, Normal distribution-Skewness, kurtosis, Inferential statistics-Hypothesis testing-t-test -One Sampled t-test, Correlation -Person correlation coefficient.	
MODULE 4: Data Science Algorithms	**10 Hrs**
Classification of Regression Analysis, Regression process, Linear Regression, Understanding Linear regression, making prediction-hypothesis on regression coefficients, multiple Linear Regression, concepts and formulas, Logistic regression, Model building and making predictions, Adding best fit.	
MODULE 5: Machine Learning Techniques	**11 Hrs**
Classification techniques-Decision Trees, K Nearest Neighbor classification Technique. Implementation in R Clustering techniques, Applications, k-means Clustering algorithm, Performance	

of k-means, choosing Initial centroid- Implementation in R, Efficiency using Confusion matrix	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks:

7. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
8. David Dietrich ,Barry Heller ,"Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data",Wiley,2015
9. Joseph Schmuller, "Statistical Analysis with R", John Wiley, 2017.

Reference Books

1. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005

COURSE OUTCOMES (CO)

CO1:Explain role of data science and the significance of exploratory data analysis (EDA) in data science.

CO2: Apply statistics and computational analysis for data to make predictions using statistical tools.

CO3: Apply basic machine learning algorithms for predictive modelling and interpret the results visually.

CO4: Construct use cases to validate approach and identify modifications required.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	PO1,PO2
CO2	PO1,PO2,PO4,PO5
CO3	PO1,PO2,PO4,PO5,PO7
CO4	PO4,PO5,PO7

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	L	M		S	M							
CO3		M		S	S		S					
CO4				M	S		S					

II SEMESTER

PROGRAMMING USING C#

Course Code:				**20MCA254**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

10. To describe the Fundamentals of .Net framework

11. To demonstrate Object Oriented Programming concepts using C#

12. To implement delegates, event handling and exception handling

13. To develop Web applications using ASP.NET,ADO.NET

MODULES	TEACHING HOURS
MODULE 1: Getting started with .NET Framework 4.0 and C# Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ. **Introducing C#** Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing andUnBoxing , Variables and Constants . Expression and Operators : Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements	**7 Hrs**
MODULE 2: Namespaces,Classes and Object Oriented Programming Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of assessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.System.Object Class **Encapsulation:** Encapsulation using assessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. **Polymorphism:** Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods.	**8 Hrs**

Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance	
MODULE 3: Delegates, Events, Exception Handling **Delegates:**Creating and using Delegates, Multicasting with Delegates. **Events:** Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. **Exception Handling**: The try/catch/throw/finally statement, Custom Exception. System. Exception, Handling Multiple Exception	**8 Hrs**
MODULE 4: Graphical User Interface with Windows Forms Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.	**8 Hrs**
MODULE 5: Web App Development and Data Access using ADO.NET Introduction to Web Basics, Multitier Application Architecture, First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking.Set up the sample database,Create the forms and add controls,Store the connection string,Retrieve the connection string,Write the code for the forms,Test your application **ASP.NET AJAX :**ExploringAJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, ScriptManager control, Update Panel, UpdateProgress Control, Creating Simple Application using AJAX Server Controls.	**8 Hrs**
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
TextBooks:	
1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley-Dream Tech Press.	
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education.	
Reference Books	
1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, WileyAppress.	
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.	
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.	

COURSE OUTCOMES (CO)

CO1: Distinguish the features of C# and client-server concepts using .Net Framework Components.

CO2:Demonstrate delegates, events and exception handling with ASP, Win Form, ADO.NET.

CO3:Develop Graphical User Interface for various applications

CO4:Develop Web based and Console based applications with database connectivity

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO2,PO3,PO4,PO5,PO8
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5

LEVEL OF CO-PO MAPPING TABLE

CO/P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	M	L			L				
CO2	H	H	L	M								
CO3	M	H	M	H	L							
CO4	M	H	H	H	H							

II SEMESTER

ETHICAL HACKING

Sub Code:				**20MCA255**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Introduce the fundamental aspects of ethical hacking**
- **Demonstrate different features of ethical hacking**
- **Remediate computer security breaches, attack and defence**
- **Analyze encryption techniques and security architecture**

MODULES	**TEACHING HOURS**
MODULE 1: Ethical Hacking	**10Hrs**
Overview of Ethics ,Overview of Ethical Hacking ,Methodology of ethical Hacking ,Reconnaissance and Foot printing ,Scanning and Enumeration ,Gaining Access ,Maintaining Access ,Covering Tracks. **Security Foundations:** The Triad, Risk, Policies, Standards, and Procedures, Security Technology, Being Prepared	
MODULE 2: System Hacking & Malware	**10 Hrs**
Searching for Exploits ,System Compromise ,Metasploit Modules ,Exploit-DB ,Gathering Passwords ,Password Cracking ,John the Ripper ,Rainbow Tables ,Client-Side Vulnerabilities ,Post Exploitation ,Privilege Escalation ,Pivoting ,Persistence ,Covering Tracks. Malware Types ,,Virus ,Worm ,Trojan ,Botnet ,Ransomware , Dropper ,Malware Analysis ,Static Analysis, Dynamic Analysis , Creating Malware ,Writing Your Own, Using Metasploit ,Malware Infrastructure ,Antivirus Solutions	
MODULE 3: Sniffing and Social Engineering	**11 Hrs**
Packet Capture .tcpdump ,tshark ,Wireshark ,Berkeley Packet Filter (BPF) ,Port ,Mrroring/Spanning , Packet Analysis ,Spoofing Attacks ,ARP Spoofing ,DNS Spoofing ,sslstrip Social Engineering ,Pretexting ,Social Engineering Vectors ,Physical Social Engineering ,Badge Access ,Man Traps ,Biometrics ,Phone Calls ,Baiting ,Phishing Attacks ,Website Attacks ,Cloning ,Rogue Attacks ,Wireless Social Engineering ,Automating Social Engineering	

MODULE 4: Wireless Security , Attack and Defence	**11 Hrs**
Wi-Fi ,Wi-Fi Network Types ,Wi-Fi Authentication ,Wi-Fi Encryption ,Bring Your Own Device (BYOD) ,Wi-Fi Attacks ,Bluetooth ,Scanning ,Bluejacking ,Bluesnarfing ,Bluebugging ,Mobile Devices ,Mobile Device Attacks. Web Application Attacks ,XML External Entity Processing ,Cross-Site Scripting (XSS) ,SQL Injection ,Command Injection ,Denial of Service Attacks ,Bandwidth Attacks ,Slow Attacks ,Legacy ,Application Exploitation ,Buffer Overflow ,Heap Spraying ,Lateral Movement ,Defense in Depth/Defense in Breadth ,Defensible Network Architecture.	
MODULE 5: Cryptography & Security Architecture and Design	**10 Hrs**
Basic Encryption ,Substitution Ciphers ,Diffie-Hellman ,Symmetric Key Cryptography ,Data Encryption Standard (DES) ,Advanced Encryption Standard (AES) ,Asymmetric Key Cryptography ,Hybrid Cryptosystem ,Non-Repudiation ,Elliptic Curve Cryptography ,Certificate Authorities and Key Management ,Certificate Authority ,Trusted Third Party ,Self-Signed Certificates ,Cryptographic Hashing ,PGP and S/MIME. Data Classification ,Security Models ,State Machine ,Biba ,Bell-LaPadula ,Clark-Wilson Integrity Model ,Application Architecture ,n-tier Application Design ,Service-Oriented Architecture ,Cloud-Based Applications ,Database Considerations ,Security Architecture .	
Practical contents	

1. Scanning for Open Ports of Remote Machine
2. Gaining SSH Access of Remote Machine using hydra Tool
3. Accessing Wife Saved Password in Windows Machine
4. Accessing Wife Saved Password in Linux Machine
5. Accessing Key using Keylogger through email/Telegram
6. Sniffing Wifi Password of Access Point
7. Accessing System, Boot and CPU information of windows machine
8. Obtaining Screenshots of Remote Machine

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks:

1. CEH Certified Ethical Hackers All-in-one Exam Guide,Willy publishing inc
2. Computer Hacking Beginners Guide: How to Hack Wireless Network, Basic Security and Penetration Testing, Kali Linux, Your First Hack Kindle Edition
3. The Web Application Hacker's Handbook, DafyddStuttard Marcus Pinto,Willy publishing inc

Reference Books

1. Hacking: The Art of Exploitation, John Ericson, 2nd Edition
2. Penetration Testing: A Hands-On Introduction to Hacking

by Georgia Weidman

3. Penetration Testing with Kali Linux, Offensive security
4. Wireless Attacks – WiFu, Mati Aharoni Devon Kearns Thomas d'Otreppe de Bouvette

COURSE OUTCOMES (CO)

CO1: Understand the features of ethical hacking

CO2: Analyse the security breaches required for ethical hacking

CO3:Apply the ethical hacking techniques in the real time scenario

Course outcomes mapping with program outcomes

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO3,PO5,
CO2	PO2, PO3, PO6, PO9, PO10
CO3	PO4, PO6, PO8, PO10

CO/P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		M		H							
CO2		M	L			H			H	H		
CO3				H		H		L		H		

II SEMESTER
DATA MINING AND BUSINESS INTELLIGENCE

Course Code:				**20MCA261**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**03**

COURSE LEARNING OBJECTIVES (CLO)

- **Learn the concept of data base technology evolutionary path which has led to the need for data mining and its application**
- **Understand the concept of Data warehousing and OLAP, storage and retrieval technique of data from DATA CUBE and different pre processing techniques**
- **Discover interesting patterns from large amounts of data to analyze and extract pattern to solve problems, make predictions of outcomes**
- **Select and apply proper data mining algorithms to build analytical applications**
- **Evaluate systematically supervised and unsupervised models with respect to their accuracy**
- **Learn thedata mining for various business intelligence applications for the given problem**

MODULES	TEACHING HOURS
MODULE 1: Overview and concepts Data Warehousing and Business Intelligence Why reporting and Analysing data, Raw data to valuable information- Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing. **The Architecture of BI and DW** BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations.	**7Hrs**

MODULE 2: Introduction to data mining (DM) Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process Data Pre-processing:Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.	**7 Hrs**
MODULE 3: Concept Description and Association Rule Mining What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining.	**8Hrs**
MODULE 4: Classification and prediction What is classification and prediction? – Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression. Introduction of tools such as DB Miner /WEKA/DTREG DM Tools.	**9 Hrs**
MODULE 5: Data Mining for Business Intelligence Applications Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc., Data Analytics Life Cycle: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.	**8 Hrs**
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
TextBooks:	
1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann	
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.	
3. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India	
Reference Books	
1. PaulrajPonnian, "Data Warehousing Fundamentals", John Willey	

2. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.
3. AlexBerson and Stephen J.Smith: Data Warehousing, Data Mining, and OLAP Computing McGrawHill Publisher, 1997.

COURSE OUTCOMES (CO)

CO1: Understand the concept of data warehouse, Business Intelligence and OLAP, data pre-processing techniques

CO2: Demonstrate application of association rule mining algorithms, various classification algorithms and evaluation of classifiers for the given problem

CO3: Apply classification and regression techniques for the given problem.

CO4:Analyse data mining for various business intelligence applications for the given problem

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO2,PO5
CO2	PO1,PO2,PO4
CO3	PO1,PO2,PO4
CO4	PO1,PO2,PO4

LEVEL OF CO-PO MAPPING TABLE

CO/P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L			L							
CO2	M	M		H								
CO3	H	M		H								
CO4	L	L		H								

II SEMESTER

ENTERPRISE RESOURCE PLANNING

Course Code:				**20MCA262**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hours**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

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

- **Identify the different ERP related Technologies and their benefits**
- **Understand the Various Business Modules**
- **ERP implementation using different Techniques**
- **Learn different ERP vendors and practice them**

MODULES	TEACHING HOURS
MODULE 1: ERP and Related Technologies	**8 Hrs**
Business Process Re-engineering, Management Information systems,Decision Support Systems, Executive Information Systems-Advantages of EIS; Disadvantages of EIS, Data Warehousing, Data Mining, On-Line Analytical Processing, Product Life Cycle Management, Supply Chain Management, ERP Security	
MODULE 2: Benefits of ERP	**7 Hrs**
Reduction of Lead-time, On-time shipment, Reduction in cycle time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier performance, Increased flexibility, Reduced quality costs, improved information Accuracy and Decision-making capability	
MODULE 3: Business Modules	**8 Hrs**
Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	
MODULE 4: ERP Implementation Life Cycle	**8 Hrs**
ERP Tools and Software, ERP Selection Methods and Criteria, ERP Selection Process, ERP Vendor Selection, ERP Implementation Lifecycle, Pros and cons of ERP implementation, Factors for the Success of an ERP Implementation, Latest ERP Implementation Methodologies	
MODULE 5: Different ERP Vendors	**8 Hrs**

ERP Vendors, SAP-AG: Products and technology R/3 overview; SAP advantage, Baan Company , Oracle Corporation: Products and technology; Oracle Application; Vertical solutions, Microsoft Corporation, QAD Case Study - hands on exercises using various ERP tools	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books

1. Alexis Leon, Enterprise Resource planning, McGraw-Hill Education (India) , 2014
2. Garg, vinodkumar, venkitakrishnan n. k., Enterprise Resource planning concepts and practice, 2016
3. Ellen F. Monk, Bret J. Wagner, Concepts of Enterprise Planning , Cengage , 2013

Reference Books

1. Enterprise Resource Planning, Mary Sumner, Pearson Education, Fourth Impression 2009
2. The SAP R /3 Hand book, Jose Antonio Fernandz, , Tata McGraw Hill
3. Enterprise Resource Planning, Mahadeo Jaiswal & Ganesh Vanapalli, Macmillan, 1/e 2005

COURSE OUTCOMES (COs)

CO1: Acquire knowledge of ERP related Technologies and their benefits

CO2: Analyze various Business Modules

CO3: Apply ERP implementation in different business organizations

CO4: Evaluate various ERP tools, and practice them

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes (COs)	Mapping with POs
CO1	PO5, PO6
CO2	PO9, PO11, PO12
CO3	PO8, PO9,PO10
CO4	PO5, PO7

LEVEL OF CO-PO MAPPING TABLE												
CO /PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1					**H**	**M**						
CO2									**H**		**M**	**L**
CO3									**H**		**M**	**L**
CO4					**H**		**L**					

II SEMESTER

SUPPLY CHAIN MANAGEMENT

Course Code:				**20MCA263**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Demonstrate knowledge of the functional logistics and supply chain management**
- **Illustrate the concepts and activities of the supply chain and actual organization**
- **Analyse the role of technology in logistics and supply chain management**
- **Evaluate cases for effective supply chain management and its implementation and execute smart contracts to maintain relationship management**

MODULES	TEACHING HOURS
MODULE 1: Introduction to Supply Chain Management Objectives, importance, decision phases, process view, competitive and	**8 Hrs**
supply chain strategies, achieving strategic fit, supply chain drivers, obstacles, framework facilities inventory transportation information sourcing pricing	
MODULE 2: Designing the Supply Chain Network	**8 Hrs**

Designing the distribution network, role of distribution ,factors influencing distribution, design options, e business and its impact, distribution networks in practice, network design in the supply chain, role of network, factors affecting the network design decision, modelling for supply chain	
MODULE 3: Designing and Planning Transportation Network	**8 Hrs**
Role of transportation , modes and their performance, transportation infrastructure and policies, design options and their trade off, tailored transportation	
MODULE 4: Sourcing and Pricing	**7 Hrs**
Sourcing, In-house or outsource, 3rd and 4th PLs, supplier scoring and assessment, selection, design collaboration, procurement process, sourcing Planning and analysis. Pricing and revenue management for multiplecustomers, perishable products, seasonal demand, bulk and spot contracts	
MODULE 5: Information Technology in Supply chain	**8 Hrs**
IT Framework, customer relationship management, internal supply chain management, supplier relationship management, transaction management, future of IT	
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	

TextBooks:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – Stratergy, Planning and Operation, Pearson/PHI,3rd Edition, 2007
2. Coyle, Bardi, Longley, The management of Business Logistics- A Supply Chain Perspective, Thomson Press,2006
3. Supply Chain Management by Janat Shah Pearson Publication 2008

Reference Books

1. Donald J Bowersox, Dand J closs, M BixybyColuper,Supply Cain Logistics Management, TMH, Second Edition,2008
2. Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, 2005
3. David Simchi-Levi et al, Designing and Managing the Supply Chain- Concepts, ISBN-13:978-0072357561

COURSE OUTCOMES (CO)

CO1: Demonstrate the knowledge of the functional logistics and supply chain management

CO2: Illustrate Concept and Activities of supply chain management Analyse the role of technology in logistics and supply chain management

CO3: Evaluate cases for effective supply chain management and its implementation

CO4: Predict the role information technology in bringing transparency and execute smart contracts to maintain relationship management

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO5, PO10
CO2	PO1, PO2, PO3, PO4
CO3	PO1, PO2, PO4, PO5, PO8
CO4	PO1, PO2, PO3, PO11, P12

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L				H					H		
CO2	L	L	M	M								
CO3	L	L		M	M			H				
CO4	L	L	M								H	H

II SEMESTER
STORAGE AREA NETWORKS

Course Code:				**20MCA264**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**100**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Understand the need for Storage Area Network and Data protection to satisfy the information explosion requirements.**
- **Get an insight of Storage area network architecture, protocols and its infrastructure.**
- **Evaluate different SAN management strategies to fulfil business continuity requirements.**

MODULES	TEACHING HOURS
MODULE 1: Concepts of Storage Networking	**8 Hrs**
The Data Storage and Data Access Problem, The Battle for Size and Access Decoupling the Storage Component: Putting Storage on the Network, Decoupling the Storage Component: Creating a Network for Storage	
MODULE 2: Storage Fundamentals	**7 Hrs**
Storage Architectures, Device Overviews, Connectivity Options,Data Organizational Methods.	
MODULE 3: Network Attached Storage	**8 Hrs**
Putting Storage on the Network, NAS Hardware Devices , NAS software Components, NAS Connectivity Options.	
MODULE 4: Storage Area Networks	**8 Hrs**
Architecture Overview, Hardware Devices, Software Components,Configuration Options for SANs.	
MODULE 5: SAN Applications	**8 Hrs**
Defining the I/O Workload, Applying the SAN Solution, Applyingthe NASSolution Considerations When Integrating SAN and NASManagement. Planning Business Continuity, Managing Availability, Maintaining Serviceability, Capacity Planning and SecurityConsiderationsCase StudiesNAS Case Study, SAN Case Study, SAN/NAS Management CaseStudy.	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module.

TextBooks:

3. The Complete Reference " Storage networks" , Robert Spalding, Mc Graw Hill Education (India) 2003.

Reference Books

1. Information Storage and Management (Misl-Wiley) : 2nd Edition, Emc Education Services, Wiley; Second edition (29 August 2012), ISBN-13: 978-8126537501
2. Storage Are networks Essentials : A complete guide to understanding and Implementing SANs, Richard Barker, Paul Massiglia, Wiley

COURSE OUTCOMES (CO)

CO1:Understand the significance of storage component in networking.

CO2: Apply the SAN techniques and solutions used for data maintenance.

CO3: Analyse the significance of the architectural components for NAS and SAN.

CO4: Design secured, scalable SAN / NAS enterprise solutions.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO3, PO5
CO2	PO4, P5.
CO3	P03, PO5, PO8
CO4	P05, PO8, PO12

LEVEL OF CO-PO MAPPING TABLE

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			H		M							
CO2			H		M							
CO3			H		H			L				
CO4					H			H				M

II SEMESTER

DISTRIBUTED OPERATING SYSTEM

Course Code:				**20MCA265**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **To understand the hardware and software architecture of modern distributed systems.**
- **To handle process synchronization in distributed systems**
- **To analyse the memory management techniques in distributed systems**

MODULES	TEACHING HOURS
MODULE 1: Introduction to Distributed Systems Introduction to Distributed System, Hardware concepts, Software concepts, Design issues. Communicationin Distributed Systems, Layered Protocols, ATM networks, The Client-sever model, Remote Procedure call, Group communication.	**8 Hrs**
MODULE 2: Synchronization Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.	**8 Hrs**
MODULE 3: Process Management Process and processors in Distributed System threads, System Models, Processors allocation, Scheduling in Distributed System, Fault tolerance, Real time Distributed System.	**8 Hrs**
MODULE 4: Distributed File System Distributed File Systems, Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.	**7 Hrs**
MODULE 5: Memory Management Distributed Shared Memory, Introduction, Consistency models, Page based Distributed Shared memory, Shared – variable Distributed Shared memory, Object based Distributed Shared Memory.	**8 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**

- **Questions are set covering all the topics under each module**

TextBooks:

1. Distributed Operating Systems, Andrew S. Tanenbanm
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI

Reference Books

1. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,TimKindberg, Pearson
2. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
3. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India

COURSE OUTCOMES (CO)

CO1: Understand the various models of Distributed systems

CO2: Understand the process management and synchronization of Distributed Computing systems

CO3: Analyze the file system architecture for distributed systems

CO4: Analyse the implementation of memory management techniques for distributed architecture

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO3
CO2	PO1,PO3,PO10
CO3	PO1,PO3,PO10
CO4	PO1,PO3,PO10

LEVEL OF CO-PO MAPPING TABLE

CO/P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L		M									
CO2	S		M							L		
CO3	S		M							L		
CO4	M		S							M		

III SEMESTER

MACHINE LEARNING USING PYTHON

Sub Code:				**20MCA31**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To distinguish between, supervised & unsupervised and gain knowledge about basic concepts of Machine Learning.**
- **To introduce participants to the fundamentals of data analytics using Python**
- **To apply the appropriate machine learning strategy for any given problem.**
- **To develop skills of using recent machine learning software for solving practical problems.**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction to Machine learning	**10 Hrs**
Introduction toMachine Learning, types of Machine learning, Applications, Machine Learning Process, Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning	
MODULE 2: Modelling and Evaluation	**10 Hrs**
Selecting a Model, Training a model, Model representation and interpretability, Evaluating performance of a model Introduction to Bayes Theorem and Concept learning, Naive Bayes Classifier, Applications of Naïve Bayes Classifier, Bayesian Belief Network in Machine Learning	
MODULE 3: Unsupervised Learning & Supervised Learning	**11 Hrs**
Clustering –Different types of the clustering techniques, K-Means Clustering Algorithm Classification-Introduction, KNN classifier, Decision Tree, Random Forest Model, Support Vector Machines	
MODULE 4: Regression Learning	**10 Hrs**
Training a model-Linear Regression, Multiple Linear regression, Improving accuracy of Linear Regression Model, k-fold cross validation method, Polynomial Regression Model	
MODULE 5: Neural Network and Deep Learning	**11 Hrs**

Artificial Neural Networks: IntroductionArtificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptron, Back propagation algorithm. Deep Learning, Deep Learning Architectures.	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

TextBooks:

1. Fabio Nelli, " Python Data Analytics", Apress,Springer Science + Business Media Finance Inc (SSBM Finance Inc).
2. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, 1st Edition, 2019, Pearson Publications, , ISBN 978-93-530-6669-7
3. Machine Learning, Tom M Mitchel, McGraw Hill publications,ISBN-0070428077
4. Machine Learning with Python: Design and Develop Machine Learning and Deep Learning, BPB Publishing, India,2018

Reference Books

1. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
2. EthemAlpaydin "Introduction To Machine Learning" 2nd Edition PHI Learning Pvt. Ltd-New Delhi.

COURSE OUTCOMES (CO)

CO1: Explain the concepts related to Machine Learning techniques.

CO2: Demonstrate Pre-processing techniques and perform exploratory data analysis related to a scenario.

CO3: Identify and apply the appropriate techniques to process the data and solve the applications using machine learning techniques

CO4: Apply data analytics principles and techniques of Machine learning to solve real time problems.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO1,PO2,**
CO2	**PO1,PO2,PO4,PO8**
CO3	**PO1,PO2,PO4,PO5,PO8,PO10,PO11**
CO4	**PO1,PO2,PO4,PO5,PO8,PO10,PO11**

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M	S										M
CO2	L	M		S				M				L
CO3	L	L		S	S			M		S	M	L
CO4	L	L		S	S			M		S	M	L

III SEMESTER
ADVANCES IN JAVA

Sub Code:				**20MCA32**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Describe the JDBC concepts and designing an applications using JDBC.**
- **Introduce the concepts of server side programming using Servlets & JSP.**
- **Understand Java Beans and different types of enterprise java beans and implement them. Design and developing an application using springs framework.**

MODULES	**TEACHING HOURS**
MODULE 1: JDBC	**10 Hrs**
The Concept of JDBC, JDBC Driver types, A brief overview of JDBC process, Database Connection, Statement objects, Result Set, Transaction Management, Data types, Exceptions. Introduction to Embedded SQL with JDBC.	
MODULE 2: SERVLET	**10 Hrs**
Architecture, Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, SingleThreadModel interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.	
MODULE 3: JSP	**10 Hrs**
Overview of JSP: JSP Technology, Benefits of JSP, Advantages of JSP, Basic syntax. JSP life cycle, JSP tags, looping statements, The JSP page directive, JSP Action tags, JSP implicit objects.JSP form processing, JSP database connectivity.	
MODULE 4: Annotations & EJB	**10 Hrs**
Annotations Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations with examples. **Java Beans and EJB** Working with Java Beans. Introspection, creating java bean, manifest file, Bean Jar file, adding controls, Bean properties, Simple properties, bound properties, Icon, Bean info class, Constrained Properties, Persistence, Java Beans API. Enterprise Java Beans: The EJB Container, EJB Classes, EJB Interface. Deployment Descriptor, Session Java Bean, Entity Java Bean, Message-Driven Bean.	

MODULE 5: Spring Framework	12 Hrs
Spring Framework Introduction to Spring Framework, Spring Framework architecture, IOC-containers, Bean scopes, Bean Life cycle, Dependency Injection, Beans wiring, Event Handling in springs, Custom events in springs Spring AOP, and Spring JDBC. **Spring MVC** Spring MVC : Spring 3.0 features –Introduction to Spring MVC –Handler Mapping – Controllers –Validations –Handler Interceptors –Views –Form tags.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books:

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).
2. Java 6 Programming Black Book, Dreamtech Press. 2012 (Chapter 17,18,19,20,21,22,27,28,29,30).
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008.
2. Herbert Schildt, Java The Complete Reference, 8th Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.

COURSE OUTCOMES (CO)

CO1:Understand Concept of advanced java concepts.

CO2:Analyze the methodologies and constraints of implementation.

CO3: Apply the advanced java methodologies to design applications.

CO4: Design and Develop applications to be deployed in real world scenarios.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO 1	PO2,PO3,PO5
CO 2	PO2,PO4,PO5,PO11
CO 3	PO2,PO4,PO5,PO8,PO11
CO 4	PO2,PO4,PO5,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

PO												
CO 1		M	H	H								
CO 2		M		H	M						H	
CO 3		M		H	M			H			M	
CO 4		S		H	H			H			M	

III SEMESTER

NETWORK ARCHITECTURE AND PROGRAMMING

Sub Code:				**20MCA33**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**04**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**03**
Lecture (L):	**4**	**Practicals (P):**	**2**	**Tutorial (T):**	**0**	**Total Credits:**	**04**

COURSE LEARNING OBJECTIVES (CLO)

- **Classify the network protocols and identify the service**
- **Demonstrate the architecture of larger and emerging networks**
- **Implement a wired and wireless network architecture using a simulator tool**
- **Analyse the performance characteristics of a network with a simulator tool**

MODULES	TEACHING HOURS
MODULE 1: Protocols and Standards	**14 Hrs**
TCP/IP Reference Model, Circuit Switching, Packet Switching, InternetProtocols (TCP, IP, UDP, ICMP, ARP), Unicast Routing Protocols (OSPF, DVRP), Multicast Routing protocols (MOSPF, DVMRP)	
MODULE 2: Larger Networks	**10 Hrs**
Optical Networking: SONET/SDH, Frame Relay, ATM, Virtual LAN	
MODULE 3: Wireless Networking	**08 Hrs**
SAN, Bluetooth, Broadband ISDN, Wireless networks, Wireless sensor Networks	
MODULE 4: Emerging Network Technologies	**08 Hrs**
Software Defined Network, Delay-tolerant Networking, Home Networking, Content Distributed Network, Data Center Network	
MODULE 5: Network Simulation Software	**12 Hrs**
Working on Network Simulation Tools – Building a Lan Topology with a simulation tool, Analysing the flow of packets with TCP protocol, Analysing	

the flow of packets with UDP protocol, Simulating routing technologies (Distance Vector), wireless	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

5. Tanenbaum, A., Computer Networks, 3rd ed., Prentice-Hall, 1996.

6. Jan L Harrington, Network Security: A Practical Approach, Morgan Kauffman, 2005

Reference Books

6. "Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI – 2014, ISBN-10: 0130183806

7. Uyless Black "Computer Networks, Protocols, Standards and Interfaces" 2nd Edition - PHI ,ISBN-10: 8120310411

8. M. E. Whitman and Herbert J. Mattored, Principles of Information Security, Information Security Professional 4thedition

9. A Practical Guide To Advanced Networking By Jeffrey S. Beasley And PiyasatNilkaew, Pearson Education 2013 Ed

COURSE OUTCOMES (CO)

CO1: Understand the network protocols and its services

CO2: Demonstrate the architecture of wired and wireless network variants

CO3: Analyse the significance of emerging network architectures

CO4: Implement a network architecture with a simulator and automate the performance analysis of a network

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO3
CO2	PO1, PO3, PO10
CO3	PO3, PO10

CO4					PO1,P03, PO5							
LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**		**H**									
CO2	**M**		**H**							**L**		
CO3			**H**							**L**		
CO4	**L**		**M**		**H**							

III SEMESTER

DIGITAL MARKETING

Sub Code:				**20MCA341**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**04**		**SEE Marks:**	**100**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**03**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**2**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Identify the importance of the digital marketing for marketing success, to manage customer relationships across all digital channels**
- **Able to do Web site and SEO optimization and to develop a digital marketing plan.**
- **Create Google AdWords campaigns, social media planning and basic knowledge of Google Analytics for measuring effects of digital marketing**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction to Digital Marketing	**7 Hrs**
Introduction: Introduction to digital marketing, Digital marketing platforms and Strategies , Latest Digital marketing trends ,Emergence of digital marketing as a tool, Drivers of the new marketing environment; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models. **Web design:** Optimization of Web sites, MS Expression Web)	
MODULE 2: Search Engine Optimization	**9 Hrs**
Search Engines: Components of Search Engines, Keyword Research, Google Keyword Planner, Market Research and Analysis. **OnpageOptimization :**Onpage Analysis Methodology , Web site Speed , Domain name in SEO ,Optimization- Title,URL,Meta Tags, Sitemaps	

Generation, Redirecting Techniques . Offp**Offpage Optimization:** Link Building and Types, Linking Building Methodology, Links Analysis Tools, Directory Submissions, Local Business Directories, Social Bookmarking, Using Classifieds for Inbound traffic , Question and Answers ,Blogging & Commenting . **Webmaster Tools:** Verification Process in GWMT , Selecting Target Location, Google Webmaster Tools . **Local SEO:** Introduction, Submission to Google My Business, Completing the Profile, Local SEO Ranking Signals, Citations and Local Submissions, SEO Reporting**.**	
MODULE 3: Google AdWords	**07 Hrs**
PPC Advertising: Paid Marketing, Google Account setup Google AdWords, Display Advertising. Remarketing Strategy, Building Remarketing List & Custom Targets, Creating Remarketing Campaign. **CRM:**CRM platform , CRM models	
MODULE 4: Web Analytics	**08 Hrs**
Web analytics: Web analytics – levels, Importance of Analytics for Business, Popular Analytics Software's, Key performance Metrics [KPI] in Analytics Visits and Users , Time on Page ,Bounce Rate , Exit Rate , Conversion Rate Engagement. **Google Analytics**: Installing Analytics code in site , Analytics account structure , Real Time Reports , Settings in Analytics, Traffic Reports. **Conversion Tracking**: What is conversion, Conversion Process and Funnel, Types of Conversions, Conversion Reports, Funnel Visualization, Multi-Channel Funnels , Attribution Reporting, Digital Marketing Budgeting	
MODULE 5: Social Media Marketing	**08 Hrs**
Introduction, Impact of Social Media on SEO,Facebook Marketingstrategy**,** Email Marketing, Visual Marketing ,Business opportunities and Instagram options , LinkedIn Marketing,YouTube marketing ,Analytics and Targeting Twitter Marketing, Mobile Marketing, social media metrics. Social media	

risks and challenges.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

14. "Seema Gupta "Digital Marketing" Mc-Graw Hill 1st Edition – 2017.

15. Puneet Singh Bhatia "Fundamentals of Digital Marketing" Pearson 1st Edition – 2017.

Reference Books

1. Ian Dodson "The Art of Digital Marketing" Wiley Latest Edition

2. "Digital Social Media Marketing" By Prof. Nitin C. Kamat, Mr.Chinmay Nitin Kamat

COURSE OUTCOMES (CO)

CO1: Understand the key concepts related to digital-marketing

CO2: Demonstrate the use of different electronic media for designing marketing activities.

CO3: Analyze role of social media marketing for the given problem and technical solutions to overcome social media threats.

CO4: Estimate the key concepts related to digital-marketing for the given case.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO7,PO10
CO2	PO4,PO5
CO3	PO10, PO12
CO4	PO7,PO10,PO12

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							M			H		

CO2				**M**	**H**							
CO3										**H**		**M**
CO4							**L**			**H**		**M**

III SEMESTER
CLOUD COMPUTING THEORY AND PRACTICE

Course code:				**20MCA342**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**	**1**	**Tutorial (T):**	**-**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **Introduce the fundamental aspects of cloud computing**
- **Discuss virtualization technologies along with the architectural models of cloud computing.**
- **Leverage the prominent Cloud computing technologies available in the market place.**
- **Demonstrate different features of cloud platforms used in Industry**
- **To understand how energy efficiency achieved in cloud computing using green computing and understand the mechanism needed to harness cloud computing in the respective endeavours.**

MODULES	**TEACHING HOURS**
MODULE-1: CLOUD COMPUTING OVERVIEW	**12 Hrs**
Cloud Computing Overview, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Architecture, Characteristics and Benefits, Challenges in the cloud, Historical Developments, Distributed Systems, Virtualization, Web 20, Service Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Forcecom and Salesforcecom,	
MODULE-2: VIRTUALIZATION	**10Hrs**
Virtualization Introduction, Characteristics of virtualized environments, Increased security, Managed execution, Portability, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples- Xen par virtualization, VMware: full virtualization, Microsoft Hyper-V. Cloud Computing Architecture: Introduction, Reference model-Architecture, Infrastructure- and hardware-as-a-service, Platform as a	

service, Software as a service, Deployment Model- Public clouds, Private clouds, Hybrid clouds, Community clouds, Open challenges.	
MODULE-3: CLOUD MANAGEMENT	**10 Hrs**
Service Level Agreement, Cloud Economics, Managing Data, Introduction to Map Reduce, Open Stack, Resource Management.	
MODULE-4: CLOUD PLATFORMS IN INDUSTRY	**10 Hrs**
Amazon web services: Compute services, Storage services, Communication services, Additional services. Google Cloud, AppEngine : Architecture and core concepts, Application life cycle, Cost model Observations Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance , Observations.	
MODULE-5: ADVANCED TOPICS IN CLOUD COMPUTING	**10 Hrs**
Green cloud computing, Introduction to Docker Container, Sensor Cloud Computing, IoT Cloud, Fog Computing, Mobile Cloud Computing.	
PRACTICAL CONTENT:	
Working with Amazon Web Services(AWS): • Familiarize the services by AWS • Creating user login • Creating Linux, Windows virtual machines instance using EC2 • Run simple applications on EC2 Instance • Creating Storage using S3 • Create a Backup using Image and launch new instance using Backup image • Creating an RDS Instance with MySQL Workbench and Dynamo DB • Demonstrate Database application on AWS • Upgrading and downgrading the infrastructure based on the requirement • Demonstrate Load balancing using different instance of EC2 • Launch a web application. • Demonstration of Identity and Access management. • Demonstrate Elastic bean stack • Demonstrate AWS dynamic web application Salesforce Trailhead Platform • Create a web application to enter the students' details like name,	

USN, semester, section and CGPA to a database on Salesforce cloud platform. • Create a web application to implement an online cart for adding items to a shopping cart and deleting it. • Create a web application to enter the faculty details like faculty ID, faculty name, and salary to a database and calculate the income tax to be paid by the faculty at the end of financial year. • Create a web application to book a flight from a source to destination and store the status of flight, and departure timings on database. • Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. • Develop Department events' registration app with an object containing event name, date/time, venue as parent relationship, another object containing student name, branch, event name, date/time, and venue as child relationship. • Develop Blood donation registration app with an object which records donors' name , age and blood group as parent relationship and another object containing hemoglobin level, donated or not details (if age>18) child relationship. • Develop Attendance maintenance app with an object to record student details, attendance and provide a link to college websites' results webpage. • Create a web application with objects to maintain database of an art gallery which contains objects like artists, arts, and inventory and provide a link to any of the art gallery website.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Textbooks:

Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley,2011

Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010

Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010

Reference Books:

Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.

COURSE OUTCOMES (CO)

CO1: Explain the fundamental principles of cloud computing and its related Concepts.

CO2: Analyse Prominent Cloud computing technologies available in the marketplace.

CO3: Apply suitable applications to leverage the strength of cloud computing.

CO4: Develop the applications of cloud Computing that can harness the power of cloud computing.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

COs	Mapping with POs
CO1	PO1,PO2,PO3
CO2	PO1,PO5,PO8,PO10
CO3	PO1,PO2,PO3,P10
CO4	PO1,PO2,PO3,PO4,PO5

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M									
CO2	L				S			S		M		
CO3	M	M	M							L		
CO4	S	S	M	M	M							

III SEMESTER
BIG DATA ANALYTICS

Sub Code:				**20MCA343**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3+2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To impart fundamental concepts about big data and its identification.**
- **To analyse the design of Hadoop Distributed Files system.**
- **To understand and analyse Map Reduce technique for solving Big Data problems**
- **To analyse different hadoop related tools like Pig & Hive and manage NOSQL databases.**

MODULES	**TEACHING HOURS**
MODULE 1: Big Data & Hadoop Eco system	**10 Hrs**
Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , types of Data Sources, Sampling, Types of data elements, data explorations, exploratory statistical analysis, missing values, outlier detection and Treatment, cloud and Big Data –Predictive Analytics. A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response.	
MODULE 2: The Hadoop Distributed File system	**11 Hrs**
The Hadoop Distributed File system The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command Line Interface, Basic File system Operations, Hadoop File systems Interfaces ,The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow Anatomy of a File Read ,Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced, Hadoop Archives	
MODULE 3: Map Reduce	**10 Hrs**
A Weather Dataset ,Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Working of Map Reduce - Anatomy of a Map Reduce Job Run, Failures, Shuffle and Sort, Task Execution, Map Reduce Formats - Input Formats, Output Formats	
MODULE 4: NOSQL &Hadoop Tool-Pig	**11 Hrs**
NOSQL Data bases	

Introduction to NoSQL– Types of NOSQL Data bases-Key-Value based , Document based, Column-oriented data models, graph databases **Hadoop Tool-Pig** Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts, **Pig Latin** – Structure, Statements, Expressions, Types, Schemas, Functions, Macros,User-Defined Functions DataProcessing Operators – Loading and storing of data, Filtering data, Groupingand Joining data	
MODULE 5: Hadoop Tool-Hive	**10 Hrs**
Installing Hive – The Hive shell,Hive – Architecture, data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries. Tables – Managed Tables and External Tables, Partitions and Buckets, Importing Data,Altering Tables, Dropping Tables Querying Data – Sorting and Aggregating,Storage Formats, Joins, Sub queries, Views.	
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
TextBooks:	
10. Bart Baesens, " Analytics in a Big Data World : The Essential Guide to Data Science and its Applications" Wiley	
11. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.	
12. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.	
13. Alan Gates, "Programming Pig", O'Reilley, 2011	
Reference Books	
3. Boris lublinsky, Kevin t. Smith, AlexeyYakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.	
4. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.	
COURSE OUTCOMES (CO)	
CO1: Explain the fundamentals of big data analytical techniques and usage of hadoop tools.	
CO2: Analyse Hadoop ecosystem and Map Reduce concept to solve big data problems.	
CO3: Design a Map-Reduce model to process the data using hadoop tools for a use case.	
CO4: Evaluate the performance of data analytics and visualize the results.	
COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:	

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO3,PO4**
CO2	**PO3,PO4,PO5**
CO3	**PO3,PO4,PO5,PO7,PO10,PO11**
CO4	**PO2,PO3,PO4,PO5,PO7,PO10,PO11**

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1			**M**	**H**								
CO2			**M**	**H**	**H**							
CO3			**M**	**M**	**H**		**L**			**M**	**L**	
CO4		**L**	**M**	**M**	**H**		**H**			**H**	**H**	

III SEMESTER
PROGRAMMING IN GOLANG

Course code:				**20MCA344**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**03**
Lecture (L):	**3**	**Practicals (P):**	**01**	**Tutorial (T):**	**0**	**Total Credits:**	**04**

COURSE LEARNING OBJECTIVES (CLO)

- **Learn the fundamentals of Go programming language**
- **Understand the handling of various data structures in Go**
- **Apply Go routines and packages to build parallel systems**
- **Design and implement runtime projects**

MODULES	TEACHING HOURS
MODULE 1: Structure of Go Program	**10 Hrs**
GO: Getting started – Go Primer: Variables, Functions, Looping, Enumerations, Structures, Methods, Interfaces, Numbers	
MODULE 2: Go Data Structures	**10 Hrs**
Generic and Specialized Generic Data Structures, Arrays – Slices – Strings, Collections: Maps, Lists	
MODULE 3: Handling Concurrency	**11 Hrs**
Go Routines: Channels – Multiplexing – Cancellation – Implementation	
MODULE 4: Testing	**11 Hrs**
The Go test Tool, Test Functions, Benchmark functions, profiling - Implementation	
MODULE 5: Network Access	**10 Hrs**
Connecting to servers, Distributing Go, Serving Objects, Calling Remote procedures	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books

a. The GO Programming Language by David Chisnall published by Addision Wesley

b. The GO Programming Language by Alan A. A. Donovan, Brian W. Kernighan published by Addision Wesley

Reference Books

1. An Introduction to Programming in GO by Caleb ISBN: 978-1478355823
2. Learning GO by MiekGieben

COURSE OUTCOMES (CO)
CO1: Understand the language features of Go and gain an insight on their implementation
CO2: Analyse the language features for critical design decisions
CO3: Apply Go tools to handle concurrent programming
CO4: Implement Go tools to build applications for massively parallel systems

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES	
Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1, PO2, PO3,PO4, PO5**
CO2	**PO1,PO2, PO3,PO4, PO5**
CO3	**PO2, PO3,PO4, PO5, PO8**
CO4	**PO2, PO3,PO4, PO5, PO8,PO10**

LEVEL OF CO-PO MAPPING TABLE

CO/ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**H**	**M**	**H**	**H**							
CO2	**M**	**H**	**L**	**H**	**H**							
CO3		**H**	**M**	**H**	**H**			**L**				
CO4		**H**	**M**	**H**	**H**			**L**		**L**		

III SEMESTER

FULL STACK WEB DEVELOPMENT

Sub Code:				**20MCA345**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3+2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To design as web page using front end technologies**
- **To develop application with server side scripting tools**
- **To develop web application with REST APIs and use of framework to communicate client-server applications.**
- **To build as responsive web application with managing NOSQL databases.**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction to React	**10 Hrs**
Welcome to React: Obstacles and Roadblocks, React's future, keeping up with the changes, working with the files. The Basics-Introduction, Installation, getting started -hello world program, Lifecycle of Components, Understanding Functional & Class Components Passing Data.	
MODULE 2: React Components and Redux	**11 Hrs**
React Props, React state-setting state, Event handling, Designing components-state vs props An Introduction to Redux- Core Concepts, Reducer,Action,Action Creator, Combining Reducers,Store,Data Flow in Redux,Usage with React	
MODULE 3: Programming in Node.js	**11 Hrs**
Node.js Installation –getting started, Control flow, asynchronous pattern callback, Sequential functionality, nested callbacks and exception handling, asynchronous patterns and control flow. Routing Traffic, Serving Files and Middleware: Building a Simple Static File Server from Scratch, Middleware, Routers and Proxies	
MODULE 4: Expressing REST APIs	**10 Hrs**
REST-HTTP Methods as actions, Express-Routing, Handler Functions, The List API-automatic Server Restart, testing, Create API, Error Handling.	

MODULE 5: Module Title	**10 Hrs**
Introduction to MongoDB: -Installation-Databases, Data Types, Using MongoDB Shell. Creating, Updating, Deleting and Querying Documents: Inserting, removing, and updating the documents. Scheme Initialization, Reading and writing to Mongodb.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks:

1. Tomasz Dyl Kamil Przeorski, "Mastering Full-Stack React Web Development", 2017 Packt Publishing
2. VasanSubramanian ,"ProMERN Stack",Apress,2018.

Reference Books

1. Eddy Wilson IriarteKoroliova ,"MERN-Full stack Development", Packt Publishing Ltd.,2018
2. ShamaHoque,"Full stack React Projects",Pack Publishing Ltd.,2018.

COURSE OUTCOMES (CO)

CO1: Demonstrate basic concepts of react, node, express and mongodbtechologies

CO2: Design front end application using React and Redux libraries.

CO3: Develop interactive web applications on server side with NOSQL databases.

CO4: Build responsive web application communicating with RES API and managing data with NOSQL databases.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(Cos)	**Mapping with Program Outcomes(POs)**
CO1	PO5,PO11
CO2	PO2,PO4,PO5,PO11
CO3	PO2,PO4,PO5,PO7,PO11
CO4	PO5,PO11

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1					**H**						**M**	
CO2		**M**		**H**	**H**						**L**	
CO3		**L**		**M**	**H**		**H**				**H**	
CO4					**M**						**H**	

III SEMESTER
BLOCKCHAIN TECHNOLOGY

Course code:				**20MCA351**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Designed to provide the conceptual understanding of the blockchain**
- **Learn the working technology of blockchain**
- **Understand the application scenarios of blockchain**
- **Implement blockchain in Ethereum technology**

MODULES	TEACHING HOURS
MODULE 1: Basis of Blockchain Technology Introduction to Blockchain, growth – Definition – Elements of Blockchain, Tiers, Types, Consensus, Decentralization: Methods of Decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization	**8Hrs**
MODULE 2: Blockchain Mining Blockchain: The structure of block, The structure of block header, genesis block – Mining: Tasks, Rewards, Proof of Work, Mining Algorithm, Mining Systems: CPU, GPU, FGPA, ASIC- Mining Pools	**8 Hrs**
MODULE 3: Usecase - Financial Markets and Smart Contracts Trading, Exchanges, Trade Lifecycle, order anticipators, Market, Manipulation**,** Smart Contracts: Templates, Smart Oracles, Deploying smart contracts in Blockchain	**8 Hrs**
MODULE 4: Generic Use Cases BlockChain as Evidences – Digital Art -BlockChain Health–Blockchain Government	**8Hrs**
MODULE 5: Technology on Ethereum Ethereum blockchain, Ethereum network: mainnet, testnet, private net, components of Ethereum ecosystem, Ethereum Virtual Machine	**7 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Mastering Blockchain, by Imran Bashir, II edition Packt Publications
2. BlockChain: Blueprint for a new economy, by Melanie Swan O'Reilly Publications

Reference Books

1. "BlockChain: A Beginners Guide", Authors: SherminVoshmgir, Valentin Kalinov Publisher: https://blockchainhub.net/
2. "Cryptocurrency and Bitcoin Technologies", Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder published by Princeton University press 2016

COURSE OUTCOMES (CO)

CO1:Understand the structure and underlying technology of blockchain

CO2:Analyze the application scenarios of blockchain

CO3: Apply the blockchain technology to build a blockchain system

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO3,PO7
CO2	PO3, PO7, PO10
CO3	PO3, PO4, PO5, PO7, PO10

LEVEL OF CO-PO MAPPING TABLE

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	M	H					L					
CO2			H				L			M		
CO3			H	L	M		L			M		

III SEMESTER
5G WIRELESS TECHNOLOGIES

Course code:				**20MCA352**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Understand 5G wireless features and their benefits**
- **Outline different 5G Wireless Use Cases**
- **Walk through current and future deployment of 5G scenarios**
- **Illustrate 5G network architecture and components**

MODULES	**TEACHINGHOURS**
MODULE 1: Introduction And Roadmap To 5g	**8 Hrs**
Historical trend and evolution of LTE technology to beyond 4G – Key building blocks of 5G 5th Generation Wireless technology,5G as a technology vision, Why 5G?, End-to-End 5G Ecosystem, 5G high level requirements and features, Basic concepts behind 5G technology of mobile communication, 5G technologies, 5G technical objectives, 5G Activities and Interest Groups, 5GPP, 5G Forum, 5GMF, 3GPP, ITU-T's IMT-2020, WRC-15, NGMN Alliance, 5G Americas, ETSI, ARIB	
MODULE 2: Wireless Requirements, Applications, And Services	**8 Hrs**
5G promises and challenges, Disruptive technology directions, Bandwidth Power consumption, Infrastructure, Spectral efficiency, Resilience of the network, Adapting new topologies, Radio propagation and channel models, Pervasive networks, Internet of things (IoT) and M2M, Wireless sensor networks and ubiquitous computing, Wearable devices with AI capabilities.	
Module 3: Mobile Edge Computing & Fog Computing	**8 Hrs**
Mobile Edge Computing Introduction, Concept, Architecture, Benefits; Fog Computing and Cloud Computing.	
MODULE 4: 5g Wireless Use Cases And Applications	**8Hrs**

Description of Use Cases and Scenarios, Internet of Things (IoT) and Machine to Machine (M2M), Smart Grid, SCADA, EMS and Critical Infrastructure Monitoring, Smart Building and Smart Cities, m-Health/Telemedicine, eMBB: Enhanced Mobile Broadband, MTC: Machine Type Communications, Automotive and Self-Driving Vehicles, V2X, Sports and Fitness Management, 3D/Virtual Reality (VR), Augmented Reality (AR), Gaming Applications, Public Safety and Citizen Analytic, Location and Context-Aware Service	
MODULE 5: 5G NETWORK SECURITY	**7Hrs**
5G Security , 5G Security Goals,5G New Trust Model, Diversified Identity ManagementUser Privacy Protection Requirement,5G Core Security5G Radio Network Security	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Textbooks:

- A Comprehensive Guide to 5G Security by MadhusankaLiyanage ,Ijaz Ahmad, et al.,| 19 March 2018.
- An Introduction to 5G Wireless Networks: Technology, Concepts and Use-cases BySaroVelrajan– 3 July 2020

Reference Books:

- 5G Simplified Paperback by Ajith Singh, 3 October 2019
- 5G System Design: Architectural and Functional Considerations and Long Term Research Hardcover by Patrick Marsch– 4 May 2018

COURSE OUTCOMES (CO)

CO1:Describe features supporting 5G wireless technologies.

CO2:Discuss the rationale for 5G wireless and key deployment topologies

CO3:Walk through current and future deployment of 5G scenarios

CO4:Outline the changes required to implement 5G and security issues

COURSE OUTCOMES	MAPPING WITH PROGRAM OUTCOMES:
CO1	PO1,PO3
CO2	PO3,
CO3	PO10
CO4	PO3

LEVEL OF CO-PO MAPPING TABLE												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**S**											
CO2			**M**									
CO3										**M**		
CO4			**S**									

III SEMESTER
ARTIFICIAL INTELLIGENCE

Course code:				**20MCA353**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Identify the problems where AI is required and the different methods Available.**
- **Compare and contrast different AI techniques available.**
- **Define and explain learning algorithms.**

MODULES	TEACHING HOURS
MODULE 1: Introduction	**8Hrs**
Introduction to artificial intelligence, Course structure and policies, Historyof AIProposing and evaluating AI applications, Case study What is artificial intelligence?, Problems, Problem Spaces and search, Heuristic searchtechnique	
MODULE 2: Knowledge Representation	**8Hrs**
Issues, Using Predicate Logic, Representing knowledge using Rules, Problem spaces and search Knowledge and rationality, heuristic search strategies, Search and optimization (gradient descent) Adversarial search, Planning and scheduling	
MODULE 3: Symbolic Reasoning	**8Hrs**
under Uncertainty, Statistical reasoning,Weak Slot and Filter Structures, strong lot-and-filler structures, Game Playing	
MODULE 4: Fuzzy Logic and inference	**8Hrs**
Ontologies Bayesian reasoning Temporal reasoning Case study: Medical diagnosis	
MODULE 5: Natural Language Processing	**7Hrs**
Learning, Expert Systems, Case studies: Playing chess, Manufacturing scheduling	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

Text Books:

1. E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.
2. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson

Education 2nd Edition

3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India

Reference Books:

1. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill.
2. N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

COURSE OUTCOMES (CO)

CO1: Identify the AI based problems

CO2: Apply techniques to solve the AI problems

CO3: Define learning and explain various learning techniques

CO4: Implement AI concepts in real time projects

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes (COs)	Mapping with POs
CO1	PO1, PO2, PO3
CO2	PO1, PO3, PO6
CO3	PO3, PO8, PO10
CO4	PO1,P03, PO9

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	H									
CO2	M		H		L							
CO3			H					M		L		
CO4	L		M						H			

III SEMESTER
SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

Course code:				**20MCA354**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

1. **Designed to understand emerging field of software architecture in software development and the critical need for the development of such architectures.**
2. **Develop ability to perform the analyses necessary to formulate effective software architectures.**
3. **Analyze Software Engineering problems in terms of architectural thinking.**
4. **Apply the architectural concepts of platform, framework, pattern in architecting applications**

MODULES	TEACHING HOURS
MODULE 1: Understanding Architecture Introduction and Context of Software Architecture. The Architecture Business Cycle. What software architecture is and what it is not; What makes a "good" architecture? What it is and what it is not? Other points of view. Architectural patterns, Reference Models and Reference Architectures. Importance. Architectural structures and views	**7 Hrs**
MODULE 2: Architecture Quality Architecture and Quality Attributes: System Quality Attributes. Quality attribute scenarios in practice. System quality attributes. Achieving Quality attributes: Availability; Modifiability; Performance; Security; Testability; Usability, Business Qualities	**8 Hrs**
MODULE 3: Quality Tactics Applying Tactics: Availability tactics, Interoperability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics	**8 Hrs**
MODULE 4: Design Patterns - 1 Architectural styles: Pipes and Filters, Data Abstraction and OO organization, Event-based, Implicit Invocation, Layered Systems, Repositories, Interpreters, Process Control Architectural Patterns - I: From Mud to structure; Layers; Pipes and filters; Blackboard	**8 Hrs**
MODULE 5: Architecture Designs Case Studies Architectural Patterns – II: Distributed systems: Broker; Interactive systems: Model-view-control Case Studies: Keyword to context, Instrumentation Software, Mobile	**8 Hrs**

Robotics	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks:

1. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice" 3rd Edition ISBN-13: 978-0321815736, ISBN-10: 9780321815736
2. Frank Buschmann, RegineMeunier, et al "Pattern Oriented Software Architecture" 2nd Edition –John Wiley &Sons , ISBN-10: 8120310411

Reference Books

4. Nick Rozanski, Eoin Woods "Software Systems Architecture working with stake holders using viewpoints and perspectives" I edition ISBN-published by Addison Wesley 13: 978-0321112293, ISBN-10: 0321112296.

COURSE OUTCOMES (CO)

CO1:To acquire the knowledge of the context and importance of software architecture andquality maintenance

CO2:To apply the knowledge of various architectural tactics in multiple scenarios to enhancesoftware quality

CO3:To comprehend an architectural style as patterns

CO4:To analyze and apply architectural style in multiple contexts

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO3
CO2	PO1, PO3, PO8
CO3	PO1, PO3,PO5, PO8
CO4	PO1, PO3, PO5,PO8, PO10

LEVEL OF CO-PO MAPPING TABLE

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L		H									
CO2	L		H					M				
CO3	L	L	H		M			M				
CO4	L	L	H		M			H		M		

III SEMESTER
GRAPH THEORY

Course code:				**20MCA355**		**CIE Marks:**	**50**
Number of Lecture Hours per week				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**		**Tutorial (T):**	**1**	**Total Credits:**	**04**

COURSE LEARNING OBJECTIVES (CLO)

- **The primary objective of this course is to provide mathematical background and sufficient experience on various topics of Graph Theory**
- **Students will be able to formally understand and prove theorems/lemmas and relevant results in graph theory.**
- **Students will be able to apply theoretical knowledge acquired to solve realistic problems in real life and concepts to address network design problems.**

MODULES	TEACHING HOURS
MODULE 1: **DEFINITIONS AND FUNDAMENTAL CONCEPTS** Definitions, Walks, Trails, Paths, Circuits, Connectivity, Components Graph Operations, Cuts, Labelled Graphs and Isomorphism	**07 Hrs**
MODULE 2:TREES Trees and Forests (Fundamental) Circuits and (Fundamental) Cut Sets , Directed Graphs, Definition , Directed Trees , Acyclic Directed Graphs	**08 Hrs**
MODULE 3: GRAPH ALGORITHMS Computational Complexity of Algorithms, Warshall's Algorithm Depth First and Breadth-First Searches, The Lightest Path: Dijkstra's Algorithm, The Lightest Path: Floyd's Algorithm, The Lightest Spanning Tree: Kruskal's and Prim's Algorithm The Lightest Hamiltonian Circuit (Travelling Salesman's Problem): Hungarian Algorithm Maximum Flow in a Transport Network: The Ford–Fulkerson Algorithm	**08 Hrs**
MODULE 4: DRAWING GRAPHS Planarity and Planar Embedding, The Davidson–Harel Algorithm, The Lightest Hamiltonian Circuit (Travelling Salesman's Problem): Hungarian Algorithm Maximum Flow in a Transport Network: The Ford–Fulkerson Algorithm	**08 Hrs**
MODULE 5: MATROIDS itary Systems The Circuit Matroid of a Graph, Other Basic Matroids Greedy Algorithm, The General Matroid, Operations on Matroids	**08 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. ANDRÁSFAI, B.: Introductory Graph Theory. The Institute of Physics (1978)
2. ANDRÁSFAI, B.: Graph Theory: Flows, Matrices. The Institute of Physics (1991)
3. BANG-JENSEN, J. & GUTIN, G.: Digraphs: Theory, Algorithms and Applications. Springer–Verlag (2002)
4. BOLLOBÁS, B.: Modern Graph Theory. Springer–Verlag (2002)

Reference Books

1. CHRISTOFIDES, N.: Graph Theory. An Algorithmic Approach. Academic Press (1975)
2. DOLAN, A. & ALDOUS, J.: Networks and Algorithms. An Introductory Approach. Wiley (1999)
3. GIBBONS, A.: Algorithmic Graph Theory. Cambridge University Press (1987)

COURSE OUTCOMES (CO)

CO1: To understand and apply the fundamental concepts in graph theory To improve the proof writing skills.

CO2: To apply graph theory based tools in solving practical problems

CO3: To improve the proof writing skills.

CO4:Apply the acquired knowledge of finite graph theory and to design network problems to solve by computers.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1, PO2, PO3
CO2	PO1, PO3, PO10
CO3	PO3, PO6, PO10
CO4	PO1,P03, PO5

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	H									
CO2	M		H							L		
CO3			H			M				L		
CO4	L		M		H							

III SEMESTER

MACHINE LEARNING USING PYTHON LAB

Sub Code:				**20MCAL36**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:						**SEE Hours:**	**3**
Lecture (L):	**0**	**Practical (P):**	**1**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- **To understand Pre-processing techniques and perform exploratory data analysis.**
- **Identify and apply Machine Learning algorithms to solve real world problems**
- **To develop skills of using recent machine learning software for solving practical problems**

Sl.No	Program
1.	Create a Data frame and demonstrate different ways to treat missing values.
2.	Implement Data Wrangling (Merge, Concatenate, Group) and Data Aggregation.
3.	a. Write a python program to read and write data into files (.CSV, .txt, .XLS). b. Perform exploratory data analysis (Head, Tail, Description, etc.) on any dataset.
4.	Implement Linear Regression using Python Script and identify explanatory variables.
5.	Write a program to demonstrate the working of the decision tree.
6.	Implement clustering technique for a given data set in python.
7.	Write a program to implement the naïve Bayesian classifier for a sample training data set stored asa .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test thesame using appropriate data sets.

Note : Student has to pick one question from a lot of 8 questions

COURSE OUTCOMES (CO)

CO1: Implement exploratory data analysis, data visualization and different machine Learning Techniques to solve real world problems in Python.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	PO2, PO4, PO5, PO7,PO11

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO		L		M	M		S				S	

III SEMESTER
ADVANCES IN JAVA LAB

Sub Code:				**20MCAL37**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**02**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**26**		**SEE Hours:**	**3 Hrs**
Lecture (L):		**Practicals (P):**	**02**	**Tutorial (T):**		**Total Credits:**	**1**

Course Learning objectives

- **Learn the fundamental of connecting to the database**
- **Demonstrate server side programming using Servlet , JSP, EJB.**
- **Design and develop web applications using Spring Framework.**

List of Programs

1.	Demonstrate JDBC programs using MySQL and native database
2.	Demonstrate servlet program to handle form data
3.	Demonstrate servlet programs i) Login and password validation using database ii) Auto refreshing web page iii) Using get or post method
4.	Develop a java servlet program using cookies
5.	Develop a java servlet program for session handling
6.	Develop a JSP program for i) Implementing page directives ii) Implementing action tags iii) Implementing page directives
7.	Develop an application using JSP and JDBC
8.	Develop an application using JAVA bean and JSP
9.	Develop a java application using i) interface ii) packages
10.	Develop a sample application using Spring framework
11.	Develop JDBC application using Spring framework
12.	Develop MVC application using Spring framework

- **Note: In the practical Examination each student has to pick one question from a lot of all the 12 questions.**

COURSE OUTCOMES(CO):

CO: Design and Develop real time applications using Advance java concepts

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	**PO1,PO2,PO4,PO5,PO8,PO11**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	**PO1**	**PO**	**PO3**	**PO**	**PO**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO	**H**	**H**	**L**	**M**	**L**			**H**			**H**	

III SEMESTER
MINI PROJECT

Course Code	**20MCAM38**	**CIE Marks**	**50**
Number of Practical Hours/Week	**4**	**SEE Marks**	**50**
Number of Instructional Hours/Week			
Total Number of Lecture Hours		**SEE Hours**	**03**

Lecture (L):	**0**	**Practicals (P):**	**4**	**Tutorial (T):**	**0**	**Total Credits:**	**2**

Course Learning Objectives:

Students will develop an application using any latest tools and technologies learnt.

MINI-PROJECT

Synopsis

- A team of two students must develop the mini project.
- Synopsis of the project must be submitted in the beginning of the 3rd semester
- The synopsis of the project must include:

  Problem formulation and literature survey.

  Details of the required tools and technologies for the development of project.
- Internal assessment shall be evaluated by the internal panel/guide for 50 marks.

The team must submit a brief project report (25-30 pages)

that must include the following

- Introduction
- Requirement Analysis
- Software Requirement Specification
- Analysis and Design
- Implementation
- Testing

The report must be evaluated for 10 Marks. Demonstration and Viva for 40 Marks.

The project presentation and Viva-voce shall be evaluated jointly by both the internaland external examiners for 50 marks.

Course Outcome:

CO: Design and develop an applications for real world scenario.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	**PO1,PO2,PO4,PO5,PO6,PO8,PO11**

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO	**L**	**M**		**S**	**M**	**M**		**S**			**S**	

III SEMESTER
TECHNICAL SEMINAR

Course Code				**20MCAS39**		**CIE Marks**	**50**
Number of Practical Hours/Week				**-**		**SEE Marks**	
Number of Instructional Hours/Week				**-**			
Total Number of Lecture Hours				**-**		**SEE Hours**	**03**
Lecture (L):	**-**	**Practicals (P):**	**-**	**Tutorial (T):**	**-**	**Total Credits:**	**2**

Course Learning Objectives:

- **Students will present technical seminar by learning new technologies**

Technical Seminar

Seminar Guidelines

- Selection of topic/area : Select a paper according to the specialization of students. Papers from any reputed journals or latest technology shall be selected.

- Obtain the approval from the guide for the selected topic.
  Study of topic: Students are informed to acquire a thorough knowledge on the subject end of the paper) on the corresponding area.

- Preparation of slides for presentation: Slides may be presented in MS power point. Time allowed for presentation is 20 minutes for presentation and 5 minutes for discussions. So, number of slides may be around 20 - 25 to adhere the time limit.

  Organization of slides:

  The first slide will be a title page showing the title, name of student (presenter), USN.

  and Semester. 2nd page will contain overview of the seminar

- Successive pages will contain
  - ✓ Objectives of the paper
  - ✓ Introduction
  - ✓ Body of the paper includes system dynamics, methodology, graphs, block
  - ✓ diagrams etc. arranged in a logical sequence depending on the problem.
  - ✓ Results and discussions
  - ✓ Conclusion

- Last page will contain references and bibliography. References must be presented in

IEEE format

- Each slide consists of 4 or 5 lines with enough space between lines.
- All equations must be typed using equation editor (available with MS office/other office suite)
- Each slide will have a title and each figure have a caption.
- The internal panel will evaluate the seminar presentation for 50 Marks.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	**PO1,PO7,PO8,PO11**

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO	**L**						**M**	**H**			**H**	

IV SEMESTER

MOOC COURSE & INDUSTRY INTERNSHIP

Course Code:	**20MCAI41**	**CIE Marks:**	**50**
Number of Lecture Hours per week:	**-**	**SEE Marks:**	**50**
Total number of Lecture Hours:	**-**	**SEE Hours:**	**3**
		Credits	**05**

Internship - Guidelines

- The students should undergo an internship for 4 weeks during the vacation soon after the 3rd semester SEE.
- The internship shall be carried out in an Industry/R&D labs or Institution
- The student should submit the internship report and make the presentation to the internal panel.
- The internal panel will evaluate the internship work for 50 Marks.
- SEE will be conducted for Internship and will be evaluated for 50 Marks

MOOC Course -Guidelines

- Student shall register in any IT related online courses through NPTEL, SWAYAM etc.,or any other MOOC platform (Minimum of Four weeks)

  Note: Department will not take care of reimbursement of paid courses

- Student should submit Course Registration Details to the guides for the registered online platforms (i.e., NPTEL, SWAYAM, etc.).
- Students can register for MOOC course in any semester between I to III Semesters and have to Submit the Course Completion Certificate during 4th Semester.
- The soft copy of certificate should be submitted to the respective guides/exam section to indicate that student has cleared the MOOC course.

Course Outcomes	
CO1	Apply domain knowledge in proposing solution for IT problem
CO2	Develop/implement the design with appropriate techniques and tools to deliver the solution.
CO3	Work in independently or in collaborative environment
CO4	Develop project with communications skills, make presentations and prepare technical document

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO1,PO2,PO3,PO4**
CO2	**PO1,PO2,PO3,PO4,PO5,PO7,PO8**
CO3	**PO4,PO5,PO7,PO8,PO10,PO11**
CO4	**PO4,PO5,PO7,PO8,PO9,PO10,PO11,PO12**

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**M**	**M**								
CO2	**L**	**L**	**M**	**H**	**H**			**M**				
CO3				**M**	**M**		**M**	**H**		**H**	**H**	
CO4				**M**	**M**		**M**	**M**	**H**	**H**	**H**	**H**

IV SEMESTER
PROJECT WORK

Course Code:				**20MCAP42**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**-**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**-**		**SEE Hours:**	**3**
Lecture (L):	**0**	**Practical (P):**	**4**	**Tutorial (T):**	**0**	**Total Credits:**	**20**

Synopsis

- Synopsis of the project must be submitted before the end of the first month of 4th semester
- The synopsis of the project must include:

  a) Problem formulation and literature survey.

  b) Details of the required tools and technologies for the development of project.

  c) Write up shall not exceed 15 pages.
- Internal assessment for synopsis presentation and evaluation of the synopsis by the internal panel /guide is for 100 marks.

Dissertation:

- The project shall be carried out in the same institution or in industry/R&D labs based on software tools and technologies learnt in MCA course/internship for minimum period of 16 weeks.
- Internal assessment shall be evaluated by the internal panel/guide for **50** marks. For continuous evaluation of project work by the internal examiner/guide with progress reports is for 10 marks each. (3 progress reports x 10 marks= 30)
- Final presentation for the entire project is evaluated for 20 marks by the project Guide.
- The internal examiners (Project Guide with at least 3 years of experience) and the external examiners shall be appointed by the authorities of the college for the final evaluation of the project.
- Internal and external examiners shall carry out the evaluation of Dissertation report for **125** marks individually. The average of the marks allotted by the internal and external examiners shall be the final marks for the project Dissertation report evaluation.
- The project presentation and Viva-voce shall be evaluated jointly by both the internal and external examiners for **75** marks.
- The student shall publish the project outcome in the reputed journals.

Course Outcomes	
CO1	Analysis of project based on various parameters and resources and prepare Gantt chart.
CO2	Implement algorithms or techniques that contribute to the software solution of the project using different tools.
CO3	Analyse, interpret, test and validate experimental results.
CO4	Develop research/technical report with enhanced writing /communication skills following ethical practices.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	PO1,PO2,PO3,PO4
CO2	PO1,PO2,PO3,PO4,PO5,PO7,PO8
CO3	PO4,PO5,PO7,PO8,PO10,PO11
CO4	PO4,PO5,PO7,PO8,PO9,PO10,PO11,PO12

LEVEL OF CO-PO MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	H								
CO2	L	L	M	M	H		H	H		M		
CO3				H	M		H	H				H
CO4				H	M		H	H	H		H	H

Dr. Ambedkar Institute of Technology, Bengluru-56

(An Autonomous Institute, Approved by AICTE, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications

(Accredited by National Board of Accreditation)

MCA I to VI Semester

(2018-21) Scheme & Syllabus

Dr. Ambedkar Institute of Technology, Bengaluru – 560056

Master of Computer Applications

Institute - Vision and Mission

Vision

To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

Mission

- To offer state-of-the-art under graduate, post graduate and doctoral programs in the fields of Engineering, Technology and Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industrial requirements.
- To instill moral and ethical values with social and professional commitment.

DEPARTMENT - VISION AND MISSION

VISION

To create a quality human resource with good technical competence to face the global challenges.

MISSION

- To create a Center of Excellence through industry institute interaction.
- To prepare students for utilizing more creativity, innovativeness and leadership Qualities.
- To inculcate a sense of commitment to the students towards socio-economic development of the nation

Program Educational Objectives

PEO 1: Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.

PEO 2: To prepare students for utilizing more creativity, innovativeness and leadership Qualities.

PEO 3: To provide an opportunity to students to learn the latest trends in computer

technology and make them ready for life-long learning process with leadership skills and corporate social responsibilities.

Program Outcomes:

PO 1: Ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer based systems.

PO 2: Graduates will be able to demonstrate with excellent programming, analytical, logical and problem solving skills.

PO 3: Graduates will be able to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.

PO 4: An ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO 5: An ability to select modern computing tools and techniques and use them with dexterity.

PO 6: An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.

PO 7: An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

PO 8: Develop and maintain medium to large scale application software using theoretical and applied knowledge of software engineering and project management.

PO 9: An ability to communicate effectively.

PO 10: An ability to understand the impact of system solutions in a contemporary, global, economic, environmental, and societal context for sustainable development.

PO 11: An ability to execute the project either individually or in a group.

PO 12: An ability to become an Entrepreneur in the field of information technology to create a value and wealth for the betterment of the individual and society at large.

		I Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
18MCA11	OOPS using C++	3	1	-	4	3	50	50	100
18MCA12	Linux Programming	3	1	-	4	3	50	50	100
18MCA13	Web Technologies	3	1	-	4	3	50	50	100
18MCA14	Discrete Mathematical Structures	3	1	-	4	3	50	50	100
18MCA15	Computer Organization and Architecture	2	1	-	3	3	50	50	100
18MCAL16	OOPS Lab	--	-	1	1	3	50	50	100
18MCAL17	Linux Lab	--	-	1	1	3	50	50	100
18MCAL18	Web Technology Lab	--	-	1	1	3	50	50	100
Total		**14**	**5**	**3**	**22**	**24**	**400**	**400**	**800**

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		II Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**Practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA21	Java Programming	3	1	-	4	3	50	50	100
18MCA22	Data Structures using C++	3	1	-	4	3	50	50	100
18MCA23	Analysis and Design of Algorithms	3	1	-	4	3	50	50	100
18MCA24	Database Management System	3	1	-	4	3	50	50	100
18MCA25	Operating System	2	1	-	3	3	50	50	100
18MCAL26	Java Programming Lab	--	-	1	1	3	50	50	100
18MCAL27	Data Structures Lab	--	-	1	1	3	50	50	100
18MCAL28	DBMS lab	--	-	1	1	3	50	50	100
Total		**14**	**5**	**3**	**22**	**24**	**400**	**400**	**800**

		III Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
18MCA31	Network Architecture & Management	3	1	-	4	3	50	50	100
18MCA32	Python Programming	3	1	-	4	3	50	50	100
18MCA33	Advanced Software Engineering	3	1	-	4	3	50	50	100
18MCA34	Data Science using R	2	1	-	3	3	50	50	100
18MCA35	Elective-1	2	1	-	3	3	50	50	100
18MCAL36	Network Architecture Lab	--	-	1	1	3	50	50	100
18MCAL37	Python programming Lab	--	-	1	1	3	50	50	100
18MCAL38	Data Science using R Lab	--	-	1	1	3	50	50	100
Total		**13**	**5**	**3**	**21**	**24**	**400**	**400**	**800**

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ELECTIVE-1									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA351	Software Testing and Practices	2	1	-	3	3	50	50	100
18MCA352	Advanced DBMS	2	1	-	3	3	50	50	100
18MCA353	Artificial Intelligence	2	1	-	3	3	50	50	100

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		IV Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	practicals	Total Credits		CIE	SEE	
18MCA41	Enterprise Applications-1	2	1	-	3	3	50	50	100
18MCA42	Advanced Web Technologies	2	1	-	3	3	50	50	100
18MCA43	Analytical Skills And Building Professional Development	2	1	-	3	3	50	50	100
18MCA44	Elective-2	2	1	-	3	3	50	50	100
18MCA45	Elective-3	2	1	-	3	3	50	50	100
18MCA46	Research Methodology	1	1	--	2	3	50	50	100
18MCAL47	Enterprise Applications Lab	--	-	1	1	3	50	50	100
18MCAL48	Advanced Web Technologies Lab	--	-	1	1	3	50	50	100
18MCAM49	Mini Project using Android	--	-	2	2	3	50	50	100
Total		**11**	**6**	**4**	**21**	**27**	**450**	**450**	**900**

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ELECTIVE-2									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA441	Information Security	2	1	--	3	3	50	50	100
18MCA442	Data Mining & Business Intelligence	2	1	--	3	3	50	50	100
18MCA443	Object oriented Modelling & Design	2	1	--	3	3	50	50	100

ELECTIVE-3									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA451	Software Quality & Performance Evaluation	2	1	--	3	3	50	50	100
18MCA452	Software Architecture	2	1	--	3	3	50	50	100
18MCA453	Enterprise Resource Planning	2	1	--	3	3	50	50	100

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		V Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	practicals	Total Credits		CIE	SEE	
18MCA51	Machine Learning	3	1	-	4	3	50	50	100
18MCA52	Big Data Analytics	2	1	-	3	3	50	50	100
18MCA53	Cloud Computing	2	1	-	3	3	50	50	100
18MCA54	Elective -4	2	1	-	3	3	50	50	100
18MCA55	Elective -5	2	1	-	3	3	50	50	100
18MCAL56	Machine Learning Lab	--	-	1	1	3	50	50	100
18MCAL57	Big Data Analytics Lab	--	-	1	1	3	50	50	100
18MCAL58	Cloud Computing Lab	--	-	1	1	3	50	50	100
18MCAI59	Industry Internship (6 weeks)	--	--	--	5	3	50	50	100
Total		**10**	**5**	**4**	**24**	**27**	**450**	**450**	**900**

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ELECTIVE-4									
V SEMESTER									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA541	Enterprise Application-2	2	1	--	3	3	50	50	100
18MCA542	Full Stack Development with MERN	2	1	--	3	3	50	50	100
18MCA543	DevOps	2	1	--	3	3	50	50	100

ELECTIVE-5									
V SEMESTER									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA551	Web Services	2	1	-	3	3	50	50	100
18MCA552	Internet of Things	2	1	-	3	3	50	50	100
18MCA553	Block Chain Technology	2	1	-	3	3	50	50	100

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VI SEMESTER							
Subject Code	**Name of the Subject**	**Internal**	**External**	**Dissertation Evaluation**	**Viva voce**	**Total Marks**	**Credits**
18MCAS61	Technical Seminar	50	--	--	--	50	2
18MCAP62	Project Work	50	-	100	100	250	20
Total		100	--	100	100	300	22

Grand Total (I to VI Semesters): 4500 Marks : 132 Credits

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Master of Computer Applications

Institute - Vision and Mission

Vision

To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

Mission

- To offer state-of-the-art under graduate, post graduate and doctoral programs in the fields of Engineering, Technology and Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industrial requirements.
- To instill moral and ethical values with social and professional commitment.

DEPARTMENT - VISION AND MISSION

VISION

To create a quality human resource with good technical competence to face the global challenges.

MISSION

- To create a Center of Excellence through industry institute interaction.
- To prepare students for utilizing more creativity, innovativeness and leadership Qualities.
- To inculcate a sense of commitment to the students towards socio-economic development of the nation

Program Educational Objectives

PEO 1: Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.

PEO 2: To prepare students for utilizing more creativity, innovativeness and leadership Qualities.

PEO 3: To provide an opportunity to students to learn the latest trends in computer technology and make them ready for life-long learning process with leadership skills and corporate social responsibilities.

Program Outcomes:

PO 1: Ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer based systems.

PO 2: Graduates will be able to demonstrate with excellent programming, analytical, logical and problem solving skills.

PO 3: Graduates will be able to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.

PO 4: An ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO 5: An ability to select modern computing tools and techniques and use them with dexterity.

PO 6: An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.

PO 7: An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

PO 8: Develop and maintain medium to large scale application software using theoretical and applied knowledge of software engineering and project management.

PO 9: An ability to communicate effectively.

PO 10: An ability to understand the impact of system solutions in a contemporary, global, economic, environmental, and societal context for sustainable development.

PO 11: An ability to execute the project either individually or in a group.

PO 12: An ability to become an Entrepreneur in the field of information technology to create a value and wealth for the betterment of the individual and society at large.

		I Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**Practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA11	OOPS using C++	4	-	-	4	3	50	50	100
18MCA12	Linux Programming	4	-	-	4	3	50	50	100
18MCA13	Web Technologies	4	-	-	4	3	50	50	100
18MCA14	Discrete Mathematical Structures	4	-	-	4	3	50	50	100
18MCA15	Computer Organization and Architecture	3	-	-	3	3	50	50	100
18MCAL16	OOPS Lab	--	-	1	1	3	50	50	100
18MCAL17	Linux Lab	--	-	1	1	3	50	50	100
18MCAL18	Web Technology Lab	--	-	1	1	3	50	50	100
	Total	**19**	**-**	**3**	**22**	**24**	**400**	**400**	**800**

		II Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**Practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA21	Java Programming	4	-	-	4	3	50	50	100
18MCA22	Data Structures using C++	4	-	-	4	3	50	50	100
18MCA23	Analysis and Design of Algorithms	4	-	-	4	3	50	50	100
18MCA24	Database Management System	4	-	-	4	3	50	50	100
18MCA25	Operating System	3	-	-	3	3	50	50	100
18MCAL26	Java Programming Lab	--	-	1	1	3	50	50	100
18MCAL27	Data Structures Lab	--	-	1	1	3	50	50	100
18MCAL28	DBMS lab	--	-	1	1	3	50	50	100
Total		**19**	**-**	**3**	**22**	**24**	**400**	**400**	**800**

		III Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**Practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA31	Network Architecture & Management	4	-	-	4	3	50	50	100
18MCA32	Python Programming	4	-	-	4	3	50	50	100
18MCA33	Advanced Software Engineering	4	-	-	4	3	50	50	100
18MCA34	Data Science using R	3	-	-	3	3	50	50	100
18MCA35	Elective-1	3	-	-	3	3	50	50	100
18MCAL36	Network Architecture Lab	--	-	1	1	3	50	50	100
18MCAL37	Python programming Lab	--	-	1	1	3	50	50	100
18MCAL38	Data Science using R Lab	--	-	1	1	3	50	50	100
Total		**18**	**-**	**3**	**21**	**24**	**400**	**400**	**800**

ELECTIVE-1									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA351	Software Testing and Practices	3	-	-	3	3	50	50	100
18MCA352	Advanced DBMS	3	-	-	3	3	50	50	100
18MCA353	Artificial Intelligence	3	-	-	3	3	50	50	100

		IV Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA41	Enterprise Applications-1	3	-	-	3	3	50	50	100
18MCA42	Advanced Web Technologies	3	-	-	3	3	50	50	100
18MCA43	Analytical Skills And Building Professional Development	2	1	-	3	3	50	50	100
18MCA44	Elective-2	3	-	-	3	3	50	50	100
18MCA45	Elective-3	3	-	-	3	3	50	50	100
18MCA46	Research Methodology	2	-	--	2	3	50	50	100
18MCAL47	Enterprise Applications Lab	--	-	1	1	3	50	50	100
18MCAL48	Advanced Web Technologies Lab	--	-	1	1	3	50	50	100
18MCAM49	Mini Project using Android	--	1	1	2	3	50	50	100
Total		**16**	**2**	**3**	**21**	**27**	**450**	**450**	**900**

ELECTIVE-2									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA441	Information Security	3	--	--	3	3	50	50	100
18MCA442	Data Mining & Business Intelligence	3	--	--	3	3	50	50	100
18MCA443	Object oriented Modelling & Design	3	--	--	3	3	50	50	100

ELECTIVE-3									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA451	Software Quality & Performance Evaluation	3	--	--	3	3	50	50	100
18MCA452	Software Architecture	3	--	--	3	3	50	50	100
18MCA453	Enterprise Resource Planning	3	--	--	3	3	50	50	100

		V Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA51	Machine Learning	4	-	-	4	3	50	50	100
18MCA52	Big Data Analytics	3	-	-	3	3	50	50	100
18MCA53	Cloud Computing	3	-	-	3	3	50	50	100
18MCA54	Elective -4	3	-	-	3	3	50	50	100
18MCA55	Elective -5	3	-	-	3	3	50	50	100
18MCAL56	Machine Learning Lab	--	-	1	1	3	50	50	100
18MCAL57	Big Data Analytics Lab	--	-	1	1	3	50	50	100
18MCAL58	Cloud Computing Lab	--	-	1	1	3	50	50	100
18MCAI59	Industry Internship (6 weeks)	--	--	--	5	3	50	50	100
	Total	**16**	**-**	**3**	**24**	**27**	**450**	**450**	**900**

ELECTIVE-4									
V SEMESTER									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA541	Enterprise Application-2	3	--	--	3	3	50	50	100
18MCA542	Full Stack Development with MERN	3	--	--	3	3	50	50	100
18MCA543	DevOps	3	--	--	3	3	50	50	100

ELECTIVE-5									
V SEMESTER									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA551	Web Services	3	--	-	3	3	50	50	100
18MCA552	Internet of Things	3	--	-	3	3	50	50	100
18MCA553	Block Chain Technology	3	--	-	3	3	50	50	100

VI SEMESTER							
Subject Code	**Name of the Subject**	**Internal**	**External**	**Dissertation Evaluation**	**Viva voce**	**Total Marks**	**Credits**
18MCAS61	Technical Seminar	50	--	--	--	50	2
18MCAP62	Project Work	50	-	100	100	250	20
Total		100	--	100	100	300	22

Grand Total (I to VI Semesters): 4500 Marks : 132 Credits

SEMESTER –I Object Oriented Programming using C++			
Subject Code	**18MCA11**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**4**	**SEE Marks**	**50**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives(CLO)

- Develop a greater understanding of programming language and implementation
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms
- Provide in-depth coverage of C and object-oriented programming concepts and techniques using C++.
- To demonstrate polymorphism of different operators which can be used based on the context of the program.
- To overcome the drawbacks of structured programming by introducing inheritance Concept which reduce the code complexity and increases the code reusability.
- Apply the standard template libraries for implementing stack, queue and list.

Modules

Module -1	**10 Hours**
Introduction to OOP with C++ Classes and Objects: The Origins of C++, What Is Object-Oriented Programming? ,Encapsulation, Polymorphism , Inheritance. The General Form of a C++ Program, Friend Functions, Friend Classes, Inline Functions, Constructors and Destructors, Constructors with One Parameter, When Constructors and Destructors Are Executed, Static Class Members ,Static Data Members ,Static Member Functions, The Scope Resolution Operator, Nested Classes, Passing Objects to Functions, Returning Objects, Object Assignment.	
Module -2	**10 Hours**
Arrays, Pointers, References, and the Dynamic Allocation Operators	

Arrays of Objects, Pointers, Pointer Expression, Pointer as function arguments, Functions returning pointers, Pointers to functions, Creating Initialized vs, Pointers to Objects, The this Pointer, References, Reference Parameters, Passing References to Objects, Returning References, C++'s Dynamic Allocation Operators new and delete, Initializing Allocated Memory ,Allocating Arrays ,Allocating Objects. Function Overloading, Copy Constructors and Default Arguments: Function Overloading, Overloading Constructors, Copy Constructors, Default Function Arguments, Function Overloading and Ambiguity. Operator Overloading: Creating a Member Operator Function, Creating Prefix and Postfix Forms, of the Increment and decrement Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function, Using a Friend to Overload ++ or – –, Overloading [ ] , Overloading ()	
Module -3	**12 Hours**
Inheritance: Base-Class Access Control, Inheritance and protected Members, Protected Base-Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors, and Inheritance, When Constructors and Destructors Are Executed, Passing Parameters to Base-Class Constructors, Granting Access, Virtual Base Classes. **Virtual Functions and Polymorphism:** Virtual Functions, Calling a Virtual Function Through a Base Class Reference, The Virtual Attribute Is Inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Abstract Classes, Using Virtual Functions, Early vs. Late Binding. Templates: Generic Functions, A Function with Two Generic Types, Explicitly Overloading a Generic Function, Overloading a Function Template, **Generic Function** Restrictions ,Applying Generic Functions, A Generic Sort, Generic Classes, Using Default Arguments with Template Classes, The type name and export Keywords, The Power of Templates.	
Module -4	**10 Hours**
Exception Handling: Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception HandlingOptions, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ),uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling.	

Module -5	**10 Hours**
Standard C++ I/O Classes : Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>,Creating Your Own Inserters, Creating Your Own Extractors, Creating Your Own Manipulator Functions **C++ File I/O:** fstream> and the File Classes, Opening and Closing a File, Reading and Writing Text Files, put( ) and get( ), read( ) and write( ),More get( ) Functions, getline( ) , Detecting EOF, peek( ), Obtaining the Current FilePosition.	
Question paper pattern: • There will be 10 questions with 2 full questions from each module. • Each full question consists of 20 marks. • Students have to answer 5 full questions, selecting ONE from each module.	

Text Books:

1. ".Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014. (Listed topics only from Chapters 11,12,13,14, 15, 16, 17, 18, 19, 20, and21)
2. K R Venugopal, RajkumarBuyya,T Ravishanker: Mastering C++,Tata McGraw Hill.

Reference Books:

1. "Stanley B. Lippmann, JoseeLajore: C++Primer, 4th Edition, Addison Wesley.
2. Stephen Prata : C++ Primer Plus, 6th Edition, Pearson Education.
3. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.

Course Outcome (CO):

CO1: Acquire knowledge on C++ programming concepts.
CO2: Analyze the different concepts of C++.
CO3: Design and Develop the solution to a problem using Object Oriented Programming Concepts.
CO4: Apply the learning into real world problems independently..

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO1,PO2
CO 3	PO2,PO4
CO 4	PO2,PO4

CO 5	PO2,PO4

SEMESTER –I Linux Programming			
Subject Code	**18MCA12**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**4**	**SEE Marks**	**50**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives(CLO)

- Describe the architecture of Linix Operating System (OS).
- Demonstrate and analyse the Linix commands usage.
- Use Linix utilities to create simple tools for information processing.
- Illustrate the power of Linix shell by writing shell scripts.
- Explain and analyse the process concepts in Linix OS.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Introduction History, Architecture, Experience the Basic commands ls cat,S, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and spell, Command Line Arguments, Exit Status of a Command, The Logical Operator s&& and||,ex It ,if, and case conditions, expr, sleep and wait, while, until, for,$,@, redirection, set and shift, trap.	
Module -2	**10 Hours**
UNIX File System: The file, what's in a file name? The parent-child relationship, pwd the Home directory, Absolute path names, using absolute pathnames For a command, cd ,mkdir, rmdir, Relative path names, The UNIX file system. Basic File Attributes: Is–l, the-D option, File Permissions , chmod, Security and Security and File Permission,usersandgroups,security level,changing permission, Changing ownership and group, File Attributes, More file attributes 4hard link, symbolic link, umask, find.	
Module -3	**10 Hours**
Simple Filters: Pr, head, tail, cut, paste, sort , uniq, tr commands ,Filters using Filters using Regular Expression: grep, Regular Expression, egrep, fgrep sed instruction, Line Addressing, Insert ingand Changing Text, Context addressing, writing selected lines to a file, the– f option, Substitution ,Properties of Regular Expressions.	
Module -4	**10 Hours**

Awk and Advanced Shell Programming: Awk-Advanced Filters: Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters ,get line, Built-nvariables, Arrays, Functions, Interface with the Shell, Control Flow. The sh command export, the Command, Conditional Parameter substitution	
Module -5	**12 Hours**
Process and System Administration: Process basics, PS, internal and external commands, running jobs in background, nice, at and batch , cron, time commands, Essential system Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, Aliases, Command History, On-line Command Editing.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. 1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGrawHill

Reference Books:

1. "Unix Shell Programming", Yashwant Kanetkar,
2. "Beginning Shell Scripting", Eric Foster-Johnson, JohnCWelch, MicahAnderson, Wroxpublication.
3. UNIX: Concepts and Applications, Sumitabha Das, Tata McGrawHill, "Introduction to UNIX" by M.G.Venkatesh Murthy.

Course Outcomes:

CO1: Understand and experience the UNIX environment, File system and hierarchy.
CO2: Understand File system and Demonstrate commands to extract, interpret data for further processing.
CO3: Understand Filters and Regular Expressions.
CO4: Analyze the usage of different shell commands, variables and AWK filtering.
CO5: Interpret and manipulate process attributes and System administrations

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2
CO 2	PO1, PO2
CO 3	PO1, PO2

CO 4	PO1, PO2
CO 5	PO1

SEMESTER-I Web Technologies			
Subject Code	**18MCA13**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**4**	**SEE Marks**	**50**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives(CLO):

- Demonstrate the underlying principles, methods and approaches of Web technologies.
- Understand XHTML tags and CSS style sheets.
- Build Java script and different event handlers in java script.
- Demonstrate dynamic document using java script and XML.
- Use jQuery to develop dynamic and interactive web page.

Modules	Teaching Hours
Module -1	**9 Hours**
Web Fundamentals Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, and the Web Programmers Toolbox. Introduction to XHTML Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML.	
Module -2	**12 Hours**
Introduction to HTML5 New features of HTML5, HTML5 DocType, HTML5 Structure, Tags- nav, section, article, aside, header, footer, HTML5 Form Elements- Search, tel, url, email, number and range, HTML5 Media tags- Audio and video. **Cascading Style Sheets** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color Alignment of text, The box model, Background images, The and tags, Conflict resolution.	
Module -3	**10 Hours**

The basics of JavaScript Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts. **JavaScript and XHTML Documents** The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model, The navigator Object, Dom Tree Traversal and Modification.	
Module -4	**12 Hours**
Dynamic Documents with JavaScript Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements **Introduction to XML Introduction** Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, Web services.	
Module -5	**9 Hours**
Introduction to jQuery Introducing jQuery, jQuery fundamentals, Creating the wrapped element set, Bringing pages to life with jQuery, Understanding the browser event models, The jQuery Event Model, Sprucing up with animations and effects.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Robert W.Sebesta ,"Programming the World Wide Web", 4thEdition, Pearson education, 2012.
2. Kogent Learning solutions Inc., "HTML 5: Covers CSS3, JavaScript,XML, XHTML AJAX, PHP & JQuery: Black Book", Dreamtech Press.

3. Bear Bibeault, Yehuda Katz: jQuery in Action. 3rd Edition, DreamTech India,2008.

Reference Books:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 2nd Edition, Pearson, 2018.
2. Jeffrey C.Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7 th Impression, 2012.
3. Chris Bates: Web Programming Building Internet Applications, 3rdEdition, WileyIndia, 2009.
4. Zak Ruvalcaba Anne Boehm, "Murach's HTML5 and CSS3", 3rd Edition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016.

COURSE OUTCOMES:

CO1: Understand the fundamentals of web and outline the features.

CO2: Design a web page with media components using HTML5 and CSS.

CO3: Develop XML documents and display using CSS.

CO4: Design and develop dynamic and interactive web pages using JavaScript and jQuery.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO5,PO11
CO 2	PO5,PO11
CO 3	PO4,PO5,PO7,PO11
CO 4	PO2,PO4,PO5,PO11

SEMESTER –I

DISCRETE MATHEMATICAL STRUCTURES

Subject Code	**18MCA14**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives(CLO):

- Derive logical implications and equivalences using laws of logic, use of quantifiers and different ways of proving a given statement.
- Apply the concept of set theory and properties of relations, draw Hasse diagram for partial ordering and lattice.
- Apply axioms of probability and derive independent and dependent probability.
- Identify types of graph, outline properties of graphs, and apply to some practical problems like traveling sales man problem.

Modules	**Teaching Hours**
Module -1	**12 Hours**
Fundamentals of Logic: Basic connectives and truth tables, logical equivalence, laws of logic, logical Implication, Rules of inference, Use of Quantifiers.	
Module -2	
Sets Theory and Probability Sets and subsets,set operations, laws of set theory, counting and venn diagrams. A first word on probability, axioms of probability, conditional probability.	**10 Hours**
Module -3	**10 Hours**
Fundamentals of Counting and Properties of Integers: The rules of Sum and Product, Permutations and Combinations, The Binimial theorem, Mathematical Induction, Recursive definitions: Fibonacci and Lucas numbers	
Module -4 **Relations and Functions** Cartesian product and relations ,Properties of relations, Equivalence relations, Posets and Hasse diagrams.	**10 Hours**

Functions Functions: plain and one-to-one, onto functions, Stirling numbers of the second kind, Pigeon hole principle.	
Module -5	**10 Hours**
Graph Theory: Graphs, terminology and special types of graphs, representation of graphs, isomorphism, connectivity, Euler and Hamiltonian paths, shortest path problems	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Discrete and Combinatorial Mathematics by Ralph P. Grimaldi and B V Ramana,5thedition,Pearson,2011. (Chapters: 1.1 to 1.3 4.1, 4.2,2.1 to 2.5, 3.1 to 3.6)
2. Higher Engieering Mathematics by Dr. B. S. Grewal, Khanna publishers, 40th edition(Chapters: 25.12 to 25.16, 24.1 to 24.6)

Reference Books:

1. Graph Theory with Applications to Engineering and Computer Science by NarsinghDeo, Prentice Hall India, 2004.
2. Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R. Manohar, McGraw Hill.

Course Outcome (CO):

CO1: Use the logical notation to define and reason about proofs and disproof's.

CO2: Apply fundamental mathematical concepts such as sets, relations, and functions.

CO3: Calculate numbers of possible out comes of elementary combinatorial processes such as permutations and combinations.

CO4: Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO1,PO2
CO 3	PO1,PO2
CO 4	PO1,PO2
CO 5	PO1,PO2

SEMESTER –I

Computer Organization and Architecture

Subject Code	**18MCA15**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives(CLO)

- To understand the design of Digital Logic System.
- To study the fundamental working of functional units of a computer
- To study the design of instructions in a basic system and interfaces
- To study the functionalities of hierarchical memory system

Modules	**Teaching Hours**
Module -1	**8 Hours**
Computer Organizations: -Binary Systems, Combinational Logic and Sequential Logic: Digital computers and digital systems, binary numbers, number base conversion octal and hexadecimal numbers, binary code, binary storage and registers binary logic, integrated circuits digital logic gates Map Method (2,3,4 variable Map) NAND and NOR implementation , don't care condition.	
Module -2	**8 Hours**
Introduction to Adders, Subtractors, Decoders, Multiplexers, Sequential logic: Introduction, Different types of Flip Flops, Registers.	
Module -3	**8 Hours**
Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multi computers, Introduction to Assemblers and Compilers. Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes.	
Module -4	**8 Hours**
Basics of Assembly Language Programme, Examples from Assembly Language Programming. Accessing I/O Devices, Interrupts, DMA.	

Module -5	**7 Hours**
Basic Concepts, Semiconductor RAM Memories, Read – Only Memories, Speed, Size, and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. M. Morris Mano, " Digital Logic and Computer Design", Pearson, 2012 (Chapters1.1 - 1.4, 1.6 - 1.9, 2.7, 3.2 - 3.3, 3.6, 3.8, 4.3 - 4.4, 5.5- 5.6, 6.1-6.2 7.2 - 7.4)
2. Carl Hamachar and Z. V. S. Zaky, " Computer Organization", 5th Edition, Tata McGraw Hill (Chapters 1.1 - 1.5, 2.1 - 2.4, 4.1 - 4.4, 5.1 - 5.5, 5.7)
3. P. V. S. Rao, " Computer System Organization and Architecture", Pearson 2009 (Chapters 8.1 - 8.7 , 10.1 – 10.5

Reference Books:

1. JohnP.Hayes, "Computer Architecture and Organization", Tata McGraw-Hill, Edition, 2012.
2. SoumitrsKumar Mandal,"Digital Electronics Principles and Applications", Tata McGraw-Hill, 2010
3. Hamacher , " Computer Organization" , McGraw-Hill Education

Course Outcome (CO):

CO1: Understand and apply the concepts in the design of a logic system
CO2:. Understand the Basics of Computer system organization
CO3: Analyse and implement the addressing modes and instruction set.
CO4: Acquire knowledge on I/O interfaces and memory hierarchy

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1,PO2
CO 3	PO2
CO 4	PO2
CO 5	PO2

SEMESTER –I

OOPS using C++ LAB

Laboratory Code	**18MCAL16**	CIE Marks	**50**
Number of Lecture Hours/Week	**2**	SEE Marks	**50**

SEE Hours :**03**

CREDITS – 0:0:1

Course Learning Objective(CLO)

CO1: To learn and implement how to solve common types of computing problems.
CO2: To acquire knowledge on concepts of C++ programming.
CO3: To improves the problem solving skills using C++.
CO4: To design and develop interactive applications using C++.
CO5: To implement real world problems using oop's.

PART A

1. Write a C++ program to find the sum for the given variables using function with default arguments.

2. Write a C++ program to swap the values of two variables and demonstrates a function using call by value.

3. Write a C++ program to swap the values of two variables and demonstrates a function using Call by reference using reference type (&).

4. Write a C++ program to swap the values of two variables and demonstrates a function using Call by reference using pointer (*).

5. Write a C++ program to swap the values of two dynamically allocated variables and release the memory after swapping. (use new & delete operators)

6. Write a program to find the largest, smallest & second largest of three numbers. (use inline function MAX and MIN to find largest & smallest of 2 numbers)

7. Write a program to calculate the volume of different geometric shapes like cube, cylinder and sphere and hence implement the concept of Function Overloading.

8. Write a C++ program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles.

PART B

1. Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.

2. Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a complex number:
(i) ADD (a, s2) – where 'a' is an integer (real part) and s2 is a complex number
(ii) ADD (s1, s2) – where s1 and s2 are complex numbers.

3. Friend functions and friend classes:

a) Write a program to define class name HUSBAND and WIFE that holds the income respectively. Calculate and display the total income of a family using Friend function.

b) Write a program to accept the student detail such as name and 3 different marks by get_data() method and display the name and average of marks using display() method. Define a friend class for calculating the average of marks using the method mark_avg().

4. Create a class called MATRIX using two-dimensional array of integers. Implement the following operations by overloading the operator == which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by overloading the + and – operators respectively. Display the results by overloading the operator <<. If (m1== m2) then m3 = m1+m2 and m4 = m1- m2 else display error.

5. Write a program to create an HUMAN class with features as number of Head, Legs, Hands.(NOTE: Number of Head, Legs and Hands are of integer types)

a. Create an object HUMAN1 using default constructor. (Default features to have 1 Head, 2 Legs and 2 Hands)

b. Create an object HUMAN2 with customized inputs using Parameterized Constructor

c. Create an object HUMAN3 using existing object HUMAN1 (Copy Constructor).

d. All Humans die after their lifetime. (Destructor)

6. Demonstrate Simple Inheritance concept by creating a base class FATHER with data members SurName and BankBalance and creating a derived class SON, which inherits SurName and BankBalance feature from base class but provides its own feature FirstName and DOB. Create and initialize F1 and S1 objects with appropriate constructors and display the Father & Son details. (Hint : While

creating S1 object, call Father base class parameterized constructor through derived class by sending values)

7. Create an abstract base class EMPLOYEE with data members: Name, EmpID and BasicSal and a pure virtual function Cal_Sal().Create two derived classes MANAGER (with data members: DA and HRA and SALESMAN (with data members: DA, HRA and TA). Write appropriate constructors and member functions to initialize the data, read and write the data and to calculate the net salary. The main() function should create array of base class pointers/references to invoke overridden functions and hence it implements run-time polymorphism.

8. Write a program to implement FILE I/O operations on characters. I/O operations includes inputting a string, Calculating length of the string, Storing the string in a file, fetching the stored characters from it, etc.

9. Write a program to implement Exception Handling with minimum 5 exceptions Classes including two built-in exceptions.

10. a.Write a program to concatenate 2 strings using STL String class functions.

b.Write a simple C++ program to store and display integer elements using STL Vector class.

Note 1: In the practical Examination, each student has to pick one question from PART A and one from Part B.

Note 2: Change of program is not permitted in the Practical Examination

Course Outcomes (CO):

CO1: Apply and implement major programming and object oriented concepts like function overloading, operator overloading, Encapsulations, and inheritance, message passing to solve real-world problems.
CO2: Use major C++ features such as Virtual functions, Templates for data type independent designs and File I/O to deal with large data sets.
CO3: Analyze, design and develop solutions to real-world problems applying OOP Concepts of C++.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2

SEMESTER –I

LINUX LAB

Laboratory Code	**18MCAL17**	CIE Marks	**50**
Number of Lecture Hours/Week	**02**	SEE Marks	**50**

SEE Hours : **03**

CREDITS – 0:0:1

Course Learning Objectives(CLO) :

- Familiarize the Unix environment
- Learn to work on Vi-editor
- Understand basic commands
- Apply commands and to write the shell scripts
- Understand the Filters and to use the basic filters

A. Explore the UNIX environment.

B. Explore vi editor with vim tutor .Perform the following operations using vi editor, but not limited to:

1. Insert character, delete character, replace character
2. Save the file and continue working
3. save the file and exit the editor
4. quit the editor
5. quit without saving the file
6. rename a file
7. insert lines, delete lines,
8. setline numbers
9. search for a pattern
10. move forward and backward

1a. Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.

1b. Write a shell script that accepts a pathname and creates all the components in that pathname as directories. For example, if the script is named mpc,then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.

2a.Write a shell script that accepts two filenames as arguments, checks if the permissions for these files are identical and if the permissions are identical, output

common permissions and otherwise output each filename followed by its permissions.

2b.Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.

3a. Create a script file called file-properties that reads a filename entered and outputs it Properties

3b. Write shell script to implement terminal locking (similar to the lock command).It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it mus lock the keyword until a matchingpassword is entered again by the user, Note that the script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.

4a. Write a shell script that accept one or more file names as argument and convert all of them to uppercase, provided they exist in current directory.

4b. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.

5a. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.

5b. Write a shell script to display the calendar for current month with current date replaced by *or** depending on whether the date has one digit or two digits

6a. Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir.

6b. Write a shell script to list all the files in a directory whose filename is atleast 10 characters.(use expr command to check the length)

7a. Write a shell script that gets executed displays the message either “Good Morning” or “Good Afternoon” or “Good Evening” depending upon time at which the user logs in.

7b. Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other

argument files.

8a. Write a shell script that determine the period for which a specified user is working on system and display appropriate message.

8b. Write as hell script that reports the logging in of a specified user with in one minute after he/she login. The script automatically terminate if specified user does not login during a specified period of time

9a. Write a shell script that accept the filename, starting and ending line number as an argument and display all the lines between the given line number.

9b. Write a shell script that folds long lines into 40columns.Thus any line that exceeds 40characters must be broken after 40^{th},a"\" is to be appended as the indication of folding and the processing is to be continued with the residue. The input is to be supplied through at ext file created by the user.

10a. Write an awk script that accepts date argument in the form of dd-mm-yy and displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.

10b. Write an awk script to delete duplicated line from a text file. The order of the original lines must remain unchanged.

11a. Write an awk script to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below.

Electrical	34
Mechanical	67
Electrical	80
ComputerScience	43
Mechanical	65
Civil	98
ComputerScience	64

11b. Write an awk script to compute gross salary of an employee accordingly to rule given below.

If basicsalary is<10000 then HRA=15% of basic & DA=45% of basic If basicsalary is >=10000 then HRA=20% of basic & DA=50% of basic.

Note 1: In the practical Examination each student has to pick one question from a lot of all1-11 questions.

COURSE OUTCOMES(CO):

CO1: Understand the Unix programming environment.

CO2: Be fluent in the use of Vi editor.

CO3: Be able to design and implement shell scripts to manage users with different types of Permission and file based applications.
CO4: Be fluent to write Awk scripts.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

SEMESTER –I

Web Technologies Lab

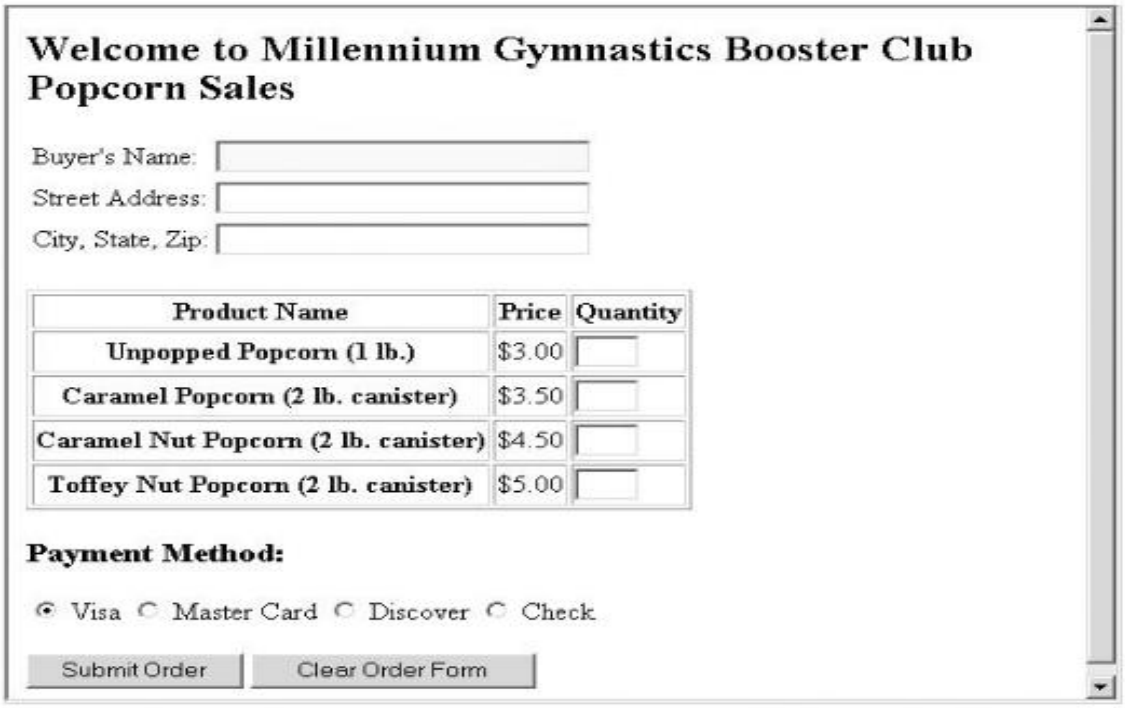
Laboratory Code	**18MCAL18**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
		SEE Hours	**03**

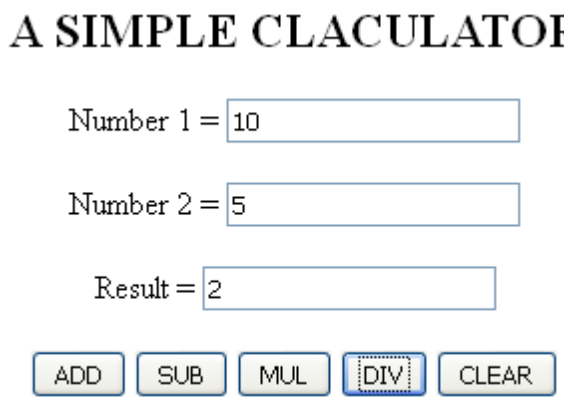
CREDITS – 0:0:1

Course Learning Objectives(CLO):

- To develop web pages using HTML and HTML5.
- To demonstrate the usage of CSS in designing web pages.
- To execute simple programming questions using JavaScript.
- To create dynamic web pages by manipulating the DOM elements.
- To design and implement user interactive dynamic web based applications using jQuery.

1	Create an XHTML page that provides information about your department. Your XHTML page must use the following tags: a) Text Formatting tags b) Horizontal rule c) Meta element d) Links e) Images f) Tables (Use of additional tags encouraged).
2	Develop and demonstrate the usage of inline, external and internal style sheet using CSS. Use XHTML page that contains at least three paragraphs of text, listed elements and a table with four rows and four columns.
3	Develop and demonstrate a XHTML file that includes Javascript script for the following problems: a) Input : A number n obtained using prompt Output : The first n Fibonacci numbers b) Input : A number n obtained using prompt Output : A table of numbers from 1 to n and their squares using alert
4	Write a JavaScript program to generate n number of random numbers and store them in an array. Sort the generated numbers in ascending order using array sort method. Develop separate functions to find mean and median of numbers that are in the array. Display the results with appropriate messages.
5	Create a XHTML document that describes the form for taking orders for popcorn. Text boxes are used at the top of the form to collect the buyer's name and address. These are placed in a borderless table to force the text box align vertically. A second table to collect actual order. Each row of this table names a product, displays the price, and uses text box with size 2 to collect the quantity ordered using <td> tag. The payment method is input by the user through one of four radio buttons. Provide provision for submission of order and clear the order form. **Sample Output**

	
6	Develop, test and validate an XHTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each) along with submit button. Each checkboxes should have its own onclick event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the submit button must produce an alert window with the message 'your total cost is $xxx', where xxx is the total cost of the chose fruit, including 5 percent sales tax. This handler must return 'false' (to avoid actual submission of the form data). Modify the document to accept quantity for each item using textboxes.
7	a) Develop and demonstrate, a HTML document that collects the USN (the valid format is : A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by three upper-case characters followed by two digits; (no embedded spaces are allowed) from the user. Use JavaScript that validate the content of the document. Suitable messages should be display in the alert if errors are detected in the input data. Use CSS and event handlers to make your document appealing. b)Modify the above program to get the current semester also(restricted to be a number from 1 to 6)
8	Develop and demonstrate a HTML5 page which contains a) Dynamic Progressive bar. b) Display Video file using HTML5 video tag.
9	Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it

	should rise to the top to become completely visible. Modify the above document so that when a text is movedfrom the top stacking position, it returns to its original position rather than to the bottom
10	Develop a simple calculator to perform arithmetic (addition, subtraction, multiplication and division) operations on given two numbers. Use an html tag that allows the user to input two numbers and to display the result of arithmetic operation. Write suitable HTML and JavaScript and CSS to your simple calculator. The following figure show sample document display. Modify your program to make HTLM document as eye-catching using CSS.. 
11	Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
12	Develop and demonstrate using jQuery to solve the following: a) Limit character input in the text area including count. b) Based on check box, disable/enable the form submit button.

Note 1: In the practical Examination each student has to pick one question from a lot of all 12 Questions

Course Outcomes(CO):

CO1: Design and implement user interactive dynamic web based applications using XHTML5,CSS, JAVA SCRIPT,XML & jquery

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO4,PO5,PO11

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications Program

(Accredited by National Board of Accreditation)

MCA II semester Syllabus

(2018 – 2021)

SEMESTER –II

JAVA PROGRAMMING

Subject Code	**18MCA21**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives(CLO):

- Understand the different object oriented concepts and implement basic programs.
- Develop applications using inheritance and interface concepts.
- Apply multithreading programming concepts and handling errors efficiently.
- Design client server application in java

Modules	**Teaching Hours**
Module -1	**11 Hours**
Java Programming Fundamentals The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifies in Java, The Java Class Libraries. **Introducing Data Types and Operators** Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions. **Program Control Statements** Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops**.** **More Data Types and Operators**	

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators. **String Handling** String Fundamentals, The String Constructors, Three String-Related Language Features, The Length () Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, String Buffer and String Builder.	
Module -2	**11 Hours**
Introducing Classes, Objects and Methods Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword. **A Closer Look at Methods and Classes** Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments. **Inheritance** Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.	
Module -3	**10 Hours**
Interfaces Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. **Packages**	

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import **Exception Handling** The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.	
Module -4	**10 Hours**
Multithreaded Programming Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods,The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads. **Enumerations, Auto boxing and Annotations** Enumerations, Java Enumeration are class types, The Values () and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata), **Generics** **Applets** Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets.	
Module -5	**10 Hours**
Networking with Java.net Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class. **Exploring Collection Framework** Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class.	
Question paper pattern: • There will be 10 questions with 2 full questions from each module.	

- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013.

Reference Books:

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.

2. Java 6 Programming, Black Book, KoGenT ,Dreamtech Press, 2012.

3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Course Outcomes(CO):

CO1: Demonstrate the basic object oriented concepts & apply them to create java applications.

CO2: Apply inheritance and interface concepts to design java applications.

CO3: Design java applications with multithreading concepts and demonstrate the error handling concepts.

CO4: Design client server applications.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO 2	PO1,PO2,PO3,PO5,PO7,PO9
CO 3	PO1,PO2,PO3,PO5,PO7,PO9
CO 4	PO1,PO2,PO4,PO5,PO7,

SEMESTER –II

DATA STRUCTURE USING C++

Subject Code	**18MCA22**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives(CLO):

- Acquire knowledge on Primitive and Non- Primitive data types and ADT
- Analyze different types of data structures
- Demonstrate different Applications of data structures.
- Demonstrate the usage and implementation of different type of Trees

Modules	**Teaching Hours**
Module -1	**10 Hours**
Introduction to Data Structures: **Abstract Data Type:** Definition, Abstract Data Type, Model for an ADT, ADT Implementations and example. **Recursion:** Recursive definition and designing recursive algorithms, Example on recursion: GCD, Fibonacci numbers, Towers of Hanoi problem. **Stack and its applications:** Definition and examples, Representing stacks, Example – Infix, Prefix and Postfix, Evaluation of Postfix Expression.	
Module -2	**12 Hours**
Queues: Queue operations, Queue ADT. Queue Applications. **Lists:** Basic Operations, Implementation, List ADT, Applications, Complex Implementations.**Singly Linked List**. Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Example of list operations such as insert and delete an element before a key element, Header nodes, Array implementation of lists.: **Circular Linked List**: Inserting, deleting and searching elements in a lists, **Double Linked List**: Inserting and	

Deleting Nodes, Queue as doubly linked lists, such as insert into position, Delete an specified element	
Module -3	**10 Hours**
Trees: Trees: Basic concepts, Binary trees and its properties, operations on binary trees, Binary tree traversals, Expression tree, General trees: insertions, deletions, changing a general tree to a binary tree Binary Search Tree: Binary Search tree: Basic concepts and its operations, threaded trees.	
Module 4	**10 Hours**
Advanced concepts in Trees: AVL Search trees: Basic concepts, implementations, Heaps - Basic Concepts, implementation**.**	
Module -5	**10 Hours**
Multiway Trees: M-way search trees, B-trees: Basic concepts, Implementations, Simplified B-Trees: 2-3 tree, 2-3-4 tree	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1.Richard F Gilberg and BehrouzAForouzan: Data Structures - A Pseudocode Approach with C,Cengage Learning, 6 the Indian Reprint 2009. Chapters (1.2, 1.3, 1.4, 2.2, 2.3, 3.1, 3.2, 3.3 3.4, 3.5, 4.1, 4.2, 4.3, 4.5, chapter 5, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3, 7.5, 8.1, 8.2, 9.1, 9.2, 10.1, 10.2, 10.4, 11.1, 11.2, 11.3, 11.4) 30

Reference Books:

1. YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenenbaum: Data Structures using C and C++, 2ndEdition, Pearson Education Asia, 2002.

2. NanjeshBennur, Dr.Manjaiaha DH, Dr. C.K. Subbaraya: C programming skills and Data Structures primer, First Edition, IPH Publication, 2017.

3. Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education Asia, 1997.

Course outcomes(CO):

CO1: Apply the concepts of ADT and its implementation for different types of data structures like Stack, Queue, and List.

CO2. Demonstrate the implementation of Stack, Queue and List for real world applications.

CO3. Demonstrate the usage and implementation of Tree and Binary Search Tree.

CO4. Describe and Demonstrate the concepts, algorithms and applications of AVL tree, Heaps and different operations on Multiway Trees and graphs.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2, PO3
CO 2	PO3
CO 3	PO3
CO 4	PO3

SEMESTER –II

ANALYSIS AND DESIGN OF ALGORITHMS

Subject Code	18MCA23	**CIE Marks**	30
Number of Lecture Hours/Week	4	**SEE Marks**	70
Total Number of Lecture Hours	50	**SEE Hours**	03

CREDITS – 4:0:0

Course Learning Objectives(CLO):

- Analyse the asymptotic performance of algorithms.
- To understand and apply algorithms and design techniques
- To solve problems using appropriate design techniques
- To analyze the complexities of various problems in different domains.
- Identify the limitations of algorithms power.

Modules	**Teaching Hours**
Module -1	**11 Hours**
Introduction, Fundamentals of the Analysis of Algorithm Efficiency Notion of Algorithm, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search and String Matching.	
Module -2	**10 Hours**
Divide-and-Conquer Merge sort, Quicksort, Binary Search, Multiplication of large integers **Greedy Technique** The General method, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.	
Module -3	**11 Hours**

Dynamic Programming Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem **Decrease-and-Conquer** Depth First and Breadth First Search, Topological sorting. **Transform and Conquer** Introduction	
Module -4	**10 Hours**
Backtracking: n-Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. **Branch-and-Bound**: Assignment Problem, Knapsack Problem	
Module -5	**10 Hours**
Limitations of Algorithm Power Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems. **Space and Time Tradeoffs** Sorting by Counting, Input Enhancement in String Matching.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition

Reference Books:

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI 1998.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication 2001.
3. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India
4. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill

COURSE OUTCOMES(CO):

CO1: Analyse time and space complexity of recursive and non- recursive algorithms.

CO2: Analyze algorithms and solve real time problems using various algorithm design techniques.

CO3: Design and analyse algorithms to solve the optimization problems.

CO4: Design and analyze algorithms associated with space–time tradeoffs with the limitations of Algorithm power.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO1,PO2,PO3
CO 3	PO1,PO2,PO3
CO 4	PO2,PO3

SEMESTER –II

DATABASE MANAGEMENT SYSTEM

Subject Code	**18MCA24**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives(CLO):

- Students understand and implement the processes of database management system.
- Students understand the design guidelines for a relational schema and learn to query from a database
- Students understand managing multiple transactions and recovery techniques in case of transaction failures

Modules	**Teaching Hours**
Module -1	**10 Hours**
Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems, Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types..	
Module -2	
Relational Model: Relational Model Concepts, Relational Model Constraints and Relational Database Schema Update Operations, Transactions and Dealing with Constraint violations	**10 Hours**
Module -3	**10 Hours**
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries, Additional Basic Operations, Null values, Aggregate Functions, nested Sub queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints	

Module -4	**10 Hours**
Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce Codd Normal Forms, Stored Procedures and functions, Triggers.	
Module -5	**12Hours**
Transaction Management: Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control: Lock Based Protocols, Deadlock Handling. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

- Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison -Wesley, 2011.
- Silberschatz, Korth and Sudharshan Data base System Concepts,6th Edition, Tata McGraw Hill, 2011.

Reference Books:

1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education,2009.
2. 2 Raghu Ramakrishnan and Johannes Gehrke: Database management Systems, 3rd Edition, McGraw-Hill, 2003.

Course Outcome (CO):

CO1: Students are demonstrated on the fundamentals of data models and develop an ER diagram and relational database model for a given scenario

CO2: Students understand to query the database

CO3: Students apply the rules of normalization to Inference the database design in the real world entities, multiple transactions, concurrency control techniques and recovery.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1, PO2,PO4
CO 3	PO1, PO2,PO4,PO5,PO7
CO 4	PO1, PO2,PO4,PO5,PO7, PO8

SEMESTER – II

Operating Systems

Subject Code	**18MCA24**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives(CLO) :

- Understand the features and design of an Operating Systems
- Apply methods for handling of Process Management and Mutual Exclusion
- Analyze different approaches to memory management.
- Analyze file handling system

Modules	**Teaching Hours**
Module -1	**10 Hours**
Introduction to Operating Systems, System Structure What operating systems do; Computer System Organization; Computer System Architecture; Operating System Operations; Computing Environments; Operating System Services; System Calls; Types of System Calls; System Programs; Operating System Structure; Virtual Machines; **Overview of Process** **Process** Concept; Process Scheduling; Operations on Processes; Inter – Process Communication; Multi – Threaded Programming: Overview; Multithreading Models;	
Module -2	**10 Hours**
Process Management Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling **Process Synchronization** Synchronization: The Critical Section Problem: Peterson's Solution; Semaphores; Classical Problems of Synchronization;	
Module -3	**10 Hours**
Deadlocks Deadlocks: System model; Deadlock Characterization, Methods for handling deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from deadlock **Memory Management** Memory Management Strategies: Background, Swapping;	

Contiguous Memory Allocation; Paging; Segmentation; Virtual Memory Management; Background; Demand Paging; Page Replacement; Allocation of Frames; Thrashing	
Module -4	**9 Hours**
File System Implementation of File System: File concepts; Access methods, Directory Structure; File System Mounting; Protection; Implementing File System: File System Structure; File System implementation; Directory Implementation; Allocation Methods; Free Space Management	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. . Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8th Edition, Wiley – India.

Reference Books:

1. D M Dhamdhere: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2002.
2. P C P Bhatt: Operating Systems, 2ndEdition, PHI, 2006.
3. Harvey M Deital: Operating Systems, 3rdEdition, Addison Wesley, 1990.

Course Outcome (CO):

CO1: Describe the elements and various functionalities of the operating system to a basic level
CO2: Illustate various memory allocation strategies and implement virtual memory techniques for effective memory management
CO3: Apply methods for process scheduling, process synchronization, and deadlock handling
CO4: Analyze the physical and logical structure of the storage media, illustrate various algorithms for storage management

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1
CO 3	PO1
CO 4	PO1

SEMESTER –II

JAVA PROGRAMMING LABORATORY

Laboratory Code	**18MCAL26**	CIE Marks	**50**
Number of Lecture Hours/Week	**02**	SEE Marks	**50**
		SEE Hours	**03**

CREDITS – 0:0:1

Course Learning Objectives(CLO) :

- Design & Develop the fundamentals of Object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Design & Develop exception handling and multithreading concepts.
- Develop efficient Java applets and applications using OOP concepts.
- Design & Develop basic understanding of network application programs.

1. A)Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading.

   b) Write a JAVA Program to implement Inner class and demonstrate its Access protection.

2. Write a program in Java for String handling which performs the following:

   i) Checks the capacity of String Buffer objects.

   ii) Reverses the contents of a string given on console and converts the resultant string in upper case.

   iii) Reads a string from console and appends it to the resultant string of (ii).

3. a). Write a JAVA Program to demonstrate multi-level Inheritance.

   b). Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

4. Write a JAVA program which has

   i) A Class called Account that creates account with 500Rs minimum balance, a deposit()method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account

holder tries to withdraw money which makes the balance become less than 500Rs.

ii) A Class called LessBalanceException which returns the statement that says withdraw amount (Rs) is not valid.

iii) A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a LessBalanceException take appropriate action for the same.

5. Write a java program to handle the following system exceptions
   ArrayIndexOutOfBoundException
   FileNotFoundException
   NumberFormatException

6. a) Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.
   b) Design a program to create two threads, one thread will print odd numbers and second thread will print even numbers between 1 to 10 numbers

7. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws).

8. Complete the following:
   i. Create a package named shape.
   ii. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
   iii. Import and compile these classes in other program.

9. Write a JAVA program which has
   i). A Interface class for Stack Operations
   ii). A Class that implements the Stack Interface and creates a fixed length Stack.
   iii). A Class that implements the Stack Interface and creates a Dynamic length Stack.
   iv). A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.

10. Write a JAVA Program which uses FileInputStream / FileOutPutStream Classes.

11. Write JAVA programs which demonstrates utilities of LinkedList Class and Array class.

12. Write a JAVA program which uses Datagram Socket for Client Server Communication for multiple systems

PART B

(Mini Project)

Student should carryout menu driven interactive program on any simple real world problem using JAVA. Students may do the above project with GUI as well.

Note 1: In the practical Examination student has to execute one program from a lot of all the 12 questions and demonstrate Part B Mini Project.

Note 2: Project to be carried out with a team of 2 or individual student

Note 3: Change of program is not permitted in the Practical Examination

Course Outcomes(CO):

CO1: Understand Java programming language fundamentals and runtime environment. Gain knowledge and skill necessary to write java programs. Learn the object oriented concepts and its implementation in Java implement the multithreading and client side programming

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

SEMESTER –II

DATA STRUCTURES LABORATORY

Laboratory Code	**18MCAL27**	CIE Marks	**50**
Number of Lecture Hours/Week	**02**	SEE Marks	**50**
		SEE Hours	**03**

CREDITS – 0:0:1

Course Learning Objectives(CLO) :

- Design the programming codes for the implementation of data structure concepts.
- Develop the programming codes to illustrate the applications of data structures.
- Develop the programming codes to illustrate the advanced concepts of Tree

1. Design, Develop and Implement a menu driven program in C++ for the following operations on STACK of integers (Array implementation of stack with maximum size MAX)

i. Push an element on to stack
ii. Pop an element from stack.
iii. Demonstrate how stack can be used to solve tower of Hanoi problem with n disks.
iv. Demonstrate Overflow and Underflow situations on stack.
v. Display the status of stack.
vi. Exit.

Support the program with appropriate functions for each of the above operations.

2. Design, develop and Implement a Program in C++ for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands.

3. Design, Develop and Implement a Program in C++ for the following Stack Applications

i. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
ii. Generate Fibonacci Numbers.

4. Design, Develop and Implement a menu driven Program in C++ for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX).

i. Insert an Element on to Circular QUEUE
ii. Delete an Element from Circular QUEUE
iii. Demonstrate Overflow and Underflow situations on Circular QUEUE

iv. Display the status of Circular QUEUE
v. Exit

Support the program with appropriate functions for each of the above operations

5. Design, Develop and Implement a menu driven Program in C++ for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Semester, Mobile number

i. Create a SLL of N Students Data by using front insertion.
ii. Display the status of SLL and count the number of nodes in it
iii. Perform Insertion and Deletion at End of SLL
iv. Perform Insertion and Deletion at Front of SLL
v. Demonstrate how this SLL can be used as STACK and QUEUE
vi. Exit

6. Design, Develop and Implement a menu driven Program in C++ for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo.

i. Create a DLL of N Employees Data by using end insertion.
ii. Display the status of DLL and count the number of nodes in it
iii. Perform Insertion and Deletion at End of DLL
iv. Perform Insertion and Deletion at Front of DLL
v. Demonstrate how this DLL can be used as Double Ended Queue
vi. Exit

7. Design, Develop and Implement a Program in C++ for create insert, delete and exit operations on Singly Circular Linked List (SCLL) with header nodes

8. Design, Develop and Implement a menu driven Program in C++ for the following operations on Binary Search Tree (BST) of Integers

i. Create a BST of N Integers
ii. Traverse the BST in Inorder, Preorder and Post Order
iii. Search the BST for a given element (KEY) and report the appropriate message
iv. Delete an element (ELEM) from BST
v. Exit

9. Design, develop and Implement a menu driven Program in C++ to perform create, insert, delete and display operations on AVL Tree.

10. Design, develop and Implement a menu driven Program in C++ to perform create, insert, delete and display operations on Heap Tree.

11. Design, develop and Implement a menu driven Program in C++ to perform create, insert, delete and display operations on M-way search trees.

12. Design, develop and Implement a menu driven Program in C++ to perform create, insert, delete and display operations on B-Trees.

Course Outcome(CO):

CO1: **Design, Develop and Implement various applications of data structures.**

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

SEMESTER –II

DATABASE MANAGEMENT SYSTEMS LAB

Laboratory Code	**18MCAL28**	CIE Marks	**50**
Number of Lecture Hours/Week	**02**	SEE Marks	**50**
		SEE Hours	**03**

CREDITS – 0:0:1

Course Learning Objectives(CLO):

- Demonstrate SQL commands.
- Implement simple exercises on relational database schema.
- Design a relational database schema for specific database application using SQL.

DBMS Lab Experiments:

Instructions for the Exercises:

1. Draw an ER diagram based on given scenario.

2. Create Relational Database Schema based on the above scenario using Mapping Rules.

3. Perform the given queries using any RDBMS Environment.

4. Suitable tuples have to be entered so that queries are executed correctly

5. The results of the queries may be displayed directly

1. **Exercise: 1**

Notown Records has decided to store information about musicians who perform on its albums. Each musician that records at Notown has an SSN, a name, an address, and a phone number. No musician has more than one phone. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date and a format (e.g., CD or MC). Each song recorded at Notown has a title and an author. Each musician may play several instruments, and a given instrument may be played by several musicians. Each album has a number of songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians,

and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Queries

a) List musician name, title of the song which he has played, the album in which song has occurted.

b) List the details of songs which are performed by more than 3 musicians.

c) List the different instruments played by the musicians and the average number of instruments played.

d) Retrieve album title produced by the producer who plays guitar as well as flute e) List the details of musicians who can play all the instruments present.

Exercise2

Professors have a PROFID, a name, an age, a rank, and a research specialty. Projects have a project number, a sponsor name (e.g. UGC/AICTE/…), a starting date, an ending date, and a budget. Graduate students have an USN, a name, an age, and a degree program (e.g. MCA/MPhil/BE/ME ..). Each project is managed exactly by one professor (known as the project's principal investigator). Each project is worked on by one or more professors (known as the project's co-investigators). Professors can manage/work on multiple projects. Each project is worked on by one or more graduate students (known as the project's research assistants). Graduate students can work on multiple projects. Each professor can supervise many students. A student who is working on a project can be supervised by only one professor.

Queries

a) Retrieve the names of all professors who do not have an ongoing project of more than 1 lakh.

b) Retrieve the names of all graduate students along with their professors under whom they work and project sponsor.

c) List the professors and sum of the budget of their projects started after 2005 but ended in 2010.

d) List the names of professors who has a total worth of project greater than the average budget of projects sanctioned

e) List the professors who work on all the projects.

Exercise: 3

A bank has many branches and a large number of customers. Bank is identified by its code. Other details like name, address and phone for each bank are also stored. Each branch is identified by its bank. Branch has name, address and phone. A customer can open different

kinds of accounts with the branches. An account can belong to more than one customer. Customers are identified by their SSN, name, address and phone number. Age is used as a factor to check whether customer is a major. There are different types of loans, each identified by a loan number. A customer can take more than one type of loan and a loan can be given to more than one customer. Loans have a duration and interest rate. Make suitable assumptions and use them in showing maximum and minimum cardinality ratios.

Queries:

a) List the details of customers who have joint account and also have at least one loan.

b) List the details of the branch which has given maximum loan.

c) List the details of saving accounts opened in the SBI branches located at Bangalore.

d) List the name of branch along with its bank name and total amount of loan given by it.

e) Retrieve the names of customers who have accounts in all the branches located in a specific city.

Exercise: 3

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Exercise: 4

Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name; it has an address and one phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. Each pharmacy has a name, address, and phone number. Each patient is checked up by some doctor. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, supervisor and the text of the contract.

Queries:

a) List the details of patients who are 20 years old and have been checked by eye-specialist.

b) List the details of doctors who have given the prescription to more than 20 patients in year 2013.

c) List the details of pharmaceutical companies who supply drug to more than 10 pharmacies d) List the details of drug supplied by only one pharmaceutical company.

e) List the details of drug supplied by all pharmaceutical companies.

Exercise; 5

Data requirements of movie industry are captured. Each movie is identified by title and year of release. Each movie has length in minutes and classified under one genres (like action, horror etc.). Each movie has a plot outline. Production companies are identified by name and each has an address. A production company produces one or more movies. Actors are identified by id. Other details like name and date of birth of actors are also stored. Each actor acts in one or more movies. Each actor has a role in movie. Directors are identified by id. Other details like name and date of birth of directors are also stored. Each director directs one or more movies. Each movie has one or more actors and one or more directors and is produced by a production company.

Queries:

a) List the details of horror movies released in 2012 and directed by more than 2 directors.

b) List the details of actors and total number of movies acted between 2000 and 2010.

c) List the details of production companies producing maximum movies.

d) List the details of movies where director and actor have same date of birth.

e) Retrieve the names of directors directed all the movies produced by any one production company.

Course Outcome (CO):

CO1: Design an ER diagram and implement a database schema for a given problem domain and query the tables.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4, PO7

Dr. Ambedkar Institute of Technology, Bengluru-56

(An Autonomous Institute, Approved by AICTE, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications

(Accredited by National Board of Accreditation)

MCA III to IV Semester

(2018-21) Scheme & Syllabus

		III Semester							
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration in Hours**	**Marks**		**Total Marks**
		Lecture	**Tutorial**	**Practicals**	**Total Credits**		**CIE**	**SEE**	
18MCA31	Network Architecture & Management	4		-	4	3	50	50	100
18MCA32	Python Programming	4		-	4	3	50	50	100
18MCA33	Advanced Software Engineering	4		-	4	3	50	50	100
18MCA34	Data Science using R	3		-	3	3	50	50	100
18MCA35	Elective-1	3		-	3	3	50	50	100
18MCAL36	Network Architecture Lab	--	-	1	1	3	50	50	100
18MCAL37	Python programming Lab	--	-	1	1	3	50	50	100
18MCAL38	Data Science using R Lab	--	-	1	1	3	50	50	100
Total		**18**	**-**	**3**	**21**	**24**	**400**	**400**	**800**

ELECTIVE-1									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA351	Software Testing and Practices	3	-	-	3	3	50	50	100
18MCA352	Advanced DBMS	3	-	-	3	3	50	50	100
18MCA353	Artificial Intelligence	3	-	-	3	3	50	50	100

		IV Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	practicals	Total Credits		CIE	SEE	
18MCA41	Enterprise Applications-1	3		-	3	3	50	50	100
18MCA42	Advanced Web Technologies	3		-	3	3	50	50	100
18MCA43	Analytical Skills And Building Professional Development	3		-	3	3	50	50	100
18MCA44	Elective-2	3		-	3	3	50	50	100
18MCA45	Elective-3	3		-	3	3	50	50	100
18MCA46	Research Methodology	2	-	--	2	3	50	50	100
18MCAL47	Enterprise Applications Lab	--	-	1	1	3	50	50	100
18MCAL48	Advanced Web Technologies Lab	--	-	1	1	3	50	50	100
18MCAM49	Mini Project using Android	--	1	1	2	3	50	50	100
Total		**17**	**1**	**3**	**21**	**27**	**450**	**450**	**900**

ELECTIVE-2									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA441	Information Security	3	-	--	3	3	50	50	100
18MCA442	Data Mining & Business Intelligence	3	-	--	3	3	50	50	100
18MCA443	Object oriented Modelling & Design	3	-	--	3	3	50	50	100

ELECTIVE-3									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA451	Software Quality & Performance Evaluation	3	-	--	3	3	50	50	100
18MCA452	Software Architecture	3	-	--	3	3	50	50	100
18MCA453	Enterprise Resource Planning	3	-	--	3	3	50	50	100

SEMESTER – III

Network Architecture and Management

Subject Code	**18MCA31**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives (CLO):

- Classify the network protocols and identify the services
- Demonstrate the architecture of advanced networks and larger networks
- Analyze the significance of network management and apply the security tactics

Modules	**Teaching Hours**
Module -1	**12 Hours**
Protocols And Standards TCP/IP Reference Model, Circuit Switching, Packet Switching, Internet Protocols (TCP, IP, UDP, ICMP, ARP), Unicast Routing Protocols (OSPF, DVRP). Multicast Routing protocols (MOSPF, DVMRP)	
Module -2	**8 Hours**
Larger Networks Optical Networking: SONET/SDH, ATM, Frame Relay, Virtual LAN	
Module -3	**9 Hours**
Wireless Networking SAN, Bluetooth, wireless networks, Wireless sensor networks	
Module -4	**12 Hours**
Emerging Network Technologies Software Defined Network, Delay-tolerant Networking, Home Networking, Content Distributed Network, Data Center Network	
Module -5	**12 Hours**
Network Security Quality of Service – Techniques, Security: Firewalls: Packet Filtering, Stateful, Application Proxy, Spoofing: TCP, DNS, IP and Web Denial of Service: Single Source and distributed, Designing a comprehensives security plan	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module

Text Books:

1. A Practical Guide To Advanced Networking By Jeffrey S. Beasley And Piyasat Nilkaew, Pearson Education 2013 Ed
2. Jan L Harrington , Network Security: A Practical Approach, Morgan Kauffman, 2005

Reference Books:

- "Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI – 2014, ISBN-10: 0130183806
- Uyless Black "Computer Networks, Protocols, Standards and Interfaces" 2nd Edition - PHI , ISBN-10: 8120310411
- M. E. Whitman and Herbert J. Mattored, Principles of Information Security, Information Security Professional 4thedition.
- Tanenbaum, A., Computer Networks, 3rd ed., Prentice-Hall, 1996. Wright and Stevens, TCP/IP Illustrated v.2, Addison-Wesley

Course Outcomes(CO):

CO 1: Understand the network protocols and its services.

CO 2: Analyze the architecture of wired and wireless network variants

CO 3: Demonstrate the working architecture of emerging networks

CO 4: Analyze and Apply methodologies to build a secured network

COs	**Mapping with POs**
CO1	PO1, PO5
CO2	PO1, PO3, PO5, PO7
CO3	PO1, PO3, PO5
CO4	PO3, PO5, PO7

SEMESTER –III Python Programming			
Subject Code	**18MCA32**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**4**	**SEE Marks**	**50**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives (CLO):

- To describe the Fundamentals of Python
- To demonstrate the python data structure
- To implement files and data base connectivity and object oriented programing
- To develop Web applications using python

Modules	**Teaching Hours**
Module -1	**10Hours**
Overview of Python Introduction to 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, Comparisons between C and Python. Datatypes in Python, operators and I/O Statements: Comments in Python, User-defined Datatypes, Output statements, Input Statements Control Statements: Functions: 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, Anonymous Functions or Lambdas,	
Module -2	**10 Hours**
Exception Handling and Regular expressions Exceptions: Errors in a Python Program, Exceptions, Exception Handling, Types of Exceptions, -The Except Block, The assert Statement, User-Defined Exceptions. Regular Expressions: Sequence Characters in Regular Expressions, Quantifiers in Regular Expressions, Special Characters in Regular Expressions, Using Regular Expressions on Files, Retrieving Information from a HTML File.	
Module -3	**12 Hours**

Python Data Structure Strings and Characters: Creating Strings, Length of a String, Indexing in 10 Strings, Slicing the Strings, Repeating the Strings, Concatenation of Strings, Hours String Methods, Lists, Tuples and Sets: , Nested Lists as Matrices, List Comprehensions, Tuples, Dictionaries: Operations on Dictionaries, Dictionary Methods, , Sorting the Elements of a Dictionary using Lambdas, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions, Ordered Dictionaries. Using zip() Function, Sets, Set Methods, Traversing of Sets,	
Module -4	**10 Hours**
Files and database Connectivity Files: Types of Files in Python, Opening a File, Closing a File, Working with 10 Text Files Containing Strings, Knowing Whether a File Exists or Not, Hours Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods, Python's Database Connectivity: Types of Databases Used with Python, 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	
Module -5	**10 Hours**
Object Oriented Programming Concepts OOP in Python: Specialty of Python Language, Creating a Class, The Self 10 Variable, Constructor, Types of Variables, Namespaces, Types of Methods, Hours Passing Members of One Class to Another Class, Inner Classes. Inheritance and Polymorphism, Constructors in Inheritance, Overriding Super Class, Constructors Inheritance, Overriding Super Class, Constructors and Methods, The super() Method, Types of Inheritance, Method Resolution Order (MRO), Polymorphism, Operator Overloading, Method Overloading, Method Overriding, Abstract Classes and Interfaces, Abstract Method and Abstract Class, Interfaces in Python, Abstract Classes vs. Interfaces. **Introduction to Networking concepts in python** Python Network services, socket program, simple networking programs.	
Question paper pattern: • The question paper will have five questions. All questions are compulsory. Module 1 and 5 shall have internal choice. • Each full question consists of 20 marks. Questions are set covering all the topics under a each module.	

Text Books:

1. Core Python Programming: 2017 Edition, R. Nageswara Rao, DreamTech Publication.
2. Exploring Python, Timothy A. Budd, Mc Graw Hill Education
3. Introduction to Python Programming , Gowrihankar S, Veena A, CRC Press/Tyler and Francies.
4. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.

Reference Books:

1. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
2. Python for Informatics: Exploring Information, Charles Severance.
3. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication.

Course Outcome (CO):

CO1: Understand the Fundamentals of Python programming

CO2: Demonstrate various features of python programming for building Applications.

CO3: Apply python programming for designing the applications efficiently.

CO4: Design and Develop applications to be deployed in real world scenarios.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO8
CO 2	PO1,PO2,PO3,PO4
CO 3	PO1,PO2,PO3,PO4,PO5
CO 4	PO1,PO2,PO3,PO4,PO5

SEMESTER –III Advanced Software Engineering			
Subject Code	**18MCA33**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**4**	**SEE Marks**	**50**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives (CLO):

- Understand the software life cycle models and International standards of software engineering
- Analyze the software requirements engineering
- Demonstrate the limitations of Software Design
- Design and develop correct and robust software products
- Identify the Software Testing, Software Quality and Software Maintenance

Modules	Teaching Hours
Module -1	**12Hours**
Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies **Software Engineering and its models:** Evolution of Software Engineering Software development models, Capability maturity models, Software process technology **Software Process & Agile Software Development** Software Process models: waterfall, incremental development Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.	
Module -2	**12 Hours**
Requirements Engineering and System models Requirements engineering: Functional and Non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management. System modeling: Context models, Interaction Models, Structural Models, Behavioral models, Model-driven engineering.	
Module-3	**10 Hours**
Software design concepts and principles Design characteristics, Architectural Design, Architectural views, Architectural design patterns, System structuring, Control models;	

Structured design; Object-oriented analysis and design; User interface design; Design for reuse	
Module -4	**10 Hours**
Software Implementation Structured coding Techniques, Coding Styles, Standards and Guidelines, Documentation Guidelines, Modern Programming Language Features: Type checking, User defined data types, Data Abstraction, Exception Handling, Concurrency Mechanism.	
Module -5	**10 Hours**
Software Testing, Project Planning and Management Software Testing: Development testing, Test driven development, Release testing, User testing; Project Planning and Management: Risk management, Plan-driven development, Project scheduling, Estimation techniques; cost and effort estimation for the problem identified.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 1 and 5 shall have internal choice.
- Each full question consists of 20 marks. Questions are set covering all the topics under each module.

Text Books:

1. Ian Sommerville : Software Engineering, 9th edition, Person Education Ltd, 2011. (Chapters-: 1, 2, 3, 4, 5, 17, 18)
2. PankajJalote: Software Engineering, Wiley India Pvt Ltd (2010) (Chapters-:4, 6.1, 6.2, 6.5, 6.6)

Reference Books:

1. Roger S Pressman: Software Engineering-A Practitioners approach, 6th Edition, McGraw-Hill, 2010.
2. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley–India, 2010

Course Outcome (CO):

CO1: Understand the Software Development Life cycle and Professional ethics.

CO2: Demonstrate the Requirements Engineering Process

CO3: Design and develop Software Models to develop robust software products

CO4: Illustrate the Software Implementation Standards and Techniques

CO5: Evaluate Software testing, Project planning and Project Management.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO6
CO 2	PO9,PO10,PO11
CO 3	PO3, PO11,PO12
CO 4	PO8, PO11,PO12
CO 5	PO9, PO10,PO11

SEMESTER – III

Data Science using R

Subject Code	**18MCA34**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives (CLO):

- To understand the concepts of Data science
- To analyse the sampling techniques for data classification.
- To implement modeling methods for machine learning problems
- Analyzing data from files and Visualizing graphical presentations using R

Modules	**Teaching Hours**
Module -1	**8 Hours**
DATA SCIENCE PROCESS Introduction, Evolution of data science, Data science process – roles, stages in data science project – components of the Data Science lifecycle, data analytics, exploring data – managing data – cleaning and sampling for modeling and validation	
Module -2	**8 Hours**
EXPLORING R BASICS Introduction, R features basic data types, Vectors, Lists ,Arithmetic, logical & Matrix Operations, Control structures, Functions in R, Data frames ,Reading Data & cleaning data Data visualization techniques –Histograms, box plot, bar chart, scatter plot.	
Module -3	**7 Hours**
STATISTICAL MEASURES IN R Understanding Descriptive statistics, standard deviations, probability distribution, Normal distribution-Skewness, kurtosis, Inferential statistics-Hypothesis testing- t-test -One Sampled t-test, Correlation - Person correlation coefficient.	
Module -4	**8 Hours**
DATA SCIENCE ALGORITHMS Classification of Regression Analysis, Regression process, Linear Regression, Understanding Linear regression, making prediction-hypothesis on regression coefficients, multiple Linear Regression, concepts and formulas, Logistic regression, Model building and making predictions, Adding best fit.	
Module -5	**8 Hours**

MODELLING TECHNIQUES Classification techniques-Decision Trees, K Nearest Neighbor classification Technique. Implementation in R Clustering techniques, Applications, k-means Clustering algorithm, Performance of k-means, choosing Initial centroid- Implementation in R, Efficiency using Confusion matrix	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. David Dietrich , Barry Heller ,"Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data",Wiley,2015
3. Joseph Schmuller, "Statistical Analysis with R", John Wiley, 2017.

Reference Books:

1. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison- Wesley, 2005

Course Outcomes(CO):

CO 1: Understand role and process of Data Science.

CO 2: Apply exploratory methods for statistical modeling and analysis using R.

CO 3: Analyse modelling methods and interpret the results visually.

CO 4: Construct use cases to validate approach and identify modifications required.

Course Outcomes(CO)	**Mapping with Pos**
CO1	PO1,PO2
CO2	PO1,PO2,PO4,PO5
CO3	PO1,PO2,PO4,PO5,PO7
CO4	PO4,PO5,PO7

SEMESTER – III

Software Testing And Practices

Subject Code	**18MCA351**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives (CLO):

- The process of Software Testing Life Cycle and Types of Testing
- Differentiate between Manual Testing and Automation in Testing.
- Design Test Cases using the testing tool Selenium IDE and Web Driver
- Identify different web Elements and apply them to design test cases

Modules	Teaching Hours
Module -1	**7 Hours**
Introduction To Testing Introduction and Fundamentals of Testing, Myths and Facts of Software Testing, Quality Assurance and Quality Control, Testing Objectives, Software Testing Life Cycle (STLC), Test Planning, Test-case Design Technique. Types of Testing- White Box testing, Black Box Testing, Integration Testing, Regression Testing, Validation Testing, Alpha Testing, Beta Testing, Acceptance Testing. Defect Management: Defect Management Process, JIRA Defect Tracking Tools.	
Module -2	**8 Hours**
Overview Of Selenium Software Test Automation: Fundamentals of Test Automation, Manual Testing Vs Test Automation, Terms used in Automation, Skills needed for Automation, Scope of Automation, Challenges in Automation. Selenium –WebDriver: Introduction to WebDriver , Installation of Selenium WebDriver, Creating the Scripts in WebDriver, Web Element Locators, Xpath , id, LinkText, CSS Selector, Class Name, TagName WebDriver Commands: Browser Commands, getUrl(), getTitle(), getPageSource(),close(),Quit(), Navigation Commands, backward(0,forward(),to(),refresh() WebElements Commands, Isselected(), IsEnabled(), getAttribute(), getText(),notify(), sendKeys(), submit(), wait().	
Module -3	**8 Hours**
Handling Webelements CheckBox and Radio Button Operation, DropDown and Multiple select Operations, Handle Alert in WebDriver : dismiss(), accept(), getText(), sendKey(), Popup window handling in Web Drivers, getWindowHandle(), Wait commands in Web Drivers, Mouse Event using Action commands, Handling Multiple Windows, and IFrames, Running Test in Invisible Mode, Handling Dynamic Web Pages. Running selenium Web Driver in different popular Browser	

Module -4	8 Hours
Application Programming Interface(API) Testing Introduction, API testing types, Command, tests on APIs, Advantages, Tasks involved, Tools used for API Testing, Challenges, Best Practices, Case study, Database Testing, Security Testing	
Module -5	**8 Hours**
Advanced Topics on Testing Cross Platform Testing, coding standard overview, code coverage metrics, code freeze, code Inspection, code Review, code walkthrough, code based testing, code driven Testing, CUCUMBER Framework, Test Driven development, Behavioral driven Development.	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

1. Rex Black: Advanced Software Testing—Vol. 1, Shroff Publishers, 2011.
2. Srinivasan Desikan Gopalaswamy: Software Testing Principles and Practices, 5th Edition, Pearson Education, 2007.
3. Paul C. Jorgensen: Software Testing A Craftman's Approach, 3rd Edition, Auernac Publications, 2008
4. David Burns: Selenium 2 Testing Tools: Beginner's Guide, Packt Publishing, 2012.

Reference Books:

1. Rex Black: Advanced Software Testing—Vol. 2, Shroff Publishers, 2011.
2. Gundecha Unmesh: Selenium Testing Tools Cook Book, PACKT PUBLISHING, 2012.

Course Outcomes(CO):

CO 1: Analyze the process of Software Testing Life Cycle and types of Testing.
CO 2: Demonstrate Manual Testing and Automation in Testing

CO 3: Design Test Cases for User Interface Testing
CO 4: Design Test Cases for Application Programming Interface (API) Testing and Data base Testing

Cos	Mapping with Pos
CO1	PO1, PO5, PO10
CO2	PO1, PO2, PO3, PO4
CO3	PO1, PO2, PO4, PO5, PO8
CO4	PO1, PO2, PO3, PO11, P12

SEMESTER – III Advanced DBMS			
Subject Code	**18MCA352**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**
CREDITS – 3:0:0			

Course Learning Objectives (CLO):

- Acquire the conceptual knowledge on various databases
- Learn NoSQL Database
- Apply database concepts in distributed applications
- Understand the role of distributed databases in modern applications

Modules	Teaching Hours
Module -1	**7 Hours**
Overview Comparison between different databases: Significance of Databases, Database System Applications, Advantages and Disadvantages of different Database Management systems, Comparison between DBMS, RDBMS, Distributed and Centralized DB.	
Module -2	**8 Hours**
Working With Nosql Introduction to NoSQL, Types of NoSQL Databases, Advantages of NoSQL, SQL versus NoSQL, Aggregate Data Models, Aggregates, Key-value and Document Data Models, Relationships, Graph Databases, Schema-less Databases, Distribution Models, CAP Theorem, Eventual Consistency, Advantages and Disadvantages of NoSQL.	
Module -3	**8 Hours**
Fundamentals To Mongodb MongoDB: Introduction to MongoDB and its Features, Database, Collection and Documents, Data Types in MongoDB, Installation, The Mongo shell, CRUD Operations, Create Operations, Read Operations, Update Operations, Delete Operations Bulk Write, Aggregation, Aggregation Pipeline, Map-Reduce, Single Purpose Aggregation Operations	
Module -4	**8 Hours**
Working With Mongodb Text-search Text Indexes, Text Search Operation, Text search in the Aggregation Pipeline, Geospatial Queries, Find Restaurants with Geospatial Queries, Geo JSON Objects, Indexes-Single Field Indexes, Compound Indexes, Storage, Storage Engines, Journaling, GridFS, Replication: Replica Set Members, Replica Set Deployment Architecture, Replica Set High Availability, Replica Set Read and Write Semantics.	

Module -5	**8 Hours**
Building Web Applications Sharding: Sharded Cluster Components, Sharding strategy, Data Partitioning with Chunks, Sharded Cluster balancer, Web Application with MongoDB using PHP/Python/PyMongo, Connecting PHP/Python/PyMongo with MongoDB, CRUD Operations, Aggregate functions with PHP/Python /PyMongo	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

Kristina Chodorow: MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, 2nd Edition, O'Reilly, 2013

Reference Books:

- Kristina Chodorow: MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, 2nd Edition, O'Reilly, 2013.

Course Outcomes (CO):

CO1:Understand the significance of different databases

CO2:Design and develop queries for CRUD operations

CO3: Design and develop queries using Aggregation Framework and Pipeline to access MongoDB

CO4:Develop PHP/Python/Mongo programs for CRUD operations and Aggregation functions

COs	**Mapping with POs**
CO1	PO3
CO2	PO1,PO2,PO3,PO4, PO5,PO7,PO11
CO3	PO1,PO2,PO3, PO4, PO5,PO7,PO11
CO4	PO1,PO2,PO3,PO4, PO5,PO7,PO8,PO11,PO12

SEMESTER – III

Artificial Intelligence

Subject Code	**18MCA353**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives (CLO):

- Identify the differences between knowledge representation and knowledge organization.
- Understand about Robotics and structure
- Learn different search strategies and fuzzy methodology
- Representation of knowledge and reasoning
- Evaluate knowledge about planning and learning strategies

Modules	**Teaching Hours**
Module -1	**7 Hours**
Artificial Intelligence Introduction: over view of AI, Importance of AI, AI- History, AI and related fields, search control strategy: preliminary concepts, AI-Applications, Turing Test, Application areas, Problem Space, Problem Characteristics, and AI Problems.	
Module -2	**8 Hours**
Fundamentals Of Robotics Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems	
Module -3	**8 Hours**
Fuzzy Logic Introduction, fuzzy set theory, classical sets, membership function, fuzzy rule generation, compliment, Intersections, Unions, combinations of operations, Aggregation operations. Fuzzy number, Linguistic variables, arithmetic operations on intervals and numbers, lattice of fuzzy numbers, fuzzy equations, fuzzy relations, fuzzy projections, fuzzy systems, fuzzy propositions, fuzzy inference, fuzzyfications, and defuzzification.	
Module -4	**8 Hours**
Probabilistic Reasoning Bayesian probabilistic inference, Bayes Theorem, Knowledge based system, representation of knowledge origination, knowledge	

manipulation	
Module -5	**8 Hours**
Planning And Natural Language Processing Introduction, Components of a Planning System, Goal Stack Planning, Hierarchical Planning. Linguistics, grammars and languages. Basic parsing techniques, expert system architecture, characteristics of expert systems, Rules for Knowledge in Language Understanding, Syntax and Semantic Analysis, NLP.	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

1."Artificial Intelligence-A modern Approach" Stuart Russel, Peter Norvig, second edition, PHI/Pearson Education, 2010
2. Artificial Intelligence – Structures and Strategies for Complex Problem Solving, George F. Luger, Pearson Education, 4/e, 2003.
3. Thimothi and Ross: Engineering Applications Fuzzy Fuzzy logic, PHI.

Reference Books:

1. Artificial Intelligence and Intelligent Systems, N. P. Padhy, Oxford Press, 4/e, 2008.
2. Artificial Intelligence: A new Synhesis Approach, Nils J. Nilson, Morgan Kaufmann, 1998.
3.G.J.Klir and B.Yuan: Fuzzy sets and Fuzzy logic, PHI, 1995

Course Outcomes(CO):

CO 1: Understand of Artificial intelligence concepts.
CO 2: Apply different Search strategies in problem solving
CO 3: Discover knowledge and perform reasoning.
CO 4: Derive planning strategies and machine learning techniques

Cos	Mapping with Pos
CO1	PO1, PO2, PO5, P10
CO2	PO1, PO2
CO3	PO1, PO2, PO4, PO5
CO4	PO1, PO2, PO5

SEMESTER –III

Network Architecture and Management Laboratory

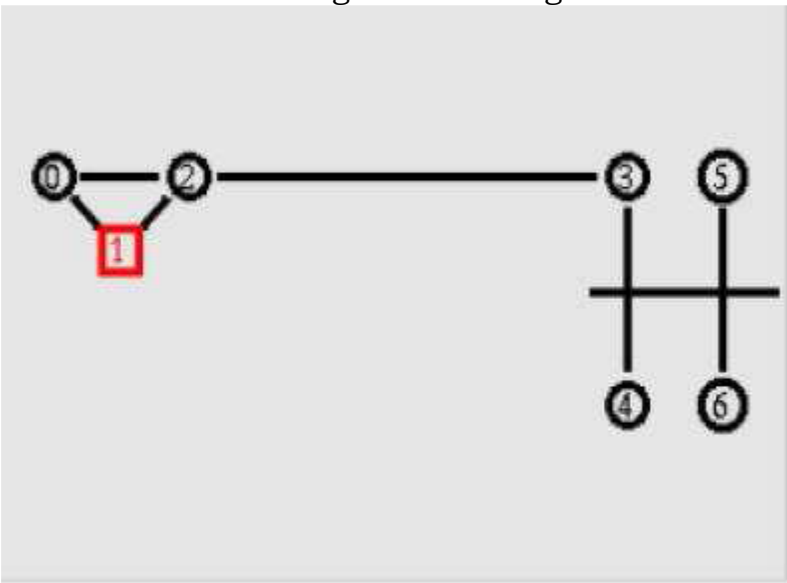
Laboratory Code	**18MCAL36**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**26**	**SEE Hours**	**03**

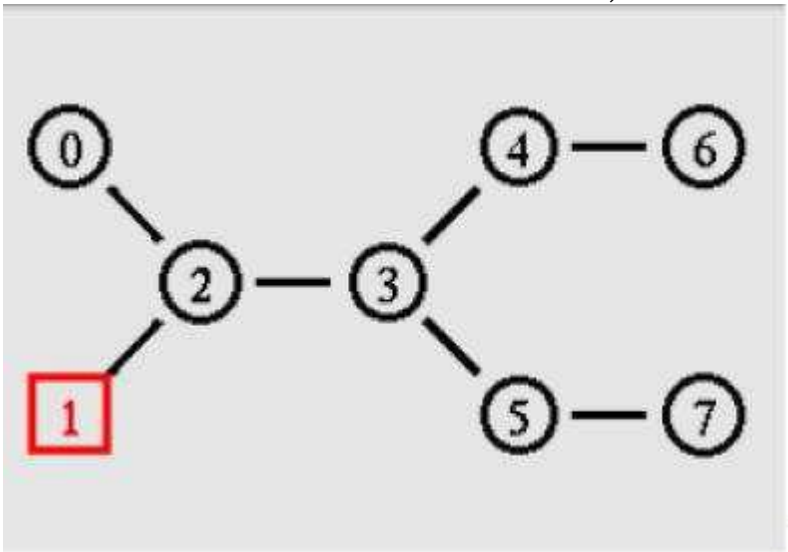
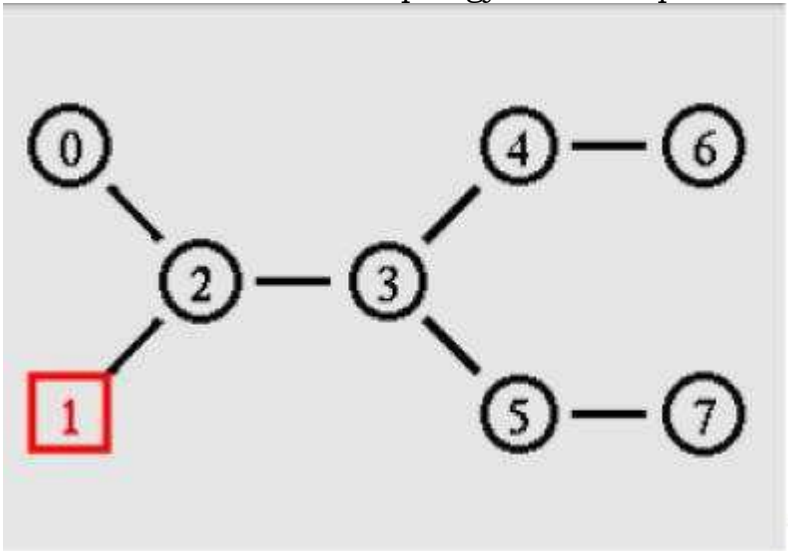
CREDITS – 0:0:1

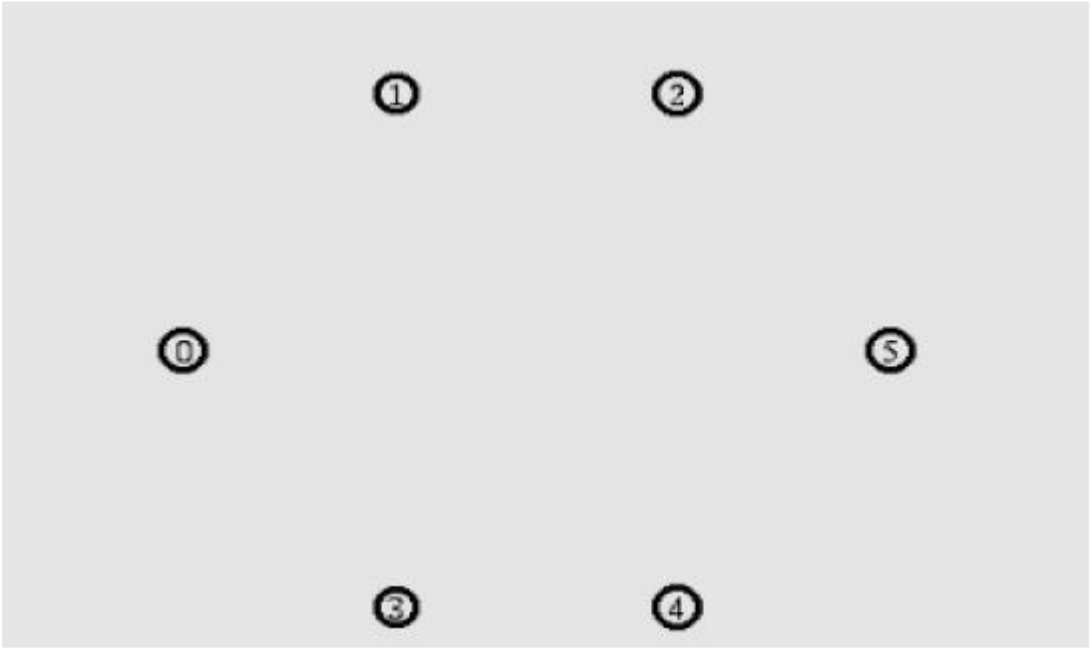
Course Learning Objectives (CLO):

- Demonstrate the architecture of networks and the flow of packets
- Analyze the significance of network management and apply the security tactics

1	**Write a TCL script to simulate the network described below** Consider a small network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds. Write a Tcl script (in the text area below) to simulate this scenario. Once you have written your simulation script, click on the "Run" button to execute it. You can verify your code by clicking on the "View Solution" button at the bottom of the page
2	**Write a TCL script to simulate a file transfer with ns2** Consider a client and a server. The server is running a FTP application (over TCP). The client sends a request to download a file of size 10 MB from the server. Write a script to simulate this scenario. Let node #0 be the server and node #1 be the client. TCP packet size is 1500 B. Assume typical values for other parameters. **Note:** This simulation require transfer of a **fixed** size file. Therefore, time required for the transfer would be constant for a given bandwidth of a link. To verify this, determine the time that would roughly be required for the transfer. Then look at the bottom of the trace file and verify whether there is any transmission beyond the time calculated. To verify that the client has downloaded the entire file, plot the "Bytes Received " curve for node #1. The y-axis is in Kbits. Convert it to MB and verify whether it approximates the specified file size. TCP headers would effectively increase the count of received bytes at node # 1.
3	**Setting up a local area network with ns2** In this exercise you will be simulating a CSMA/CD based LAN with ns2. Consider the LAN with seven nodes to be an isolated one i.e. not connected to the Internet. Node # 0 in the LAN act as a UDP traffic source, and node # 6 is the destination node. Assume CBR traffic to be flowing between the nodes. The simulation lasts for 25

	seconds. In Ethernet a packet is broadcasted in the shared medium, and only the destination node accepts the packet. Other nodes simply drop it. What should be the number of hops a packet from node # 0 to node # 6 travel? Verify this from the "Hop Count" plot. **Additional Task:** Suppose the above LAN is to be connected to the Internet. Add node # 7 into the network so that it act as the gateway. Connect node # 0 and # 7 with a 1 Mb wired link. Move the UDP source to node # 7. How the hop count should get affected in this case? Verify from the plot.
4	**Simulating link errors** Consider the following network diagram  Here node # 2 act as a router. Any traffic to or from the LAN passes through it. Consider node # 1 running a FTP server, and node # 5 is downloading a file of size 4 MB. However, the link between node # 2 and # 3 is fault. It drops packets with a fixed probability of 0.2. Implement a link error model to reflect this. It may be noted here that the file download time will be more than the we had in exercise # 2 of experiment # 1. Try different values of the simulation time to ensure that the file has been entirely transferred. Is the plot of bytes received a linear curve or non-linear? Why? Presence of link errors cause one or more packets to be retransmitted. Verify this from the "Packet Retransmissions" plot. .
5	**Measuring Network Performances** **Bottleneck in the network** Consider a dumbbell topology with eight nodes as shown as in the following figure. Consider nodes# 2 and 3 to be two routers connecting two different networks. When the bandwidth of the link 2-3 is much lower than the sum of bandwidths of the

	other links in the network, it act as a bottleneck.  Assume node # 0 running a FTP application (over TCP) and sending data to node # 6. Node # 1 is sending CBR data node # 7. Assume all the links except 2-3 has a bandwidth of 1 Mb, propagation delay of 10ms and queue type as DropTail. (All are duplex links). **Tasks:** • The link 2-3 has a propagation delay of 10 ms. Vary it's bandwidth from 0.5 Mb to 2.5 Mb in steps of 0.25Mb. • Compute the throughput for node # 3 in each case • Plot the throughput vs. bandwidth data in the "Custom Plot" section below Based on the above plots, suggest what should be the recommended bandwidth of the link 2- 3. Now, plot the end-to-end delay between nodes 0 and 6 for the above chosen values of link 2-3 bandwidth. Revisit your previous answer (i.e. optimum bandwidth of link 2-3) based on these graphs.
6	**Bandwidth sharing between TCP and UDP** Consider the dumbbell topology from our previous exercise: 

	Node # 0 is a TCP source, and the corresponding sink is at node # 6. Node # 1 is a UDP source (CBR traffic) with a null agent attached to node # 7. These two traffic flows through the common link 2-3. The aim of this exercise is to examine how TCP and UDP share the bandwidth between themselves when the rate of CBR traffic is changed. Set the TCP packet size to 1460 B. The UDP and CBR packet sizes are 1500 B. All the links in the network have same bandwidths (say, 4 Mb), delay and queue types. **Part 1:** • Set the initial rate of CBR traffic to 0.5 Mb. Run the simulation, and plot the "Bytes Received" by node #s 4 and 5 (sinks for TCP and UDP traffic) • Now, increment the rate up to 4 Mb, the link bandwidth, in steps of 0.5 Mb. Run the simulation and plot the graphs again. How does the graphs change after each run? In particular, what's the nature of the graphs when the rate of CBR traffic is 50% of the bandwidth? **Part 2: Behaviour of UDP** • Reduce the bandwidth of the link 2-3 to say, 2 Mb. Repeat the above steps and observe the graphs in this case. From the graphs plotted observe how UDP occupies a larger portion of the bandwidth. How does the behaviour change for other variations of TCP (Newreno, Vegas)?
7	**Write a TCL script to simulate the following scenario with ns2 simulator.** Consider six nodes, (as shown in the figure below) moving within a flat topology of 700m x 700m.  The initial positions of nodes are 0 (150,300) ,1 (300,500),2 (500,500),3 (300,100),4(500,100) and 5(650,300) respectively.A TCP connection is initiated between node 0 (source) and node 5 (destination) through node 3 and node 4 i.e the route is 0-3-4-5. At time t = 3 seconds the FTP application runs over it. After time t=4.0 sec, node 3 (300,100) moves towards node 1 (300,500)

	with a speed of 5.0m/sec and after some time the path break, then the data transmit with a new path via node 1 and node 2 i.e the new route 0-1-2-5. The simulation lasts for 60 secs. In the above said case both the route has equal cost. Use DSR as the routing protocol and the IEEE 802.11 MAC protocol. Now Analyze the trace file and determine when the use of second route commence, and Plot the number of packets received by each node over the entire time duration of the simulation
8	**Simulate a wired network and demonstrate Distance Vector Routing algorithm .**

Course Outcomes:

CO: Design networks to implement network topologies, routing techniques and analyze the network performance under various networking conditions

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	PO1,PO3,PO5,PO7,PO11

III SEMESTER Python Programming Laboratory			
Laboratory Code	**18MCAL37**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**26**	**SEE Hours**	**03**

CREDITS – 0:0:1

Course Learning Objective(CLO) :

- Learn basics concepts of python programming.
- Implement advanced programs in python based on the knowledge gained.

	Program Statements
1.	a) Write a Python program to compute the sum of first n given prime numbers. b)Write a program to compute 1/2+2/3+3/4+...+n/n+1 with a given n input by console (n>0).
2.	a)Python program to check withdrawal is possible or not, based on balance amount and withdrawal amount input from the user. b) Write a python program compress and decompress the string.
3.	a)Write a Python program to display some information about the OS where the script is running. b)Convert a string to camel case. E.g.: If the given string is "This is a test", the output should be "ThisIsATest" Find the number of vowels, consonants and digits in a given string.
4.	Write the python code to perform the list operations
5.	Write the python code to perform the Set operations
6.	a) Write a program to multiply two matrices using comprehension. b) Write a Python program to copy the contents of list of lists to tuples of tuple.
7.	Read a string from keyboard input. Create a list containing tuples, where each tuple represents a word in the input string and length of that string. Write a program sort the words in descending order of their length.
8.	Do the following using regular expressions:- • Find all occurrences of a word in a multiline string. The search must be case insensitive. Also find and display the starting index of each matched word in the input string. • Given a line of text find all characters other than vowels and space characters. • Validate USN using regular expressions. (both UG and PG) of VTU students. (Hint: UG USN format: 1RN15EC001, PG USN format: 1RN15MCA01)
9.	Do the following using regular expressions:-

	Find all occurrences of a word in a multiline string. • The search must be case insensitive. • Also find and display the starting index of each matched word in the input string. • Given a line of text find all characters other than vowels and space characters. Given a list of strings find all strings that start with a digit or an underscore.
10.	Create a dictionary for words and their meanings. Write functions to add a new entry (word: meaning) , search for a particular word and retrieve meaning, given meaning find words with same meaning , remove an entry, display all words sorted alphabetically. [Program must be menu driven.
11.	Write a Python Event-driven Program for file operations Press 1. Display first 5 lines and last 5 lines of a file. read mode 2. Display current position of the file pointer 3. Reposition the pointer at the beginning 4. Insert a line of text 5. Copy the contents of the whole file into another and display. 6. exit.
12.	Write an Object oriented Python program to demonstrate: i) Constructor, methods and objects of a class ii) Polymorphism iii) Inheritance iv) Implementing interfaces
13.	Write a python program to demonstrate connection to database and retrieve the information. Example: create menu driven program which will demonstrate add, display, modify and delete the record of an employee table created using database with attributes slno, name, address, empcode, dateofbirth, age, mobile, status, designation.
14.	Write a python program to demonstrate networking concepts.
Note 1: In the practical Examination each student has to pick one question from a lot of all the 14 questions.	
Course outcomes(CO): After completing the course the students are able to: **CO:** Design and develop an applications using Python Programing.	

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	PO1,PO2,PO4,PO5,PO8,PO11

SEMESTER –III

Data Science Using R Laboratory

Laboratory Code	**18MCAL38**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**26**	**SEE Hours**	**03**

CREDITS – 0:0:1

Course Learning Objectives (CLO):

- To understand basic data analysis concepts in R
- To analyse different statistical methods in R
- To apply basic machine learning algorithms for different datasets
- To visualize data using different plots

Note: Students have to pick one from Part A and one from Part B.

Install R studio on windows and load required packages. (prerequisite)

PART A

1	Create Vector & List. Perform manipulation of list elements.
2	Create two matrices and implement matrix computations on them.
3	Write R script to import different types of data sets (.csv, .txt, .xlsx) and write modified datasets to specific location.
4	Create a data frame for student with Name, USN and Marks. Add row/column, Retrieve elements of columns and rows in the data frame.
5	Load a built in data set and view summary of individual variables. Perform different operations on data sets and export the data to csv file format.
6	Find the data distribution using box and scatter plot. Plot different types of charts on sample data.

PART B

1	Write R script to treat missing values.
2	Analyse measures of Central tendency for sample dataset. Compute covariance and infer correlation between the variables.
3	Formulate linear regression model for any data set and identify explanatory variables.
4	Write a R script to analyse the performance of k-means clustering and visualize the performance.
5	Write an R script to analyse KNN classifier and verify the performance using confusion matrix.

Course Outcomes:
CO: Apply different statistical, machine learning algorithms and visualize using R.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO-1	PO5, PO11

Dr. Ambedkar Institute of Technology, Bengluru-56

(An Autonomous Institute, Approved by AICTE, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications

(Accredited by National Board of Accreditation)

MCA IV Semester Syllabus

2018-21 Scheme

		IV Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	practicals	Total Credits		CIE	SEE	
18MCA41	Enterprise Applications-1	3	-	-	3	3	50	50	100
18MCA42	Advanced Web Technologies	3	-	-	3	3	50	50	100
18MCA43	Analytical Skills And Building Professional Development	2	1	-	3	3	50	50	100
18MCA44	Elective-2	3	-	-	3	3	50	50	100
18MCA45	Elective-3	3	-	-	3	3	50	50	100
18MCA46	Research Methodology	2	-	--	2	3	50	50	100
18MCAL47	Enterprise Applications Lab	--	-	1	1	3	50	50	100
18MCAL48	Advanced Web Technologies Lab	--	-	1	1	3	50	50	100
18MCAM49	Mini Project using Android	--	1	1	2	3	50	50	100
Total		**16**	**2**	**3**	**21**	**27**	**450**	**450**	**900**

ELECTIVE-2									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA441	Information Security	3	-	--	3	3	50	50	100
18MCA442	Data Mining & Business Intelligence	3	-	--	3	3	50	50	100
18MCA443	Object oriented Modelling & Design	3	-	--	3	3	50	50	100

ELECTIVE-3									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA451	Software Quality & Performance Evaluation	3	-	--	3	3	50	50	100
18MCA452	Software Architecture	3	-	--	3	3	50	50	100
18MCA453	Enterprise Resource Planning	3	-	--	3	3	50	50	100

ENTERPRISE APPLICATIONS SEMESTER – IV			
Subject Code	18MCA41	**CIE Marks**	50
Number of Lecture Hours/Week	3	**SEE Marks**	50
Total Number of Lecture Hours	39	**SEE Hours**	03
CREDITS – 3:0:0			

Course Learning objectives(CLO):

- Present J2EE concepts and designing database access with java applications.
- Introduce the concepts of server side programming using Servlets & JSP.
- Present different types of enterprise java beans and implement them.
- Design and developing an application using spring and Hibernate frame work.

Modules	**Teaching Hours**
Module -1	
Annotations and JDBC Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java.Lang Sub package, Built-in Annotations with examples. The Concept of JDBC, JDBC Driver types, A brief overview of JDBC process, Database Connection, Statement objects, ResultSet, Transaction Processing, Metadata, Datatypes, Exceptions. Introduction to Embedded SQL with JDBC.	**07 Hours**
Module -2	**8 Hours**
Servlet and JSP and Controlling the Structure of generated servlets J2EE Architecture,Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, SingleThreadModel interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.	
Module -3	**8 Hours**

JSP and Controlling the Structure of generated servlets Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax. Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: The JSP page directive, JSP Action tags.	
Module - 4	**6 Hours**
Java Beans Working with Java Beans. Introspection, creating java bean, manifest file, Bean Jar file, adding controls, Bean properties, Simple properties, bound properties, Icon, Bean info class, Constrained Properties, Persistence, Java Beans API. **EJB and Server Side Component Models** Enterprise Java Beans: The EJB Container, EJB Classes, EJB Interface. Deployment Descriptor, Session Java Bean, Entity Java Bean, Message-Driven Bean, The JAR File.	
Module – 5	**10 Hours**
Spring Framework Introduction to Spring Framework, Spring Framework architecture, IOC-containers, Bean scopes, Bean Life cycle, Dependency Injection, Beans wiring, Event Handling in springs, Custom events in springs Spring AOP, and Spring JDBC. **Spring MVC** Spring MVC : Spring 3.0 features –Introduction to Spring MVC – Handler Mapping –Controllers –Validations –Handler Interceptors – Views –Form tags.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks. Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).
2. Java 6 Programming Black Book, Dreamtech Press. 2012 (Chapter 17,18,19,20,21,22,27,28,29,30).
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books:

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008.
2. Herbert Schildt, Java The Complete Reference, 8th Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.

Course Outcomes(CO):

CO1: Understand Concept of enterprise applications programming.
CO2: Analyze the methodologies and constraints of implementation.
CO3: Apply the enterprise programming methodologies to design applications.
CO4: Design and Develop applications to be deployed in real world scenarios.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO4,PO5,PO8
CO 2	PO1,PO2,PO3,PO4
CO 3	PO1,PO2,PO3,PO4,PO5
CO 4	PO1,PO2,PO3,PO4,PO5,P11

Advanced Web Technologies
SEMESTER – IV

Subject Code	**18MCA42**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**

CREDITS – 3:0:0

Course Learning Objectives (CLO):

- To design web pages using Bootstrap framework
- To develop different approaches of Web technologies using PHP and Ruby on Rails.
- To design Single page web applications using AngularJs
- To design asynchronous web applications using Ajax.

Modules	**Teaching Hours**
Module -1	**8 Hours**
Bootstrap- Introduction, **Layout**: Container, Grid, **Components**: Alerts, Badge, Card, Jumbotron, Buttons/Buttons group, Navs/Navbar, Pagination, Modal, Carousel, Collapse, Form, Input group, Progress bar	
Module -2	**8 Hours**
Introduction to PHP-Origins and uses of PHP, Overview of PHP, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files handlers. Building Web applications with PHP- Using databases, tracking users- cookies, sessions.	
Module -3	**8 Hours**
Ajax- AJAX principles, Creating Ajax applications, Adding Server-side programming, Sending data to the server using GET and POST. Downloading JavaScript, Connecting to Google suggest. Ajax Patterns-Periodic fetch, Periodic refresh, case study.	
Module -4	**8 Hours**
Angular JS -Single Page Applications: -Introduction, MVC Architecture, Data binding, binding with lists, Angular Directives, Controller, Dependencies, Bootstrapping an angular applications, scope and views.	
Module -5	**7 Hours**
NodeJs-Introduction, JavaScript closures, Node Modules-Common JS Modules-core modules, third-party modules, file modules, folder modules, Developing Node.js web application.	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

1. "Bootstrap Essentials",Snig Bhaumik, PACKT publishing
2. Robert W. Sebesta: Programming the World Wide Web, 7th Edition, Pearson Education,2012.
3. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2011
4. Amos Q. Haviv," MEAN Web Development", Packt Publishing,2014.

Reference Books:

1. Steven Holzner "Complete Reference-PHP ", Tata Mc Graw Hill,2008
2. "Bootstrap programming cook book"-Fabio Cimo,Web Code Geeks
3. Adam Bretz and Colin J. Ihrig," Full Stack JavaScript Development with MEAN", SitePoint Pty. Ltd.,2014.
4. Nicholas C Zakas et al: Professional AJAX, Wiley India, publications

Course Outcome (CO):

CO1: Design web applications using Responsive designs.

CO2: Design and develop web applications using PHP and MYSQL.

CO3: Design Single page web applications using AngularJs and Node JS.

CO4: Design asynchronous web applications using Ajax.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	PO5,PO11
CO2	PO2,PO4,PO5,PO11
CO3	PO2,PO4,PO5,PO7,PO11
CO4	PO5,PO11

Analytical Skills And Building Professional Development SEMESTER IV			
Subject Code	**18MCA43**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**3**	**SEE Marks**	**50**
Total Number of Lecture Hours	**39**	**SEE Hours**	**3**
CREDITS – 2:1:0			

Course Learning Objectives(CLO)

- To solve basic problems on number systems.
- To implement time and work problem, data interpretation.
- To analyze and distinguish between reasoning, Verbal analogies, verbal classification.
- Apply Motivation principles & demonstrate communication skills

Modules	**Teaching Hours**
Module -1*: Quantitative Aptitude*	**8 Hours**
Number Systems, Profit, Loss and Discount, LCM and HCF, Speed, Time and Distance, Percentages, Time and Work, Ratio and Proportion, Averages, Simple and Compound Interest, Sequences and Series, Inequalities, Probability, Surds and Indices, Permutation and Combination, Coordinate Geometry, Geometry, ,Mensuration,	
Module -2: Data Interpretation & Logical Reasoning	**8 Hours**
Data Handling, statistics, Venn Diagrams, Basic Reasoning Questions, Calendars, Clocks, Number and Letter Series, Seating Arrangement, Logical Matching, Logical Sequence, Syllogism, Logical Connectives, Blood Relations, statistics. Cracking corporate Real time quantitative test.	
Module -3	**8 Hours**
Improving the quality of Reading, Writing, Speaking and Listening to satisfy international academic requirements. Assignments and Online assessments	
Module -4	**7 Hours**
Motivation Skills & Personality Development, Goal Setting, Career Planning, Resume Building, Psychometric Test, Priority Management & Time Management, Positive Attitude and Self Confidence.	
Module -5	**7 Hours**
Technical Writing and Professional Etiquette: Building project proposals, brochures, newsletters, articles. Professional Etiquettes: Social and Professional etiquette, email etiquettes	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory.

Module 2 and 3 shall have internal choice.

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module.

1. R.S. Aggarwal, Quantitative Aptitude, S. Chand & Company, New Delhi, 2012. 2.
2. Govind Prasad Singh and Rakesh Kumar, Text Book of Quickest Mathematics (for all Competitive Examinations), Kiran Prakashan, 2012.
3. John Hoover & Angelo Valenti, "Unleashing Leadership", Jaico publishing House –WWW.JAICOBOOKS.COM
4. Kundu, C.L – "Personality development", Sterling Bangalore. 5. Sandra D. Collins, "Listening and Responding", Cengage Learning India, 2 nd Edition, 2008.

Reference Books:

1. R.S. Aggarwal, Objective Arithmetic, S. Chand & Company, New Delhi, 2005. 4. Dr. Lal, Jain,
2. Dr. K. C. Vashistha, "U.G.C.- NET/JRF/SET Teaching & Research Aptitude", Upkar Prakashan, 2010.
3. Wallace: "Personality Development", 1st Edition, 2008 Cengage Learning India.
4. Richard Denny, "Succeed for your self", Kogan page India, 3rd Edition. www.vivagroupindia.com.

Course Outcomes:

CO1:Demonstrate number system and probability

CO2: Apply time , work and data interpretation to solve real world problem

CO3: Apply logical, analytical reasoning and verbal analogies

CO4: Apply Motivation principles & demonstrate communication skills

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO1,PO2
CO 3	PO1,PO2
CO 4	PO6,PO7,PO9,

Information Security SEMESTER –IV			
Subject Code	**18MCA441**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**3**	**SEE Marks**	**50**
Total Number of Lecture Hours	**39**	**SEE Hours**	**03**
CREDITS – 3:0:0			

Course Learning Objectives (CLO)

- Introduce students to the area of Information Security, cybercrime and Forensics.
- To understand the motive and causes for cybercrime, detection and handling.
- To analyze the areas affected by cybercrime and investigation tools used in cyber forensic.
- To Evaluate the knowledge of report writing and Forensic ethics

Modules

Module -1	**8 Hours**
INTRODUCTION: The Security Problem in Computing: The meaning of Information Security and computer Security, Computer Criminals, Methods of Defense, and Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption algorithms, The Data Encryption Standard, The AES Encryption Algorithms, Public Key Encryptions, and Uses of Encryption.	
Module -2	**6 Hours**
Program Security: Sphere, Terminology, Vulnerability in the Cyber Structure and Infrastructure, Cyber threats and Weaponry, Cyber Defense, Cyber Defense, Cyber Attack Detection and Prevention, Information Security Testing, Cyber Security Investigation/assessment, Cyber Deterrence.	
Module -3	**8 Hours**
Cyber Crimes and Cyber Laws: Classification of Cyber Crimes, IT laws & Cyber Crimes-Internet, Hacking, Password Cracking, Viruses, Virus Attacks, Reasons for Commission of Cyber Crimes, Malware and	

its type Adware, Spyware, Browser hijacking software, Virus, Worms, Trojan Horse, Scareware, Kinds of Cyber Crime.	
Module -4	**10 Hours**
Administrative Security: Security planning, Risk Analysis, Organizational Security policies, Physical Security, Legal Privacy and Ethical Issues in computer security: Protecting programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer crime, Ethical Issues in computer security.	
Module -5	**7 Hours**
Database Security: Security requirements, Reliability and integrity, Sensitivity data, proposals for multilevel security. Security in network: Threats in network, network security controls, Firewalls, Secure E-Mail.	
Question paper pattern: • The question paper will have ten questions. Choose one Question from each module • Each full question consists of 20 marks. • Questions are set covering all the topics under each module.	

Text Books:

1. SunitBelapure and Nina Godbole, " Cyber Security: Understandign Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN:978-81-265-2179-1. Publish Date 2013.
2. Surya prakash Tripathi, Rajendra Goel, and Praveen Kumar Shukla, "Introduction to Information Security and Cyber Laws", DT Editorial Services

Reference Books:

1. Thomas J. Mowbray, " Cybersecurity: Managing Systems, Conducting Testing, and Investigating Instrusions", Copyright@2014 by John Wiley & Sons, Inc. ISBN:978-1-118-84965-1.2014.

2. James Graham. Ryan Olson. Rick Howard. "Cyber Security Essentials", CRC Press. 15-Dec-2010.

Course Outcome (CO): At the end of this course, the students will be able to

CO1.Describe knowledge on the Information Security and cyber security, cybercrime and forensics.

CO2: Understand a tools and methods used in cybercrime and know about the tools and techniques for the forensics.
CO3: Ability to apply strict policies and procedures with meticulous record keeping.
CO4: Derive the digital forensics

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	PO1,PO2,PO5,PO10
CO2	PO1,PO2
CO3	PO1,PO2,PO4,PO5
CO4	PO1,PO2,PO5

Data Mining & Business Intelligence SEMESTER – IV			
Subject Code	**18MCA442**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**
CREDITS – 3:0:0			

Course Learning Objectives (CLO):

- Learn about Business Intelligent and Decision Support system
- Understand the concept of Data warehousing and OLAP, storage and retrieval technique of data from DATA CUBE
- Analyze different types of data and different preprocessing techniques
- Analyze different data mining techniques(Association, Classification & Clustering)

Modules	Teaching Hours
Module -1	**8 Hours**
BUSINESS VIEW OF INFORMATION TECHNOLOGY APPLICATIONS Business Enterprise, Functions and Core Business Processes, Baldrige Business Excellence Framework, Purpose of Using IT in Business, Application development Approaches, Information Users and Their Requirements, Types of Digital Data: Structured Data, Unstructured Data, Semi-Structured Data, Characteristics, Issues and Challenges	
Module -2	**8 Hours**
BUSINESS INTELLIGENCE BI Overview, BI Skill requirements, BI benefits, functions and Applications, Using Analytical Information for Decision Support, Role of DSS, EIS, MIS, Business Analytics, BI Component Framework, BI Users, Applications, Popular BI Tools	
Module -3	**8 Hours**
INTRODUCTION TO OLTP AND OLAP: Characteristics, Issues and Challenges, Comparison, Dimensional Data, Different OLAP Architectures, ROLAP, MOLAP, HOLAP, Data Models for OLTP and OLAP, OLAP operations **Data Mining And Its Applications** Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Which technologies are used, which kinds of applications are targeted by Data Mining , Types of Data, Data Mining Applications, Data Preprocessing	
Module -4	**8 Hours**
ASSOCIATION ANALYSIS: BASIC CONCEPTS AND ALGORITHMS Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm	

Classification: Methods, Improving Accuracy Of Classification Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, and Nearest Neighbor Classifiers. Bayesian Classifiers	
Module -5	**8 Hours**
CLUSTERING TECHNIQUES AND OUTLIER ANALYSIS Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods Outlier detection methods	

Question paper pattern:

- There will be 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions selecting ONE from each module.

Text Books:

1. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics" , Wiley India, 2011.
2. Jiawei Han and Micheline amber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison- Wesley, 2005.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.
3. Alex Berson and Stephen J.Smith: Data Warehousing, Data Mining, and OLAP Computing McGrawHill Publisher, 1997.

Course Outcomes (CO):

CO 1: Understand the basic concepts of Business Intelligent and Decision Support system, Data Warehousing and OLAP & Data cube implementation.
CO 2: Illustrate Data Mining Challenges, applications & Pre-processing techniques.
CO 3: Analyse algorithms for Associations Analysis.
CO 4: Demonstrate different Classification techniques.

OBJECT-ORIENTED MODELING AND DESIGN PATTERNS SEMESTER IV			
Subject Code	**18MCA443**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**39**	SEE Hours	**03**
CREDITS – 3:0:0			

Course Learning Objectives(CLO) :

- To apply the object oriented concepts for designing object oriented models.
- To analyze and design the software models using UML notations.
- To analyze the domain, application artifacts, and construct domain model and application model.
- To design class models using forward and reverse engineering concepts.
- To understand patterns and implement design patterns to provide solutions to real world software design problems.

Modules-1	**Teaching Hours**
Modeling Concepts & Class Modeling : What is OO development? OO themes, OO modeling history. Modeling as Design Technique: Modeling; abstraction, The three models. History of UML Building Blocks. **Object and class concepts**: Link and associations concepts, Generalization and inheritance, A sample class model, **Advanced object and class concepts:** Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.	**10 Hours**
Module -2	**6 Hours**
State Modeling and Interaction Modeling: State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior. **Advanced State Modeling:** Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; **Interaction Modeling:** Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models;	
Module -3	**10 Hours**
System Conception and Analysis: **System Conception**: Devising a system concept; elaborating a concept; preparing a problem statement. **Overview of analysis**: Domain class model; Domain state model; Domain interaction model; Iterating the analysis. **Application Analysis**: Application interaction model; Application class model; Application state model; adding operations. **Concept of Forward Engineering and Reverse Engineering:** Forward Engineering and Reverse Engineering of all diagrams of UML 2.0. Reverse engineering; Building the class models; Building the interaction model; Reverse engineering tips.	
Module -4	**5 Hours**

Pattern Introduction: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Singleton, Counted Pointer example.	
Module -5	**8 Hours**
Design Patterns : Introduction, Model View Controller, Structural decomposition- Whole-Part, Access Control- Proxy; Creational Patterns – Factory Method, Singleton Structural Patterns – Adapter, Management Patterns- Command processor, Publisher-Subscriber	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

5. Michael Blaha, James Rumbaugh, "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education / PHI, 2007
6. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, "Pattern-Oriented Software Architecture, A System of Patterns", Volume 1, John Wiley and Sons, 2006.
7. Booch, G., Rumbaugh, J., and Jacobson, I., "The Unified Modeling Language User Guide", 2nd Edition, Pearson, 2005.

Reference Books:

1. Grady Booch et al, "Object-Oriented Analysis and Design with Applications", 3rd Edition, Pearson, 2007.
2. Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, Tata McGraw-Hill, 2003.
3. Michael R Blaha, James R Rumbaugh, "Object Oriented Modeling and Design with UML", 2nd Edition, Prentice Hall, 2004.

Course Outcomes (CO):

CO1**:** Demonstrate the ability to apply the knowledge of object oriented concepts for designing system models.

CO2: Design and implement object oriented models using UML appropriate notations.

CO3: Apply the concept of domain and application analysis for designing Domain and application models, Build class models using forward and reverse engineering.

CO4: Implement patterns for constructing software designs of real world problems.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO3
CO 2	PO1
CO 3	PO3,PO8
CO 4	PO3,PO4,PO8

Software Quality & Performance Evaluation

SEMESTER –IV

Subject Code	**18MCA451**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**3**	**SEE Marks**	**50**
Total Number of Lecture Hours	**39**	**SEE Hours**	**03**

CREDITS – 3:0:0

Course Learning Objectives (CLO)

- Able to know about the system performance, common mistakes in performance evaluation.
- Evaluation techniques, Performance metrics, performance requirements.
- Types of workload, characterization of workload techniques.
- Simulation common mistakes, types, and verification techniques.

Modules

Module -1	**4 Hours**
Introduction Outline of topics, Art of Performance evaluation **Common Mistakes and How to Avoid Them** Common Mistake in Performance Evaluation, Systematic approach to Performance Evaluation	
Module -2	**5 Hours**
Selection of Techniques and Metrics Selecting the evaluation Technique, Selecting the performance metrics, Commonly used Performance metrics, Utility classification of Performance metrics, setting performance requirements.	
Module -3	**10 Hours**
Types of Workloads Addition Instructions, Instruction Mixes, Kernels, synthetic Programs, Application Bench Marks, Popular Benchmarks, **Workload Characterization Techniques** Terminology, Averaging, Specifying Dispersion, Single parameter histogram, Multi parameter histogram, Principle Component Analysis, Markov Model, Clustering.	
Module -4	**10 Hours**
Introduction to simulation Common mistake in simulation, Other causes of simulation analysis failure, Terminology, selecting a language for simulation, Types of Simulation, Event set algorithms.	

Module -5	**10 Hours**
Model Verification Techniques Top down modular design, Anti bugging, Structured walk through, Deterministic models, run simplified cases, Trace, online display, Continuity test, Degeneracy test, consistency test, seed independence	
Question paper pattern: • There will be 10 questions with 2 full questions from each module. • Each full question consists of 20 marks. • Students have to answer 5 full questions, selecting ONE from each module.	
Text Books: 1. Raj Jian. "The Art of Computer Systems Performance Analysis". John Wiley and sons, New York, USA, 1991	
Reference Books: 1.Trivedi K S, **"**Probability and Statistics with Reliability, Queuing and Computer Science Applications", Prentice Hall of India, Reprinted in 1990 2. Law A M and Kelton W.D. "Simulation Modeling and Analysis ", McGraw Hill, New York,USA, 1991	
Course Outcome (CO): • CO1: Recognize the system performance, common mistakes in performance evaluation. • CO2: Demonstrate the Evaluation techniques, Performance metrics, performance requirement • CO3: Analyze the work load and characterization. • CO4: Evaluate the fundamentals of system simulation and model verification.	

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO9**
CO2	**PO11**
CO3	**PO3, PO12**
CO4	**PO6,PO11**

ENTERPRISE RESOURCE PLANNING SEMESTER – IV			
Subject Code	18MCA452	**CIE Marks**	50
Number of Lecture Hours/Week	3	**SEE Marks**	50
Total Number of Lecture Hours	39	**SEE Hours**	03
CREDITS – 3:0:0			

Course Learning Objectives (CLO):

- Analyze a business' enterprise activities, workflow and process to identify problems, weaknesses, strengths, threats, opportunities,
- Stakeholders and entities interacting with the enterprise. Propose reengineered enterprise processes that optimize the
- Enterprise's performance.
- Evaluate ERP Products and Enterprise solutions understand the ERP Implementation Methodologies Assess ERP Modules.

Modules	**Teaching Hours**
Module -1	**8 Hours**
Introduction ERP as Integrated Management Information System - Evolution of ERP - Benefits of ERP. ERP vs Traditional Information Systems.	
Module -2	**8 Hours**
BUSINESS PROCESS REENGINEERING Business Process Reengineering- need and challenges, - Management concerns about BPR. - BPR to build business Model for ERP. ERP & Competitive advantage, - Basic Constituents of ERP, Selection criteria for ERP Packages. Procurement process for ERP Package.	
Module - 3	**8 Hours**
ERP PACKAGES Overview of ERP packages – PEOPLE SOFT, SAP-R/3, BAAN IV, MFG/PRO, IFS/AVALON, ORACLE- FINANCIAL, Survey of Indian ERP Packages regarding their Coverage, performance & cost.	
Module -4	**8 Hours**
ERP IMPLEMENTATION ERP Implementation- issues, Role of Consultants, Vendors, Users, - Need for training, customization. ERP implementation methodology and post implementation issues and options.	
Module -5	**7 Hours**
ERP CASE STUDIES ERP Case Studies In HRM, Finance, Production, Product Database, Materials, Sales & Distribution.	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module

Text Books:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.
2. Bret Wagner, Ellen Monk, "Concepts in Enterprise Resource Planning", 2012.
3. Bret Wagner, Ellen Monk, "Enterprise Resource Planning", Third Edition Cengage Learning, 2008.

Reference Books:

1. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning concepts and Planning", Prentice Hall, 1998.
2. Jose Antonio Fernandz, " The SAP R /3 Hand book", Tata McGraw Hill
3. Ashu Gupta, Rajesh Verma, Jatindar kumar, "Enterprise Resource Planning: Concepts and Applications", 2012.

Course Outcome (CO):

CO1: Identify the evolution of ERP and various benefits

CO2: Demonstrate ERP Products and Enterprise solutions

CO3: Implement ERP package to a Business Enterprise

CO4: Analyze ERP Modules for Business Enterprises

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO3, PO6
CO 2	PO9
CO 3	PO7
CO 4	P012

Software Architecture SEMESTER –IV			
Subject Code	**18MCA453**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**3**	**SEE Marks**	**50**
Total Number of Lecture Hours	**39**	**SEE Hours**	**03**
CREDITS – 3:0:0			

Course Learning Objectives(CLO):

1. Designed to understand emerging field of software architecture in software development and the critical need for the development of such architectures.
2. Develop ability to perform the analyses necessary to formulate effective software architectures.
3. Analyze Software Engineering problems in terms of architectural thinking.
4. Apply the architectural concepts of platform, framework, pattern in architecting applications

Modules	**Teaching Hours**
Module -1	**07 Hours**
Introduction and Context of Software Architecture. The Architecture Business Cycle. What software architecture is and what it is not; What makes a "good" architecture? What it is and what it is not? Other points of view. Architectural patterns, Reference Models and Reference Architectures. Importance. Architectural structures and views	
Module -2	**8 Hours**
Architecture and Quality Attributes: System Quality Attributes. Quality attribute scenarios in practice. System quality attributes. Achieving Quality attributes: Availability; Interoperability; Modifiability; Performance; Security; Testability; Usability, Business Qualities	
Module -3	**8 Hours**
Applying Tactics: Availability tactics, Interoperability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics	
Module -4	**8 Hours**

Architectural styles: Pipes and Filters, Data Abstraction and OO organization, Event-based, Implicit Invocation, Layered Systems, Repositories, Interpreters, Process Control Architectural Patterns - I: From Mud to structure; Layers; Pipes and filters; Blackboard	
Module -5	**8 Hours**
Architectural Patterns – II: Distributed systems: Broker; Interactive systems: Model-view-control Case Studies: Keyword to context, Instrumentation Software, Mobile Robotics	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module

Text Book:

- Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice" 3rd Edition ISBN-13: 978-0321815736, ISBN-10: 9780321815736
- Frank Buschmann, Regine Meunier, et al "Pattern Oriented Software Architecture" 2nd Edition – John Wiley & Sons , ISBN-10: 8120310411

Reference Books:

Nick Rozanski, Eoin Woods "Software Systems Architecture working with stake holders using viewpoints and perspectives" I edition ISBN-published by Addison Wesley 13: 978-0321112293, ISBN-10: 0321112296

Course Outcome (CO):

CO 1: To acquire the knowledge of the context and importance of software architecture and quality maintenance

CO 2: To apply the knowledge of various architectural tactics in multiple scenarios to enhance software quality

CO 3: To comprehend an architectural style as patterns

CO 4: To analyse and apply architectural style in multiple contexts.

COs	**Mapping with PO**
CO1	PO1, PO3
CO2	PO1, PO3, PO8
CO3	PO1, PO5, PO8
CO4	PO1, PO3, PO8, PO10

RESEARCH METHODOLOGY Semester IV			
Subject Code	**18MCA46**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**2**	**SEE Marks**	**50**
Total Number of Lecture Hours	**26**	**SEE Hours**	**03**
CREDITS – 2:0:0			

Course Learning Objectives (CLO):

1. To have a basic understanding of the underlying principles of quantitative and qualitative research.
2. To identify the overall process of designing a research study from its inception to its report.
3. To choose the most appropriate research method to address a particular research question.
4. To gain overview of a range of quantitative and qualitative approaches to data analysis.
5. To learn to write research report.

Modules	Teaching Hours
Module -1 Overview of Research and its types, Research approaches, Significance of Research, Research Methods versus Methodology. Research Process. Criteria of Good Research. Identifying and Identifying research problem, Technique Involved in Defining a Problem.	**5 Hours**
Module -2	
Introduction to different research designs. Essential constituents of Literature Review. Basic principles of experimental design, Primary data and Secondary Data, methods of primary data collection, classification of secondary data, designing questionnaires and schedules.	**5 Hours**
Module -3	
Sampling Methods Probability sampling: simple random sampling, systematic sampling, stratified sampling, cluster sampling and multistage sampling. Nonprobability sampling: convenience sampling, judgment sampling, quota sampling. Sampling distributions.	**5 Hours**
Module -4	

Processing and analysis of Data Statistical measures and their significance: Central tendencies, variation, skewness, Kurtosis, time series analysis, correlation and regression, Testing of Hypotheses: Parametric (t and Chi Square).	**5 Hours**
Module -5	**6 Marks**
Essential of Report writing and Ethical issues: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Ethical issues related to Research, Plagiarism and self-Plagiarism, Publishing**.**	

Question paper pattern:

- There will be 10 questions with 2 full questions from each module.
- Each full question consists of 20 marks.
- Students have to answer 5 full questions, selecting ONE from each module.

Text Books:

1. Kothari C.R., Research Methodology Methods and techniques by, New Age International Publishers, 3rd Edition, 2013.

Reference Books:

1. Krishnaswami K N, Sivakumar A I and Mathirajan M, "Management Research Methodology", Pearson Education, 2006.
2. 2. Levin R I and Rubin D S, Statistics for Management, 7th Edition, Pearson Education, 2008.

Course Outcomes (CO):

CO1: Understand various research objectives and concepts of qualitative and quantitative research problems and report writing.
CO2: Apply appropriate method for data collection, process the complex data and prepare a report.
CO3: Analyse the real word data with quantitative techniques and interpret the results.
CO4: Formulate research methodology for real world problems.

Cos	**Mapping with POs**
CO1	PO2, PO4, PO8
CO2	PO2, PO3, PO4, PO5
CO3	PO5, PO6
CO4	PO1, PO2, PO3, PO4, PO5, PO7, PO10

ENTERPRISE APPLICATIONS LABORATORY IV SEMESTER			
Laboratory Code	18MCAL48	**CIE Marks**	50
Number of Lecture Hours/Week	02	**SEE Marks**	50
Total Number of Lecture Hours	26	**SEE Hours**	3
CREDITS – 0:0:1			

Course Learning Objective(CLO) :

- Learn the fundamental of connecting to the database
- Demonstrate server side programming using Servlet , JSP, EJB.
- Design and develop web applications using Spring and Hibernate Framework.

Program Statements	
15.	Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries (For example update, delete, search etc…).
16.	Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).
17.	Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).
18.	Write a JAVA Servlet Program to implement and demonstrate get() and Post methods(Using HTTP Servlet Class).
19.	Write a JAVA Servlet Program using cookies to remember user preferences.
20.	Write a JAVA Servlet program to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.
21.	Write a JAVA JSP Program which uses jsp:include and jsp:forward action to display a Webpage.
22.	Write a JAVA JSP Program which uses <jsp:plugin> tag to run a applet
23.	Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean class, populate Bean and display the same information through another JSP
24.	Write a JSP program to implement all the attributes of page directive tag.
25.	Develop JDBC application using Spring framework
26.	Develop MVC application using Spring framework

Note 1: In the practical Examination each student has to pick one question from a lot of all the 13 questions.

Course outcomes(CO):

CO: Design and Develop real time applications using Servlets & Springs Framework.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	PO1,PO2,PO4,PO5,PO8,PO11

SEMESTER –IV **Advanced Web Technologies Laboratory**			
Laboratory Code	18MCAL48	CIE Marks	50
Number of Lecture Hours/Week	02	SEE Marks	50
Total Number of Lecture Hours	26	SEE Hours	03
CREDITS – 0:0:1			

Course Learning Objectives(CLO):

- To understand and analyses the role of server side scripting languages.
- To develop web applications using PHP, Ajax & Angular.
- To build responsive web application using bootstrap components and enhance with jquery effects.

Note : Student has to pick one question during examination.

PART A

1	Design a web page using Collapse, Cards and Badges.
2	Design a webpage with Home tab and Sign In links using Tabs. Apply modal for Sign In page and an image for Home tab.
3	a. Design a web page for Photo Gallery using Bootstrap Carousel b. Design a web page using Date picker and tooltips.
4	a) Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page. b) Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
5	Design a web page using Angular Controllers and Directives.
6	Write jQuery program to solve the following : a) Limit character input in the text area including count. b) Based on check box, disable / enables the form submit button.
7	Design a single page web application using Angular & NodeJs.
8	Design an asynchronous web application using Ajax to send data to the server using GET/POST method.
9	Create XHTML form with Name of License Holder, Gender, Vehicle ID , License plate and Date of Model. On submitting, store the values in MySQL table. Retrieve and display the data based on name.
10	Develop a web page using PHP –Ajax that can communicate with a web server when user type characters in an input field (Search Suggest)

Course Outcome (CO):

CO: Design a single page web application and develop asynchronous web application using PHP, Ajax with MYSQL database.

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO-1	PO4,PO5,PO11

MOBILE APPLICATIONS USING ANDROID LABORATORY

SEMESTER – IV

Course Code	18MCAL49	**CIE Marks**	50
Number of Practical Hours/Week and Number of Instructional Hours/Week	4	**SEE Marks**	50
Total Number of Lecture Hours	52	**SEE Hours**	03

CREDITS – 0:1:1

Course Learning Objectives:

- Learn the basics of mobile app development
- Build mobile applications using database
- Develop mobile app that uses GPS location information
- Students will learn to develop a mobile app project using multiple features learnt

Laboratory Programs:

The laboratory can be carried out only using any mobile application software.

Note:

1. Students are required to execute one question from Part A and give demo from Part B.
2. Part A has to be evaluated for 20 marks and Part B has to be evaluated for 30 marks along with the report.
3. The project should be carried out with a team strength of maximum two.
4. Students are expected to work for mini project apart from lab hours also with the contact of guides.

PART – A

1. Demonstrate layout
2. Demonstrate widgets
3. Demonstrate life cycle
4. Demonstrate Intents in Android, Shared preferences
5. Demonstrate Fragments in android
6. Demonstrate Animations
7. Demonstrate Email and SMS sending
8. Demonstrate Databases and content providers

   (Database using Silverlight , MySQL and firebase)
9. Demonstrate Services
10. Demonstrate Sensors and location based services
11. Demonstrate Audio playback and image capture

PART – B

Mini-Project

Students should be able to build a complete mobile app using multiple features learnt in Part – A with user interfaces and database connectivity. The Project should be deployed on the cloud like any cloud tool (ex.MS Azure, AWS etc..).

The team must submit a brief project report (25-30 pages) that must include the following

a. Introduction
b. Requirement Analysis
c. Software Requirement Specification
d. Analysis and Design
e. Implementation
f. Testing

4. The report must be evaluated for 10 Marks. Demonstration and Viva for 20 Marks.

Course Outcome:

CO1: Design and develop various android mobile applications.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO	PO1,PO2,PO4,PO5,PO8,PO11

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications Program

(Accredited by National Board of Accreditation)

MCA V – VI semester Syllabus
2018 Scheme

Dr. Ambedkar Institute of Technology

(An Autonomous Institute affiliated to VTU, Accredited by NAAC with 'A' grade)

Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA FIFTH SEMESTER (AUTONOMOUS) 2018-2021

		V SEMESTER							
Subject Code	Name of the Subject	Credits			Total Credits	Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals			CIE	SEE	
18MCA51	Machine Learning using Python	4	-	-	4	3	50	50	100
18MCA52	Big Data Analytics	3	-	-	3	3	50	50	100
18MCA53	Cloud Computing	3	-	-	3	3	50	50	100
18MCA54	Elective -4	3	-	-	3	3	50	50	100
18MCA55	Elective -5	3	-	-	3	3	50	50	100
18MCAL56	Machine Learning using Python Lab	--	-	1	1	3	50	50	100
18MCAL57	Big Data Analytics Lab	--	-	1	1	3	50	50	100
18MCAL58	Cloud Computing Lab	--	-	1	1	3	50	50	100
18MCAI59	Industry Internship (6 weeks)	--	--	--	5	3	50	50	100
	Total	16	-	3	24	27	450	450	900

ELECTIVE-4									
V SEMESTER									
Subject Code	**Name of the Subject**	**Credits**				**Exam Duration**	**Marks**		**Total Marks**
		L	**T**	**P**	**Credits**		**CIE**	**SEE**	
18MCA541	**Enterprise Application-2**	**3**	**-**	**--**	**3**	**3**	**50**	**50**	**100**
18MCA542	**Full Stack Development with MERN**	**3**	**-**	**--**	**3**	**3**	**50**	**50**	**100**
18MCA543	**DevOps**	**3**	**-**	**--**	**3**	**3**	**50**	**50**	**100**

Dr. Ambedkar Institute of Technology

(An Autonomous Institute affiliated to VTU, Accredited by NAAC with 'A' grade)

Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA SIXTH SEMESTER
(AUTONOMOUS) 2018-2021

VI SEMESTER							
Subject Code	**Name of the Subject**	**Internal**	**External**	**Dissertation Evaluation**	**Viva voce**	**Total Marks**	**Credits**
18MCAS61	**Technical Seminar**	**50**	**--**	**--**	**--**	**50**	**2**
18MCAP62	**Project Work**	**50**	**-**	**100**	**100**	**250**	**20**
Total		**100**	**--**	**100**	**100**	**300**	**22**

V SEMESTER

MACHINE LEARNING USING PYTHON

Course code:				**18MCA51**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**4**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**52**		**SEE Hours:**	**3**
Lecture (L):	**4**	**Practical (P):**		**Tutorial (T):**		**Total Credits:**	**4**

COURSE LEARNING OBJECTIVES (CLO)

- **To distinguish between, supervised & unsupervised and Gain knowledge about basic concepts of Machine Learning.**
- **To introduce participants to the fundamentals of data analytics using Python**
- **To apply the appropriate machine learning strategy for any given problem.**
- **To develop skills of using recent machine learning software for solving practical problems.**

MODULES	TEACHING HOURS
MODULE 1: Introduction to Machine learning	**10 Hrs**
Introduction toMachine Learning, types of Machine learning, Applications, Machine Learning Process, Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning	
MODULE 2: Python for Machine Learning	**11 Hrs**
Introduction to Pandas Data structures, Function Application & Mapping, Correlation & Covariance, Handling Missing Data, Reading & Writing Data in CSV or text files, Data Preparation-Merging and Removing data, Data Transformation-Removing Duplicates, Mapping.	
MODULE 3: Concept Learning & Unsupervised Learning	**10 Hrs**
Introduction to Bayes Theorem and Concept learning, Naive Bayes Classifier, Applications of Naïve Bayes Classifier, Clustering –Different types of the clustering techniques, K-Means Clustering	
MODULE 4: Supervised Learning	**11 Hrs**
Training a model-Linear Regression, Multiple Linear regression, Improving accuracy of Linear Regression Model, Polynomial Regression ModelClassification-Introduction, Decision Tree, Random Forest Model, Support Vector Machines, Boosting	
MODULE 5: Neural Network and Deep Learning	**10 Hrs**

Artificial Neural Networks: IntroductionArtificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm. Deep Learning-Introduction, Deep Learning Architectures	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Fabio Nelli, " Python Data Analytics", Apress,Springer Science + Business Media Finance Inc (SSBM Finance Inc).
2. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, 1st Edition, 2019, Pearson Publications, , ISBN 978-93-530-6669-7
3. Machine Learning, Tom M Mitchel, McGraw Hill publications,ISBN-0070428077
4. Machine Learning with Python: Design and Develop Machine Learning and Deep Learning, BPB Publishing, India,2018

Reference Books

1. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
2. EthemAlpaydin "Introduction To Machine Learning" 2nd Edition PHI Learning Pvt. Ltd-New Delhi.

COURSE OUTCOMES (CO)

CO1: Understand the concepts related to Machine Learning techniques.

CO2: Demonstrate Pre-processing techniques and perform exploratory data analysis related to a scenario.

CO3:Identify and apply the appropriate techniques to process the data and solve the applications using machine learning techniques

CO4: Apply data analytics principles and techniques of Machine learning to solve real time problems

Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1,PO2,**
CO2	**PO1,PO2,PO4,PO8**
CO3	**PO1,PO2,PO4,PO5,PO8,PO10,PO11**
CO4	**PO1,PO2,PO4,PO5,PO8,PO10,PO11**

V SEMESTER

BIG DATA ANALYTICS

Course code:				**18MCA52**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**		**Tutorial (T):**		**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **To impart fundamental concepts about big data and its identification.**
- **To analyse the design of Hadoop Distributed Files system.**
- **To understand and analyse Map Reduce technique for solving Big Data problems**
- **To analyse different hadoop related tools like Pig & Hive**

MODULES	**TEACHING HOURS**
MODULE 1: Big Data & Hadoop Eco system	**8 Hrs**
Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , types of Data Sources, Sampling, Types of data elements, data explorations, exploratory statistical analysis, missing values, outlier detection and Treatment, cloud and Big Data –Predictive Analytics. A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response.	
MODULE 2: The Hadoop Distributed File system	**8 Hrs**
The Hadoop Distributed File system The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command Line Interface, Basic File system Operations, Hadoop File systems Interfaces ,The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow Anatomy of a File Read ,Anatomy of a File Write	
MODULE 3: Map Reduce	**8 Hrs**
A Weather Dataset ,Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Working of Map Reduce - Anatomy of a Map Reduce Job Run, Failures, Shuffle and Sort, Task Execution, Map Reduce Formats - Input Formats, Output Formats	
MODULE 4: Hadoop Tool-Pig	**8 Hrs**
Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts, **Pig Latin** – Structure, Statements, Expressions, Types, Schemas, Functions, Macros,User-Defined Functions – A Filter UDF, An Eval UDF, A Load UDF.DataProcessing Operators – Loading and storing of data, Filtering data,	

Groupingand Joining data, Sorting data	
MODULE 5: Hadoop Tool-Hive	**7 Hrs**
Installing Hive – The Hive shell,Hive – Architecture, data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries. Tables – Managed Tables and External Tables, Partitions and Buckets, Importing Data,Querying Data – Sorting and Aggregating,Storage Formats, Joins, Sub queries, Views.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Bart Baesens, " Analytics in a Big Data World : The Essential Guide to Data Science and its Applications" Wiley
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
4. Alan Gates, "Programming Pig", O'Reilley, 2011

Reference Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.

COURSE OUTCOMES (CO)

CO1: Explain the fundamentals of big data analytical techniques and usage of hadoop tools.

CO2: Analyse Hadoop ecosystem and Map Reduce concept to solve big data problems.

CO3: Design a Map-Reduce model to process the datausing tools for a use case.

CO4: Evaluate the performance of data analytics and visualize the results.

Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1,PO4**
CO2	**PO2,PO4,PO5**
CO3	**PO2,PO3,PO4,PO5,PO7,PO11**
CO4	**PO2,PO3,PO4,PO5,PO7,PO11**

V SEMESTER CLOUD COMPUTING							
Course code:				**18MCA53**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practical (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Introduce the fundamental aspects of cloud computing**
- **Discuss virtualization technologies along with the architectural models of cloud computing.**
- **Leverage the prominent Cloud computing technologies available in the market place.**
- **Demonstrate different features of cloud platforms used in Industry**
- **To understand how energy efficiency achieved in cloud computing using green computing and understand the mechanism needed to harness cloud computing in the respective endeavours**

MODULES	**TEACHING HOURS**
MODULE-1: CLOUD COMPUTING OVERVIEW	**07 Hours**
Cloud Computing Overview, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Architecture, Characteristics and Benefits, Challenges in the cloud, Historical Developments, Distributed Systems, Virtualization, Web 20, Service Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Forcecom and Salesforcecom,	
Module-2: Virtualization	**8 Hours**

Virtualization Introduction, Characteristics of virtualized environments, Increased security, Managed execution, Portability, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples- Xen par virtualization, VMware: full virtualization, Microsoft Hyper-V. Cloud Computing Architecture: Introduction, Reference model- Architecture, Infrastructure- and hardware-as-a-service, Platform as a service, Software asa service, Deployment Model- Public clouds, Private clouds, Hybrid clouds, Community clouds, Open challenges.	
Module-3:CloudManagement	**9 Hours**
Service Level Agreement, Cloud Economics, Managing Data, Introduction to Map Reduce, Open Stack, Resource Management.	
Module-4: Cloud Platforms in Industry	**08 Hours**
Amazon web services: Compute services, Storage services, Communication services, Additional services. Google Cloud, AppEngine: Architecture and core concepts, Application life cycle, Cost model Observations Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance, Observations	
Module-5: Advanced Topics in Cloud Computing	**08Hours**
Green cloud computing , Introduction to Docker Container, Sensor Cloud Computing, IoT Cloud, Fog Computing, Mobile Cloud Computing	
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
Textbooks:	
1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011	
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010	
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010	
Reference Books	
1. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.	
COURSE OUTCOMES (CO)	
CO1: Explain the fundamental principles of cloud computing and its related Concepts.	
CO2: Analyze Prominent Cloud computing technologies available in the marketplace.	
CO3: Apply suitable applications to leverage the strength of cloud computing.	

CO4: Develop the applications of cloud Computing that can harness the power of cloud computing.	
CO5: Explain the fundamental principles of cloud computing and its related Concepts.	
COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:	
Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO1,PO2,PO3,PO4**
CO2	**PO1,PO2,PO3,PO4, PO6**
CO3	**PO1,PO2,PO3,PO4,PO6**
CO4	**PO1,PO2,PO3,PO4**
CO1	**PO1,PO2,PO3,PO4**

V SEMESTER

MACHINE LEARNING USING PYTHON LAB

Course code:				**18MCAL56**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**26**		**SEE Hours:**	**3**
Lecture (L):		**Practical (P):**	**2**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- To understand Pre-processing techniques and perform exploratory data analysis .
- Identify and apply Machine Learning algorithms to solve real world problems
- To develop skills of using recent machine learning software for solving practical problems

Sl.No	Program
1.	Create a Data frame and demonstrate different ways to treat missing values.
2.	Implement Data Wrangling (Merge, Concatenate, Group) and Data Aggregation.
3.	a. Write a python program to read and write data into files (.CSV, .txt, .XLS). b. Perform exploratory data analysis (Head, Tail, Description, etc.) on any dataset.
4.	Implement Linear Regression using Python Script and identify explanatory variables.
5.	Write a program to demonstrate the working of the decision tree.
6.	Implement clustering technique for a given data set in python.
7.	Write a program to implement the naïve Bayesian classifier for a sample training data set stored asa .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test thesame using appropriate data sets.

Note : Student has to pick one question from a lot of 8 questions

COURSE OUTCOMES (CO)

CO1: Implement exploratory data analysis, data visualization and different machine Learning Techniques to solve real world problems in Python.

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO2, PO4, PO5, PO7,PO11**

V SEMESTER
BIG DATA ANALYTICS LAB

Course code:				**18MCAL57**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**26**		**SEE Hours:**	**3**
Lecture (L):	**0**	**Practical (P):**	**2 Hrs**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- To set up single and multi-node Hadoop Clusters.
- To solve Big Data problems using Map Reduce Technique.
- To design algorithms that uses Map Reduce Technique to apply on Unstructured and structured data.
- To implement programming tools PIG and HIVE in Hadoop eco system.

Sl.No	Program
1.	Hadoop Installation.
2.	Installation of VMWare to setup the Hadoop environment and its ecosystems.
3.	a. Implement the following file management tasks in Hadoop: i. Adding files and directories ii. Retrieving files iii. Deleting files
4.	Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
5.	Write a Map Reduce program that mines weather data.
6.	Implement matrix multiplication with Hadoop Map Reduce.
7.	Installation of PIG. Write Pig Latin scripts sort, group, join, project, and filter your data.
8.	a. Run the Pig Latin Scripts to find Word Count b. Run the Pig Latin Scripts to find a max temp for each and every year.
9.	Installation of HIVE. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Note : Student has to pick one question from a lot of 9 questions

COURSE OUTCOMES (CO)

CO1: Apply Hadoop, MapReduce, HDFS and YARN develop big data applications and Explore the working of Pig & Hive and analyse the results.

Course Outcomes(COs)	Mapping with Program Outcomes(POs)
CO1	**PO3,PO4,PO5,PO7,PO11**

V SEMESTER
CLOUD COMPUTING LAB

Course code:				**18MCAL58**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**2**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**26**		**SEE Hours:**	**3**
Lecture (L):		**Practicals (P):**	**2 Hrs**	**Tutorial (T):**	**0**	**Total Credits:**	**1**

COURSE LEARNING OBJECTIVES (CLO)

- To work with Virtualization.
- Explore different Cloud services: Amazon, Google apps and Salesforce and VMware
- Design Virtual Machine using VM player and test Client server application using Virtual Machine.
- Demonstrating IaaS, PaaS and SaaS.

Sl. No	Program
10.	• **Working with Amazon Web Services(AWS)** • Familiarize the services by AWS • Creating user login • Creating Linux, Windows virtual machines instance using EC2 • Run simple applications on EC2 Instance • Creating Storage using S3 • Create a Backup using Image and launch new instance using Backup image • Creating an RDS Instance with MySQL Workbench and Dynamo DB • Demonstrate Database application on AWS • Upgrading and downgrading the infrastructure based on the requirement • Demonstrate Load balancing using different instance of EC2 • Launch a web application. • Demonstration of Identity and Access management.

	• Demonstrate Elastic bean stack • Demonstrate AWS dynamic web application
11.	**SalesforceTrailhead Platform** • Create a web application to enter the students' details like name, USN, semester, section and CGPA to a database on Salesforce cloud platform. • Create a web application to implement an online cart for adding items to a shopping cart and deleting it. • Create a web application to enter the faculty details like faculty ID, faculty name, and salary to a database and calculate the income tax to be paid by the faculty at the end of financial year. • Create a web application to book a flight from a source to destination and store the status of flight, and departure timings on database. • Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. • Develop Department events' registration app with an object containing event name, date/time, venue as parent relationship, another object containing student name, branch, event name, date/time, and venue as child relationship. • Develop Blood donation registration app with an object which records donors' name , age and blood group as parent relationship and another object containing hemoglobin level, donated or not details (if age>18) child relationship. • Develop Attendance maintenance app with an object to record student details, attendance and provide a link to college websites' results webpage. • Create a web application with objects to maintain database of an art gallery which contains objects like artists, arts, and inventory and provide a link to any of the art gallery website.

Course Outcome(CO)

CO1: Demonstrate Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

COURSE OUTCOMES	**MAPPING WITH PROGRAM OUTCOMES:**
CO 1	**PO1,PO2,PO3**

V SEMESTER
ENTERPRISE APPLICATION-2

Course code:				**18MCA541**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **To describe the Fundamentals of .Net framework**
- **To demonstrate Object Oriented Programming concepts using C#**
- **To implement delegates, event handling and exception handling**
- **To develop Web applications using ASP.NET,ADO.NET**

MODULES	TEACHING HOURS
MODULE 1: Getting started with .NET Framework 4.0 and C# Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ. **Introducing C#** Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing andUnBoxing , Variables and Constants . Expression and Operators : Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements	**7 Hrs**
MODULE 2: Namespaces,Classes and Object Oriented Programming Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of assessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.System.Object Class **Encapsulation:** Encapsulation using assessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. **Polymorphism:** Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods.	**8 Hrs**

Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance	
MODULE 3: Delegates, Events, Exception Handling **Delegates:**Creating and using Delegates, Multicasting with Delegates. **Events:** Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. **Exception Handling**: The try/catch/throw/finally statement, Custom Exception. System. Exception, Handling Multiple Exception	**8 Hrs**
MODULE 4: Graphical User Interface with Windows Forms Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.	**8 Hrs**
MODULE 5: Web App Development and Data Access using ADO.NET Introduction to Web Basics, Multitier Application Architecture, First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking.Set up the sample database,Create the forms and add controls,Store the connection string,Retrieve the connection string,Write the code for the forms,Test your application **ASP.NET AJAX :**Exploring AJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, ScriptManager control, Update Panel, UpdateProgress Control, Creating Simple Application using AJAX Server Controls.	**8 Hrs**
Question Paper Pattern: • **Each full question consists of 20 marks.** • **Questions are set covering all the topics under each module**	
TextBooks:	
1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley-Dream Tech Press.	
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education.	
Reference Books	
1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, WileyAppress.	
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.	
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.	
COURSE OUTCOMES (CO)	

CO1: Distinguish the features of C# and client-server concepts using .Net Framework Components.	
CO2: Demonstrate delegates, events and exception handling with ASP, Win Form, ADO.NET.	
CO3: Develop Graphical User Interface for various applications	
CO4: Develop Web based and Console based applications with database connectivity	
COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:	
Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO1,PO2,PO3,PO4,PO5,PO8**
CO2	**PO1,PO2,PO3,PO4**
CO3	**PO1,PO2,PO3,PO4,PO5**
CO4	**PO1,PO2,PO3,PO4,PO5**

V SEMESTER

FULL STACK DEVELOPMENT WITH MERN

Course Code:				**18MCA542**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**3**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **To design as web page using front end technologies**
- **To develop application with server side scripting tools**
- **To develop web application with REST APIs and use of framework to communicate client-server applications.**
- **To build as responsive web application with managing NOSQL databases.**

MODULES	TEACHING HOURS
MODULE 1: Introduction to React	**10 Hrs**
Welcome to React: Obstacles and Roadblocks, React's future, keeping up with the changes, working with the files. The Basics-Introduction, Installation, getting started hello world program, Lifecycle of Components, Understanding Functional & Class Components Passing Data.	
MODULE 2: React Components and Redux	**11 Hrs**
React Props, React state-setting state, Event handling, Designing components-state vs props An Introduction to Redux- Core Concepts, Reducer, Action, Action Creator, Combining Reducers, Store, Data Flow in Redux, Usage with React	
MODULE 3: Programming in Node.js	**11 Hrs**
Node.js Installation –getting started, Control flow, asynchronous pattern callback, Sequential functionality, nested callbacks and exception handling, asynchronous patterns and control flow. Routing Traffic, Serving Files and Middleware: Building a Simple Static File Server from Scratch, Middleware, Routers and Proxies	
MODULE 4: Expressing REST APIs	**10 Hrs**
REST-HTTP Methods as actions, Express-Routing, Handler Functions, The List API-automatic Server Restart, testing, Create API, Error Handling.	
MODULE 5: Module Title	**10 Hrs**

Introduction to MongoDB: -Installation-Databases, Data Types, Using MongoDB Shell. Creating, Updating, Deleting and Querying Documents: Inserting, removing, and updating the documents. Scheme Initialization, Reading and writing to Mongodb.	

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books

1. Tomasz Dyl Kamil Przeorski, "Mastering Full-Stack React Web Development", 2017 Packt Publishing
2. Vasan Subramanian ,"ProMERN Stack",Apress,2018.

Reference Books

1. Eddy Wilson IriarteKoroliova ,"MERN-Full stack Development", Packt Publishing Ltd.,2018
2. ShamaHoque,"Full stack React Projects",Pack Publishing Ltd.,2018.

COURSE OUTCOMES (CO)

CO1: Demonstrate basic concepts of react, node, express and mongodbtechologies

CO2: Design front end application using React and Redux libraries.

CO3: Develop interactive web applications on server side with NOSQL databases.

CO4: Build responsive web application communicating with RES API and managing data with NOSQL databases.

Course Outcomes(Cos)	Mapping with Program Outcomes(POs)
CO1	**PO5,PO11**
CO2	**PO2,PO4,PO5,PO11**
CO3	**PO2,PO4,PO5,PO7,PO11**
CO4	**PO5,PO11**

V SEMESTER DEVOPS							
Subject Code			**18MCA543**		**CIE Marks**		**50**
Number of Lecture Hours/Week			**03**		**SEE Marks**		**50**
Total Number of Lecture Hours			**39**		**SEE Hours**		**03**
Lecture (L):	**03**	**Practical (P):**		**Tutorial (T):**	**-**	**Total Credits:**	**3**

Course Learning objectives(CLO):

- Introduce devopps concepts and architecture of Devopps
- Analyze Building the code and deployment

MODULES	TEACHING HOURS
Module -1 Introduction Introduction to DevOps and Continuous Delivery ,Introducing DevOps, How fast is fast?,The Agile wheel of wheelsBeware the cargo cult Agile fallacy, DevOps and ITIL.The DevOps process and Continuous Delivery – an overview,The developers, The revision control system, The build server, The artifact repository,Package managers, Test environments, Staging/production, Release management, Scrum, Kanban, and the delivery pipeline, Wrapping up – a complete example, Identifying bottlenecks.	**7 Hours**
Module -2 DevOpps Architecture How DevOps Affects Architecture, Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, The principle of cohesion, Coupling, Back to the monolithic scenario, A practical example, Three-tier systems, The presentation tier, The logic tier, The data tier, Handling database migrations, Rolling upgrades, Hello world in Liquibase, The changelog file, The pom.xml file, Manual installation, Microservices, Interlude – Conway's Law, How to keep service interfaces forward compatible, Microservices and the data tier, DevOps, architecture, and resilience.	**8 Hours**
Module – 3 Building the code Why do we build code?, The many faces of build systems, The Jenkins build server, Managing build dependencies, The final artifact, Cheating with FPM, Continuous Integration, Continuous Delivery, Jenkins plugins, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, A look at the Jenkins filesystem layout, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures, About build status visualization, Taking build errors seriously, Robustness.	**7 Hours**

Module -4Deploying the Code Why are there so many deployment systems?Configuring the base OS,Describing clusters, Delivering packages to a ,system,Virtualizationstacks,Executing code on the client ,A note about the exercises, The Puppet master and Puppet agents, Ansible, PalletOps, Deploying with Chef,Deploying with SaltStack,Salt versus Ansible versus Puppet versus PalletOps execution models,Vagrant,Deploying with Docker,Comparisontables,Cloudsolutions,AWS,Azure	**8 Hours**
Module – 5 Issue Tracking What are issue trackers used for?, Some examples of workflows and issues, What do we need from an issue tracker?, Problems with issue tracker proliferation, All the trackers, Bugzilla, Trac, Redmine, The GitLab issue tracker, Jira. Introducing the IoT and DevOps, The future of the IoT according to the market, Machine-to-machine communication, IoT deployment affects software architecture, IoT deployment security, Okay, but what about DevOps and the IoT again?, A hands-on lab with an IoT device for DevOps.	**8 Hours**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

Text Books:

1. The DevOps Hand Book, Gene Kim, Jez Humble, PatricDebois& John Wills

Reference Books:

1. The Practical Guide to Enterprise DevOps and Continuous Delivery, Julian Fish

Course Outcomes(CO):

CO1: Understand Devops.

CO2: Analyze Architecture .

CO3: Apply how to build the code.

CO4: Deploy the code.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	**PO1, PO3**
CO2	**PO1, PO3, PO8**
CO3	**PO1, PO5, PO8**
CO4	**PO1, PO3, PO8, PO10**

SEMESTER-V

WEB SERVICES

Course code				**18MCA551**		**CIE Marks**	**50**
Number of Lecture Hours per week				**4**		**SEE Marks**	**50**
Total number of Lecture Hours				**39**		**SEE Hours**	**3**
Lecture (L):	**4**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **To learn the Principles of Web & Web Services**
- **To learn XML Document in both DTD and XML Schema Language.**
- **To design Web Services and its Infrastructure, Use of SOAP, Building a Web Service, Deploying and Publishing Web Service**
- **To Design Web Services Architecture, UDDI Registry**

MODULES	**TEACHING HOURS**
MODULE 1: Introduction to Web Services	**08 Hrs**
The definition of web services, basic operational model of web services benefits and challenges of using web services,Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in distributed computing role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA)	
MODULE 2: Xml Technology	**07 Hrs**
Role Of XML, XML - Name Spaces - Structuring With Schemas and DTD, Presentation Techniques - Transformation - XML Infrastructure	
MODULE 3: SOAP	**08 Hrs**
Core fundamentals of SOAP – SOAP Messages Structure, SOAP encoding SOAP message exchange models SOAP communication and messaging SOAP security, Developing Web Services using SOAP- Building SOAP Web Services, developing SOAP Web Services using Java, limitations Of SOAP	
MODULE 4: Web Services	**08 Hrs**
Overview - Architecture - Key Technologies - WSDL, ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE. – WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings	
MODULE 5: Discovering Web Services	**08 Hrs**
Service discovery, role of service discovery in a SOA service discovery	

mechanisms, UDDI-UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI registries publishing API Publishing information to a UDDI Registry searching information in UDDI Registry deleting information in a UDDI	

Question Paper Pattern:

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

TextBooks:

1. XML, Web Services and the Data Revolution, Frank. P. Coyle, 2012, Pearson Education.
2. Developing Java Web Services, Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, 2004, Wiley Publishing Inc..

Reference Books

1. Developing Enterprise Web Services, Sandeep Chatterjee, James Webber, 2004, Pearson Education. 2. Java Web Services Architecture, McGovern, et al., 2005, Morgan Kaufmann Publishers

COURSE OUTCOMES (CO)

CO1: To Design Web & Web Services

CO2: To Design the schema for the given XML documents in both DTD and XML Schema languages

CO3: To Building a Web Service, SOAP, Deploying and Publishing Web Service

CO4: Analyze Web Services Architecture, UDDI Registry.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1, PO2, PO5,P10**
CO2	**PO1, PO2**
CO3	**PO1, PO2, PO4, PO5**
CO4	**PO1, PO2, PO5**

V SEMESTER

INTERNET OF THINGS

Course code:				**18MCA552**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Learn the evolution of IOT from M2M to global Context**
- **Understand IoT in managing data and knowledge**
- **Analyze the architecture of IoT and assess its industrial applications**

MODULES	TEACHING HOURS
MODULE 1: Understanding M2M and IoT Introduction: The Vision- From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics	**8 Hrs**
MODULE 2: Introduction to IoT Architecture **A Market Perspective** – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An example for an Industrial Structure **M2M to IoT - An Architectural Overview: B**uilding an architecture, Main design principles and needed capabilities, An IoT architecture outline	**8 Hrs**
MODULE 3: Understanding XaaS Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Knowledge Management	**8 Hrs**
MODULE 4: IoT Reference Architecture Reference Architecture: ITU-T, Reference Models: IoT Domain Model, Information Model, Functional Model, Communication model, Safety, Privacy, Trust, Security Model	**8 Hrs**
MODULE 5: IoT Real time Applications Asset Management, Hazardous Goods Management, Other real time applications	**7 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition,AcademicPress, 2014.

Reference Books

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

COURSE OUTCOMES (CO)

CO1: Study the evolution of IoT towards global context

CO2: Understand the architecture of IoT and the underlying technology

CO3: Analyze the implications of IoT with real time applications

CO4: Apply the state of the art architecture of IoT to be deployed in real time world

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO3, PO5
CO2	PO3, PO5, PO8, PO10
CO3	PO3, PO6, PO8
CO4	PO5, PO6, PO10, PO12

V SEMESTER

BLOCKCHAIN TECHNOLOGY

Course code:				**18MCA553**		**CIE Marks:**	**50**
Number of Lecture Hours per week:				**03**		**SEE Marks:**	**50**
Total number of Lecture Hours:				**39**		**SEE Hours:**	**3 Hrs**
Lecture (L):	**3**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**3**

COURSE LEARNING OBJECTIVES (CLO)

- **Designed to provide the conceptual understanding of the blockchain**
- **Learn the working technology of blockchain**
- **Understand the application scenarios of blockchain**
- **Implement blockchain in Ethereum technology**

MODULES	TEACHING HOURS
MODULE 1: Basis of Blockchain Technology Introduction to Blockchain, growth – Definition – Elements of Blockchain, Tiers, Types, Consensus, Decentralization: Methods of Decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization	**8 Hrs**
MODULE 2: Blockchain Mining Blockchain: The structure of block, The structure of block header, genesis block – Mining: Tasks, Rewards, Proof of Work, Mining Algorithm, Mining Systems: CPU, GPU, FGPA, ASIC- Mining Pools	**8 Hrs**
MODULE 3: Use case - Financial Markets and Smart Contracts Trading, Exchanges, Trade Lifecycle, order anticipators, Market, Manipulation**,** Smart Contracts: Templates, Smart Oracles, Deploying smart contracts in Blockchain	**8 Hrs**
MODULE 4: Generic Use Cases BlockChain as Evidences – Digital Art - BlockChain Health –Blockchain Government	**8 Hrs**
MODULE 5: Technology on Ethereum Ethereum blockchain, Ethereum network: mainnet, testnet, private net, components of Ethereum ecosystem, Ethereum Virtual Machine	**7 Hrs**

Question Paper Pattern:

- **Each full question consists of 20 marks.**
- **Questions are set covering all the topics under each module**

TextBooks

1. Mastering Blockchain, by Imran Bashir, II edition Packt Publications
2. BlockChain: Blueprint for a new economy, by Melanie Swan O'Reilly Publications

Reference Books

1. "BlockChain: A Beginners Guide", Authors: SherminVoshmgir, Valentin Kalinov Publisher: https://blockchainhub.net/
2. "Cryptocurrency and Bitcoin Technologies", Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder published by Princeton University press 2016

COURSE OUTCOMES (CO)

CO1: Understand the structure and underlying technology of blockchain

CO2: Analyze the application scenarios of blockchain

CO3: Apply the blockchain technology to build a blockchain system

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO1	PO1,PO3
CO2	PO3, PO7, PO10
CO3	PO3, PO4, PO5, PO7, PO10

V SEMESTER
INDUSTRY INTERNSHIP

Course code:				**18MCAI59**	**CIE Marks:**		**50**
Number of Lecture Hours per week:				**-**	**SEE Marks:**		**50**
Total number of Lecture Hours:				**-**	**SEE Hours:**		**3**
Lecture (L):	**0**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**05**

Internship - Guidelines

- The students should undergo an internship for 4 weeks during the vacation soon after the 3rd semester SEE.
- The internship shall be carried out in an Industry/R&D labs or at Institution.
- The student should submit the internship report and make the presentation to the internal panel.
- The internal panel will evaluate the internship work for 50 Marks.
- SEE will be conducted for Internship and will be evaluated for 50 Marks

Course Outcomes	
CO1	**Apply domain knowledge in proposing solution for IT problem**
CO2	**Develop/implement the design with appropriate techniques and tools to deliver the solution.**
CO3	**Work in independently or in collaborative environment**
CO4	**Develop communications skills, make presentations and prepare technical document**

VI SEMESTER

TECHNICAL SEMINAR

Course Code				**18MCAS61**		**CIE Marks**	**50**
Number of Practical Hours/Week				**-**		**SEE Marks**	**-**
Total Number of Lecture Hours				**-**		**SEE Hours**	**03**
Lecture (L):	**-**	**Practicals (P):**	-	**Tutorial (T):**	**-**	**Total Credits:**	**2**

Course Learning Objectives:

- Students will present technical seminar by learning new technologies

Technical Seminar

Seminar Guidelines

- Selection of topic/area : Select a paper according to the specialization of students. Papers from any reputed journals or latest technology shall be selected.
- Obtain the approval from the guide for the selected topic.
  Study of topic: Students are informed to acquire a thorough knowledge on the subject by referring back papers and reference books (These may be included as references at the end of the paper) on the corresponding area.
- Preparation of slides for presentation: Slides may be presented in MS power point. Time allowed for presentation is 20 minutes for presentation and 5 minutes for discussions. So, number of slides may be around 20 - 25 to adhere the time limit.

  Organization of slides:

  The first slide will be a title page showing the title, name of student (presenter), USN. and Semester. 2nd page will contain overview of the seminar
- Successive pages will contain

  Objectives of the paper

Introduction,

Body of the paper includes system dynamics, methodology, graphs, block diagrams etc. arranged in a logical sequence depending on the problem.

Results and discussions

Conclusion

- Last page will contain references and bibliography. References must be presented in IEEE format
- Each slide consists of 4 or 5 lines with enough space between lines.
- All equations must be typed using equation editor (available with MS office/other office suite)
- Each slide will have a title and each figure have a caption.

. The internal panel will evaluate the seminar presentation for 50 Marks.

COURSE OUTCOME:

CO1: Students will present a seminar on any new technology or any research topic.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	**PO1,PO4,PO5,PO8,PO11**

VI SEMESTER

PROJECT WORK

Course code:				**18MCAP62**	**CIE Marks:**		**50**
Number of Lecture Hours per week:				**-**	**SEE Marks:**		**200**
Total number of Lecture Hours:				**-**	**SEE Hours:**		**3**
Lecture (L):	**0**	**Practicals (P):**	**0**	**Tutorial (T):**	**0**	**Total Credits:**	**20**

Synopsis

- The Synopsis of the project must be submitted before the third week of 4th semester.
- The synopsis of the project must include:

  a) Problem formulation and literature survey.

  b) Details of the required tools and technologies for the development of project.

  c) Write up shall not exceed 15 pages.
- Internal assessment for synopsis presentation and evaluation of the synopsis by the internal panel /guide is for 100 marks.

Dissertation:

- The project shall be carried out in the same institution or in industry/R&D labs, based on software tools and technologies learnt in MCA course/internship for minimum period of 16 weeks.
- Internal assessment shall be evaluated by the internal panel/guide for **50** marks. For continuous evaluation of project work by the internal examiner/guide with progress reports is for 10 marks each. (3 progress reports x 10 marks= 30)
- Final presentation for the entire project is evaluated for 20 marks by the project Guide.
- The internal examiners (Project Guide with at least 3 years of experience) and the

external examiners shall be appointed by the authorities of the college for the final evaluation of the project.

- Internal and external examiners shall carry out the evaluation of Dissertation report for **100** marks individually. The average of the marks allotted by the internal and external examiners shall be the final marks for the project Dissertation report evaluation.
- The project presentation and Viva-voce examination shall be evaluated jointly by both the internal and external examiners for **100** marks.
- The student shall publish the project outcome in the reputed journals.

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES:

Course Outcomes(COs)	**Mapping with Program Outcomes(POs)**
CO1	**PO1,PO2,PO3,PO4**
CO2	**PO1,PO2,PO3,PO4,PO5,PO7,PO8**
CO3	**PO4,PO5,PO7,PO8,PO10,PO11**
CO4	**PO4,PO5,PO7,PO8,PO9,PO10,PO11,PO12**

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Approved by AICTE, Affiliated to VTU)

Master of Computer Applications

MCA Syllabus (2016 – 2019)

		I Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA11	Data structures using C	4	--	-	4	3	30	70	100
MCA12	Unix Programming	4	--	-	4	3	30	70	100
MCA13	Web Technologies	4	--	-	4	3	30	70	100
MCA14	Computer Organization	4	--	-	4	3	30	70	100
MCA15	Discrete Mathematical Structures	4	--	-	4	3	30	70	100
MCAL16	Data structures using C Lab	--		1.5	1.5	3	50	50	100
MCAL17	Unix Programming Lab	--		1.5	1.5	3	50	50	100
MCAL18	Web Programming Lab	--		2	2	3	50	50	100
Total		20	-	5	25	24	300	500	800

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		II Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA21	Python Programming	4	--	-	4	3	30	70	100
MCA22	Object oriented programming using C++	4	--	-	4	3	30	70	100
MCA23	Database Management Systems	4	--	-	4	3	30	70	100
MCA24	Operating Systems	4	--	-	4	3	30	70	100
MCA25	Professional Communication & Ethics	4	--	-	4	3	30	70	100
MCAL26	Python Programming Lab	--		1.5	1.5	3	50	50	100
MCAL27	Object oriented programming using C++ lab	--		1.5	1.5	3	50	50	100
MCAL28	DBMS Lab	--		2	2	4	50	50	100
Total		20	-	5	25	24	300	500	800

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		III Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Seminar	Practicals	Total Credits		CIE	SEE	
MCA31	Computer Networks	4	--	-	4	3	30	70	100
MCA32	Java Programming	4	--	-	4	3	30	70	100
MCA33	Analysis and Design of Algorithms	4	--	-	4	3	30	70	100
MCA34	Software Engineering	4	--	-	4	3	30	70	100
MCA35	Elective -1	4	--	-	4	3	30	70	100
MCAL36	Computer Networks Lab	--		2	2	4	50	50	100
MCAL37	Java Programming Lab	--		1.5	1.5	3	50	50	100
MCAL38	Analysis and Design of Algorithms Lab	--		1.5	1.5	3	50	50	100
Total		20	-	5	25	24	300	500	800

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ELECTIVE-1	
MCA351	**Intellectual Property Rights**
MCA352	**Data Analysis using Spread Sheets**
MCA353	**Operations Research**
MCA354	**Principles of User Interface Design**

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Subject Code	Name of the Subject	IV Semester							
		Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA41	Advanced Java Programming	4	--	-	4	3	30	70	100
MCA42	Software Testing and Practices	4	--	-	4	3	30	70	100
MCA43	Advanced Web Programming	4	--	-	4	3	30	70	100
MCA44	Elective-2	4	--	-	4	3	30	70	100
MCA45	Management Elective-3	4	--	-	4	3	30	70	100
MCAL46	Advanced Java Programming Lab	--		2	2	3	50	50	100
MCAL47	Software Testing Lab	--		1.5	1.5	3	50	50	100
MCAL48	Web based Mini Project-1	--		1.5	1.5	3	50	50	100
Total		20	-	5	25	24	300	500	800

ELECTIVE—2		MANAGEMENT ELECTIVE-3	
MCA441	Data Warehousing & Mining	MCA451	Software Project Management
MCA442	Artificial Intelligence	MCA452	Supply Chain Management
MCA443	Software Architecture	MCA453	Enterprise Resource Planning
MCA444	Machine Learning	MCA454	E-commerce and Management Information System

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		V Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA51	Object-Oriented Modeling and Design Patterns	4	--	-	4	3	30	70	100
MCA52	Programming Using C# & .NET	4	--	-	4	3	30	70	100
MCA53	Mobile Applications	4	--	-	4	3	30	70	100
MCA54	Elective-4	4	--	-	4	3	30	70	100
MCA55	Elective-5	4	--	-	4	3	30	70	100
MCAL56	Software Design Laboratory	--		1.5	1.5	3	50	50	100
MCAL57	.Net Laboratory	--		1.5	1.5	3	50	50	100
MCAL58	Mini Project : (Mobile Applications Development using Android/iOS/Windows etc.,)	--		2	2	3	50	50	100
	Total	20	-	5	25	24	300	500	800

ELECTIVE-4		ELECTIVE-5	
MCA541	Cloud Computing	MCA551	Storage Area Networks
MCA542	Web Engineering	MCA552	Mobile and Adhoc Networks
MCA543	Service Oriented Architecture	MCA553	Cyber Security
MCA544	Internet of things	MCA554	Big Data Analytics
MCA545	System Simulation & Modelling	MCA555	Software Defined Networks

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VI Semester

Subject Code	Name of the Subject	Internal	External	Dissertation Evaluation	Viva	Total Marks	Credits
MCA61	Research Methodology	30	70	-		100	2
MCAI62	Internship & Seminar	100	-			100	3
MCAP63	Project Work	50	-	150	100	300	20
Total		180	70	150	100	500	25
Grand Total (I to VI Semesters): 4500 Marks : 150 Credits							

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Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications Program

Accredited by National Board of Accreditation

MCA I and II Semester Syllabus

(2016 – 2019)

Data Structures Using C SEMESTER – I			
Subject Code	**MCA11**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**
CREDITS – 4:0:0			

Course Objectives:
The objectives of the course are to :

- To understand the basic features of C language
- Learn about memory representation of various data structures.
- Understand the difference between static and dynamic memory allocations is understood with different data structures.
- Understand the basic operations and implementation of different data structures – Stacks, queues, linked list and binary trees.
- Learn basic searching and sorting techniques.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Overview of C Input and output statements – scanf, getchar, gets, printf, putchar, puts; Control Statements – if, else-if, switch, Control Structures – while, for, do-while, break and continue, goto.***Functions***: Categories of functions, Call by Value, Call by reference. ***Arrays:*** Definition, Representation, Single dimension, Two dimensional, Multi-dimensional Arrays, Passing arrays to functions, passing strings to functions	

Module -2	**10 Hours**
Pointers, Pointer Expression, Pointer as function arguments, Functions returning pointers, Pointers to functions, ***Structures*****:** Declaring and using structure types, ADT, Array as ADT, Operations - Insert, Delete, Search, Sort, ***String*** Definition, Representation, String as ADT, Operations – Insert, Delete, Concatenate, Comparing, Substring.	
Module -3	**10 Hours**
Classification of Data Structures: Primitive and Non- Primitive, Linear and Nonlinear; Data structure Operations, ***Stack:*** Definition, Representation, Stack as ADT, Operations and Applications: Polish and reverse polish expressions, Infix to postfix conversion, evaluation of postfix expression, infix to prefix, postfix to infix conversion; Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi ***Queue:*** Definition, Representation, Queue as ADT, Operations, Queue Variants: Circular Queue, Priority Queue, Double Ended Queue; Applications of Queues. Programming Examples.	
Module -4	**10 Hours**
Linked List: Limitations of array implementation, Memory Management: Static (Stack) and Dynamic (Heap) Memory Allocation, Memory management functions. Definition, Representation, Operations: getnode() and Freenode() operations, Types: **Singly Linked List**. Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Example of list operations such as insert and delete an element before a key element, Header nodes, Array implementation of lists.: **Circular Linked List**: Inserting, deleting and searching elements in a lists, **Double Linked List**: Inserting and Deleting Nodes, Queue as doubly linked lists, such as insert into position, Delete an specified element. **Application of Linked Lists**: Stacks, Queues, Double-ended Queues, Priority Queues, Sparse Matrix and Polynomials using Lists, Trees, BST.	
Module -5	**10 Hours**
Trees**:** Definitions, Terminologies, Array and linked Representation of Binary Trees, Types- Complete/full, Almost Complete, Strictly, Skewed; Traversal methods - Inorder, postorder, preorder; Binary Search Trees - Creation, Insertion, Deletion, Traversal, Searching. ***Sorting & Searching***: Bubble sort, Insertion Sort, Selection sort, Quick sort, Linear Search, Binary Search and BST. ***Hashing***: The Hash Table organizations, Hashing Functions, Static and Dynamic	

Hashing, Collision-Resolution Techniques, Programming Examples.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

1. **Programming in ANSI C, Balaguruswamy,** McGraw Hill Education
2. **Data Structures Using C and C++** by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.
3. **Introduction to Data Structure and Algorithms with C++** by Glenn W. Rowe

Reference Books:

1. **Principles of Data Structures using C & C++** by Vinu V. Das, New Age International, 2006
2. **Data Structures Using C , Balaguruswamy:,** McGraw Hill Education

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understand basics of C programming language

CO2: Acquire knowledge of

- Various types of data structures, operations and algorithms
- Sorting and searching operations

CO3: Analyze the performance of

- Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques

CO4: Implement all the applications of Data structures in a high-level language

CO5: Design and apply appropriate data structures for solving computing problems.

Course Outcomes(CO)	Mapping with Program Outcomes(PO)
CO 1	PO1
CO2	PO1, PO2
CO3	PO2, PO3
CO4	PO2, PO3
CO5	PO2, PO3

UNIX Programming

SEMESTER – I

Subject Code	**MCA12**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives :

- Describe the architecture of Unix Operating System (OS).
- Demonstrate and analyse the Unix commands usage.
- Use Unix utilities to create simple tools for information processing.
- Illustrate the power of Unix shell by writing shell scripts.
- Explain and analyse the process concepts in Unix OS.
- Illustrate the power of Report generation using sed and awk

Modules	**Teaching Hours**
Module -1	**10 Hours**
IntroductionofUNIX and Shell: Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts.	
Module -2	**10 Hours**
UNIX File System: The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, The UNIX file system. Basic File Attributes: Is – l, the –d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, user masks, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find	

Module -3	**10 Hours**
Simple Filters: Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression : grep&sedgrep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the –f option, Substitution, Prosperities of Regular Expressions Context addressing, writing selected lines to a file, the –f option, Substitution, Properties of Regular Expressions.	
Module -4	**10 Hours**
Awk and Advanced Shell Programming: Awk-Advanced Filters: Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, get line, Built-in variables, Arrays, Functions, Interface with the Shell, Control Flow. The sh command, export, cd, the Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement and Examples	
Module -5	**10 Hours**
Process and System Administration: Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, PWD, Aliases, Command History, On-line Command Editing. Advanced System Administration: Case Study: emacs editor and any one distribution of Linux.	
Question paper pattern: • The question paper will have five questions. All questions are compulsory. Module 1 and 3 shall have internal choice. • Each full question consists of 20 marks. • Questions are set covering all the topics under a each module.	

Text Books:

1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGrawHill,

Reference Books:

1. "Unix Shell Programming", YashwantKanetkar,
2. "Beginning Shell Scripting", Eric Foster-Johnson, JohnCWelch, MicahAnderson, Wroxpublication.
3. UNIX: Concepts and Applications, Sumitabha Das, Tata McGrawHill,
4. "Introduction to UNIX" by M.G.Venkatesh Murthy.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understand and experience the UNIX environment, File system and hierarchy.
CO2: Understand File system and Demonstrate commands to extract, interpret data for further processing.
CO3: Understand Filters and Regular Expressions.
CO4: Analyze the usage of different shell commands, variables and AWK filtering.
CO5: Interpret and manipulate process attributes and System administrations

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2
CO 2	PO1, PO2
CO 3	PO1, PO2
CO 4	PO1, PO2
CO 5	PO1

Web Technologies

SEMESTER – I

Subject Code	**MCA13**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives (CLO):

- Learn the underlying principles, methods and approaches of Web technologies.
- Understand XHTML tags and CSS style sheets.
- Understand Java script and different event handlers in javascript.
- Learn dynamic document using javascript and XML
- Learn basic pearl programming.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Web Fundamentals Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox. Evolution of the Web, Peak into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web Search Engines, Application Servers	
Module -2	**10 Hours**
Introduction to XHTML and CSS Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML. **Cascading Style Sheets:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.	
Module -3	**10 Hours**
The basics of JavaScript Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and	

expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts**,** **JavaScript and XHTML Documents** The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model, The navigator Object, Dom Tree Traversal and Modification.	
Module -4	**10 Hours**
Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements **Introduction to XML** Introduction, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.	
Module -5	**10 Hours**
Perl and CGI Programming Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. **Using Perl for CGI Programming**: The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 2 and module 4 will have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

1. Robert W.Sebesta : Programming the World Wide Web, 4thEdition, Pearson education, 2012. **(Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9)**
2. M.Srinivasan: Web Programming Building Internet Applications, 3rdEdition, WileyIndia, 2009**. (Chapter 1)**

Reference Books:

1. Jeffrey C.Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7th Impression, 2012.
2. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
3. Internet Technology and Web Design, Instructional Software Research and Development(ISRD) Group, TataMcGrawHill,2011 Raj Kamal : Internet and Web Technologies, McGraw Hill Education

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understand the fundamentals of web and thereby develop web applications using various development languages and tools.
CO2: Develop web applications using XHTML and CSS.
CO3: Use Scripting language utilities, develop XHTML web page using events.
CO4: Develop a dynamic document using Java script anddisplays documents using XML with CSS and XSLT.
CO5: Understand the basic concepts of Perl and develop CGI applications using PERL.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO2
CO 3	PO4
CO 4	PO7, PO11,PO12
CO 5	PO11,PO12

Computer Organization

SEMESTER – I

Subject Code	**MCA14**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives

- To understand the design of Digital Logic System.
- To study the fundamental working of functional units of a computer
- .To study the design of instructions in a basic system
- To study the design of I/O devices and interfaces.
- To study the functionalities of hierarchical memory system

Modules	**Teaching Hours**
Module -1	**10 Hours**
Binary Systems and Combinational Logic Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion ,Octal and Hexadecimal Numbers, subtraction using r's andr-1 complements, Binary Code, Binary Storage and Registers ,Binary Logic, Integrated Circuits. Axiomatic Definition of Boolean Algebra ,Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, The map Method, Two–and Three–Variable Maps, Four–Variables Map	
Module -2	**10 Hours**
Arithmetic Circuits and Sequential Logic NAND and NOR Implementation, Other Two-level Implementations, Don't Care Conditions. Introduction, Adders, Subtractors, Binary Parallel Adder, Decimal Adder , Magnitude Comparator, Decoders, Multiplexers, Sequential Logic: Introduction, different types of Flip–Flops, Triggering of Flip-Flops ,Registers ,Shift Registers, Ripple counter.	
Module -3	**10 Hours**
Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multi computers, Introduction to Assemblers and Compilers. Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes	
Module -4	**10 Hours**
Assembly Language and Input /Output Organization Basics of Assembly Language Program, Examples from Assembly	

Language Programming. Accessing I/ O Devices, Interrupts, DMA, Buses.	
Module -5	**10 Hours**
The Memory System Basic Concepts, Semiconductor RAM Memories, Read–Only Memories, Speed, Size, and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 1 and 2 shall have internal choice
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

1. M.Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.
2. Carl Hamacher, ZvonkoVranesicSafwatZaky, "Computer Organization", 5thedition, TataMcGraw-Hill, 2011

Reference Books:

1. JohnP.Hayes, "Computer Architecture and Organization", Tata McGraw-Hill, Edition, 2012.
2. SoumitrsKumarMandal,"Digital Electronics Principles and Applications", Tata McGraw-Hill, 2010
3. Hamacher , " Computer Organization" , McGraw-Hill Education

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understand and apply the concepts in the design of a logic system
CO2:. Understand the Basics of Computer system organization
CO3: Understand and implement the addressing modes and instruction set.
CO4: Acquire knowledge on I/O interfaces.
CO5: Acquire knowledge on memory hirarchy

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1,PO2
CO 3	PO2
CO 4	PO2
CO 5	PO2

Discrete Mathematical Structures SEMESTER – I			
Subject Code	**MCA15**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**
CREDITS – 4:0:0			

course objectives:

- Derive logical implications and equivalences using laws of logic, use of quantifiers and different ways of proving a given statement.
- Apply the concept of set theory and Compute zero-one matrix, composition of relations, draw Hasse diagram for partial ordering and lattice.
- Identify the different types of function and calculate composition and inverse of functions.
- Apply the basic principles of counting to solve the ordered and unordered of different objects.
- Apply axioms of probability and derive independent and dependent probability.
- Identify types of graph, outline properties of graphs, and apply to some practical problems like traveling sales man problem.
- Describe how to color the vertices/ edges of a graph, apply graph coloring in map coloring,

Modules	**Teaching Hours**
Module -1	**10 Hours**
Logic: Propositional logic, equivalences, predicates and quantifiers, rules of inference, introduction to proofs, proof methods.	
Module -2	**10 Hours**
Sets and Relations: Sets, set operations, Relations, equivalence relations and partial ordering.	
Module -3	**10 Hours**
Counting and Functions: Basics of counting, Functions, the pigeonhole principle, permutations and combinations, Binomial Co-efficients.	
Module -4	**10 Hours**
Probability: Introduction to probability, axioms of probability, independence and conditional probability, inclusion-exclusion principle. recurrence relations	
Module -5	**10 Hours**
Graph Theory:	

Graphs, terminology and special types of graphs, representation of graphs, isomorphism, connectivity, Euler and Hamiltonian paths, shortest path problems, planar graphs, graph coloring.	

Question paper pattern:

- The question paper will have five questions. Module 2 and 3 will have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

1. Discrete Mathematics and its Applications by Kenneth H Rosen, 7th edition, (Indian adaptation by Kamala Krithivasan), Tata McGraw Hill, 2011.
2. Discrete and Combinatorial Mathematics: An Applied Introduction by Ralph P. Grimaldi and B V Ramana (Indian corrupted adaptation), 5th edition, Pearson, 2011.

Reference Books:

1. Graph Theory with Applications to Engineering and Computer Science by NarsinghDeo, Prentice Hall India, 2004.
2. Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R. Manohar, McGraw Hill.

Note: Unit IV to be covered from Text Book 2.

Module I: T1: 1.1 – 1.3, 1.5,1.6

Module II: T1: 7.1, 7.5, 7.6

Module III: T1:5.1 – 5.4, 2.1- 2.3,6.1, 6.2

Module IV: T2: 3.4 – 3.6, T1: 6.5

Module V: T1: 8.1 – 8.8

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Use the logical notation to define and reason about proofs and disproof's.

CO2: Use the fundamental mathematical concepts such as sets, relations, and integers functions, **C03:** Calculate numbers of possible outcomes of elementary combinatorial processes such as permutations and combinations.

CO4: Calculate probabilities and conditional probabilities.

CO5: Apply graph theory models of data structures and state machines to solve

problems of

connectivity and constraint satisfaction, for example, scheduling.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO1,PO2
CO 3	PO1,PO2
CO 4	PO1,PO2
CO 5	PO1,PO2

DATA STRUCTURES USING C LAB

SEMESTER-I

Subject Code	**MCAL16**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

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COURSE OBJECTIVESS:

- To understand the utilization of memory in a efficient and effective manner
- Develop skills to design and analyze data structures such as Lists, Stacks, Queues, Trees
- Build capability to identify and apply the suitable data structure for a given real world problem
- Appreciate the practical applications of data structures

Laboratory Experiments:

1. Write a menu driven Program in C for the following **Array operations**
   a. Creating an Array of **N** Integer Elements
   b. Display the Array Elements
   c. Inserting an Element at a given valid Position
   d. Deleting an Element at a given valid Position
   e. Exit.
2. Write a C program to Implement the following **searching techniques**
   a. Linear Search
   b.Binary Search
3. Write a C program to implement the following **sorting** algorithms using user defined functions:
   a.Bubble sort (Ascending order)
   b. Selection sort (Descending order)
4. Write a Program in C for the following **String operations** (without using built-in functions)
   a. Read a main String (**STR),** a Pattern String (**PAT**) and a Replace String (**REP**)
   b. Perform Pattern Matching Operation: Find and Replace all occurrences of **PAT** in **STR** with **REP** if **PAT** exists in **STR.** Report suitable messages in case **PAT** does not exist in**STR** Support the program with functions for each of the above operations.
5. Write a C Program to create a class called STACK to store Integers for the following operations (**Array Implementation of Stack** with maximum size **MAX**)
   a. ***Push*** an Element on to Stack
   b. ***Pop*** an Element from Stack
   c. Demonstrate ***Overflow*** and ***Underflow*** situations on Stack
   d. Display the status of Stack
   e. Exit
6. Implement a Program in C for converting an **Infix Expression to Postfix Expression**.
7. Implement a Program in C for evaluating an **Postfix Expression**.

8. Write a C program to implement the following using **recursion**
   a. Sum of n numbers
   b. Generate Fibonacci sequence
   c. Solve Towers of Hanoi Problem

9. Implement a menu driven Program in C for the following operations on **Circular QUEUE** of Integers (Array Implementation of Queue with maximum size **MAX**)
   a. Insert an Element on to Circular QUEUE
   b. Delete an Element from Circular QUEUE
   c. Display the status of Circular QUEUE
   d. Exit

10. Write a C Program to create STACK to store Integers for the following operations (**Pointer Implementation of Stack**)
   a. Pushan Element on to Stack
   b. Popan Element from Stack
   c. Displaythe elements of the Stack
   d. Exit

11. Implement a menu driven Program in C for the following operations on **Singly Linked List (SLL)** of Student Data with the fields: ***USN, Name, Branch, Sem***
   a. Create a **SLL** of **N** Students Data.
   b. Display the status of **SLL** and count the number of nodes.
   c. Perform Insertion at the beginning of **SLL.**
   d. Perform Deletion at the beginning of **SLL.**
   e. Exit.

12. Write a program to Simulate the working of a **Singly circular linked list** providing the following operations
   a. Insert at the beginning.
   b. Delete from the beginning
   c. Display all the elements
   d. Exit

13. Write a C Program using **Doubly Linked List** to Implement ordered list.

14. Implement a menu driven Program in C for the following operations on **Binary Tree** of Integers
   a. Create a BST of **N** Integers
   b. Traverse the BST in Inorder, Preorder and Post Order
   c. Search the BST for a given element and report the appropriate message
   d. Delete an element from BST
   e. Exit

Note 1: In the practical Examination each student has to pick one question from a lot of all14questions.

Course Outcomes(CO):

This laboratory course enable students to get practical experience in design, develop, implement, analyze and evaluation/testing of

*CO1:*Student will be ableto apply data structure concepts to develop interactive applications in C.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2

UNIX Programming Lab

SEMESTER-I

Laboratory Code	**MCAL17**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

CREDITS – 0:0:1.5

Course Objectives:

- Familiarize the Unix environment
- Learn to work on Vi-editor
- Understand basic commands
- Apply commands and to write the shell scripts
- Understand the Filters and to use the basic filters
- Illustrate the file system concepts and to apply them in programs
- Learn the system management
- Distinguish between basic and advanced filters

Laboratory Experiments:

A. Explore the UNIX environment.

B. Explore vi editor with vim tutor .Perform the following operations using vi editor, but not limited to:

1. Insert character, delete character, replace character
2. Save the file and continue working
3. save the file and exit the editor
4. quit the editor
5. quit without saving the file
6. rename a file
7. insert lines, delete lines,
8. setline numbers
9. search for a pattern
10. move forward and backward

1a. Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.

1b. Write a shell script that accepts a pathname and creates all the components in that pathname as directories. For example, if the script is named mpc,thenthe command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.

2a.Write a shell script that accepts two filenames as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output eachfilename followed by its permissions.

2b.Write a shell script which accepts valid log-in names as arguments and

prints their corresponding home directories, if no arguments are specified, print a suitable error message.

3a. Create a script file called file-properties that reads a filename entered and outputs it Properties

3b. Write shell script to implement terminal locking (similar to the lock command).It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it mus lock the keyword until a matching password is entered again by the user, Note that the script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.

4a. Write a shell script that accept one or more file names as argument and convert all of them to uppercase, provided they exist in current directory.

4b. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.

5a. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.

5b. Write a shell script to display the calendar for current month with current date replaced by
*or** depending on whether the date has one digit or two digits

6a. Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory
~/mydir.

6b. Write a shell script to list all the files in a directory whose filename is atleast10 characters.(use expr command to check the length)

7a. Write a shell script that gets executed displays the message either “Good Morning” or “Good Afternoon” or “Good Evening” depending upon time at which the user logs in.

7b. Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.

8a. Write a shell script that determine the period for which a specified user is working on system and display appropriate message.

8b. Write as hell script that reports the logging in of a specified user with in one minute after he/she login. The script automatically terminate if specified user does not login during a specified period of time.

9a. Write a shell script that accept the filename, starting and ending line number as an argument and display all the lines between the given line number.

9b. Write a shell script that folds long lines into 40columns.Thus any line that exceeds 40characters must be broken after 40^{th},a“\” is to be appended as the indication of folding and the processing is to be continued with the residue.

The input is to be supplied through at extfile created by the user.

10a. Write an awk script that accepts date argument in the form of dd-mm-yyand displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.

10b. Write an awkscript to delete duplicated line from a text file. The order of the original lines must remain unchanged.

11a. Write an awkscript to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below.

Electrical	34
Mechanical	67
Electrical	80
ComputerScience	43
Mechanical	65
Civil	98
ComputerScience	64

11b. Write an awkscript to compute gross salary of an employee accordingly to rule given below.

Ifbasicsalary is<10000 then HRA=15% of basic &DA=45% of basic If basicsalaryis>=10000 then HRA=20% of basic & DA=50% of basic.

Note 1: In the practical Examination each student has to pick one question from a lot of all1-11 questions.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Students will be able to implement shell and awk scripts.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2

Web Programming Lab

SEMESTER-I

Laboratory Code	**MCAL18**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

CREDITS – 0:0:2

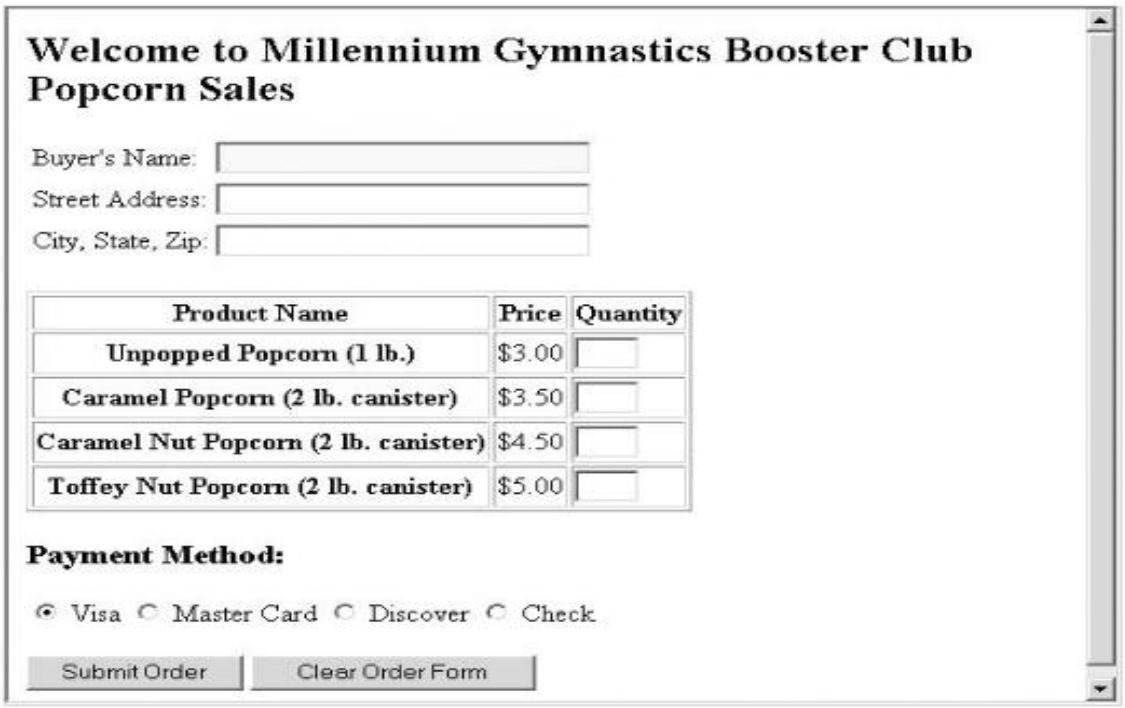
Course Objectives :

- Describe the design principles and techniques of web site design
- Provide the knowledge and skills to build websites using recent tools and technologies

Laboratory Experiments:

1. Create an XHTML page that provides information about your department. Your XHTML page must use the following tags:
   a. Text Formatting tags
   b. Horizontal rule
   c. Meta element
   d. Links
   e. Images
   f. Tables
   (If needed use additional tags).
2. Develop and demonstrate the usage of inline, external and internal style sheet using CSS. Use XHTML page that contains at least three paragraphs of text, listed elements and a table with four rows and four columns.
3. Create a XHTML document that describes the form for taking orders for popcorn. Text boxes are used at the top of the form to collect the buyer's name and address. These are placed in a borderless table to force the text box align vertically. A second table to collect actual order. Each row of this table names a product, displays the price, and uses text box with size 2 to collect the quantity ordered using <td> tag. The payment method is input by the user through one of four radio buttons. Provide provision for submission of order and clear the order form.

   Sample output form



Welcome to Millennium Gymnastics Booster Club
Popcorn Sales

Buyer's Name:
Street Address:
City, State, Zip:

Product Name	Price	Quantity
Unpopped Popcorn (1 lb.)	$3.00	
Caramel Popcorn (2 lb. canister)	$3.50	
Caramel Nut Popcorn (2 lb. canister)	$4.50	
Toffey Nut Popcorn (2 lb. canister)	$5.00	

Payment Method:

Visa Master Card Discover Check

Submit Order Clear Order Form

4. Write a JavaScript program to generate n number of random numbers and store them in an array. Sort the generated numbers in ascending order using array sort method. Develop separate functions to find mean and median of numbers that are in the array. Display the results with appropriate messages.

5. Develop, test and validate an XHTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each) along with submit button. Each checkboxes should have its own ***onclick*** event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the ***submit*** button must produce an alert window with the message '***your total cost is $xxx'***, where xxx is the total cost of the chose fruit, including 5 percent sales tax. This handler must return 'false' (to avoid actual submission of the form data).

   Modify the document to accept quantity for each item using textboxes.

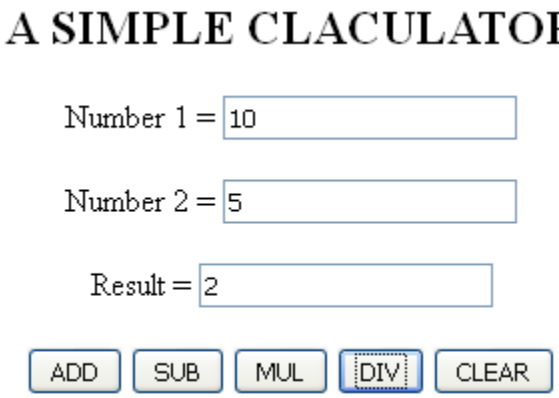
6. a) Develop and demonstrate, a XHTML document that collects the USN(the valid format is : A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by three upper-case characters followed by two digits; (no embedded spaces are allowed) from the user. Use JavaScript that validate the content of the document. Suitable messages should be display in the alert if errors are detected in the input data. Use CSS and event handlers to make your document good-looking and effective.

   b)Modify the above program to get the current semester also(restricted to be a number from 1 to 6)

7. Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.

   Modify the above document so that when a text is movedfrom the top stacking position, it returns to its original position rather than to the bottom.

8. Develop a simple calculator to perform arithmetic (addition, subtraction, multiplication and division) operations on given two numbers. Use an html tag that allows the user to input two numbers and to display the result of arithmetic operation. Write suitable HTML and JavaScript and CSS to your simple calculator. The following figure show sample document display.



Modify your program to make HTLM document as eye-catching using CSS.

9. a. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b. Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

10. Write a Perl program to process a file which contains English words, where each word is separated from the next word on a line by one space. The file is specified on the command line. The output of your program is a table in which the first column has unique words from the input file and second the second column has the number of times the word appeared in the file; no word can appear twice in the table. Use two arrays to store the table, one for the words and one for the frequency values.

Modify the program to count number of characters, words, and lines in the specified file

11. A file contains lines of employee data, where each line has name:age:deparmentcode:salary. Write a Perl program to generate the following output:
    1. The names of all the employee whose names end with “son”
    2. Percentage of employees under 40 years old
    3. Average salary of employees under 40 years old
    4. An alphabetical list of employees who are under 40 years old and who have salaries more than $40,000.

12. Write a Perl program to accept the Username and display a greeting message randomly chosen from a list of 4 greeting messages.

Modify this Perl program to count the number of visitors visiting this web page and display that number of times each visitor is visited.

13. Write an XHTML document to create a form with the following capabilities:
    a. A text widget to collect the user’s name

b. B four checkboxes, one each for the following items

I. Four 100-watt light bulbs for $2.39

II. Eight 100-watt light bulbs for $4.29

III. Four 100-watt long-life light bulbs for $3.95

IV. Eight 100-watt long-life light bulbs for $7.49

c. A collection of three radio buttons they are labeled as follows:

I. Visa

II. MasterCard

III. Discover

Write a Perl CGI program that computes the total cost of the ordered light bulbs by a customer. The program must inform the buyer of exactly what was ordered in a table.

14. Write a CGI-Perl program to use a cookie to remember the day of the last login from a user and display it when run. Modify this program to return the number of months, days, hours, and minutes since last visit by the current client. Your display should include current visit day, date and time, last visit day, date, and time, & elapsed time.

The sample out is as follows:

User name: XXXXXXXXXXX

Current visit time : Friday 05/08/2016, 9:30:30 AM

Last visit time : Thursday 04/08/2016, 3:20:00 PM

Elapsed time : 18:10:30

Note 1: In the practical Examination each student has to pick one question from a lot of all 14Questions.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Design and implement user interactive dynamic web based applications using XHTML,CSS, JAVA SCRIPT,XML & Perl

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO4

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications Program

Accredited by National Board of Accreditation

MCA II semester Syllabus

(2016 – 2019)

Python Programming

SEMESTER – II

Subject Code	**MCA21**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives:

- To Learn Syntax and Semantics and create Functions in Python.
- To Handle Strings and Files in Python.
- To Understand Lists, Dictionaries in Python.
- To Implement Object Oriented Programming concepts in Python
- To Build GUI applications

Modules	**Teaching Hours**
Module -1	**10 Hours**
Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.	
Module -2	**10 Hours**
A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing Modules , Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods , Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.	
Module -3	**10 Hours**
Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue Reading and Writing	

Module -4	**10 Hours**
Files: Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections.	
Module -5	**10 Hours**
Collection of New Information Object-Oriented Programming : Understanding a Problem Domain , Function "Isinstance," Class Object, and Class Book , Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods ,Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module.

Text Books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015

Reference Books:

1. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
2. Exploring Python, Timothy A. Budd, McGraw Hill Education
3. Python for Informatics: Exploring Information, Charles Severance.
4. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication

Course Outcome (CO): At the end of this course, the students will be able to

CO1**:** Understand and comprehend the basics of python programming.
CO2: Understand and implement modular approach using python
CO3: Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc
CO4: Understands about files and its applications.
CO5: Develop real-world applications using oops, files and exception handling provided by python

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2, PO3, PO4, PO12
CO 2	PO1, PO2, PO3, PO12
CO 3	PO1,PO2,PO3, PO4, PO9
CO 4	PO1,PO2,PO3, PO9
CO 5	PO1, PO2,PO3,PO4, PO5, PO10, PO12

Object Oriented Programming Using C++

SEMESTER – II

Subject Code	**MCA22**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives :

- Provide in-depth coverage of object-oriented programming concepts and techniques using C++.
- Introduce the following topics such as classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, templates.
- To demonstrate polymorphism of different operators which can be used based on the context of the program.
- To overcome the drawbacks of structured programming by introducing inheritance Concept which reduce the code complexity and increases the code reusability.
- To achieve code optimization using Generic functions and classes.
- To demonstrate compile time and run time exceptions, to handle abnormal program termination. These exceptions can be handled by the programmer using exception handling mechanisms.
- Apply the standard template libraries for implementing stack, queue and list.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Overview of C++: The Origins of C++ ,What Is Object-Oriented Programming? ,Encapsulation ,Polymorphism , Inheritance. Some C++ Fundamentals ,A Sample C++ Program ,A Closer Look at the I/O Operators, Declaring Local Variables ,No Default to int, The bool Data Type , Old-Style vs. Modern C++ , The New C++ Headers , Namespaces, Working with an Old Compiler, Introducing C++ Classes, Function Overloading, Operator Overloading ,Inheritance Constructors and Destructors ,The C++ Keywords, The General Form of a C++ Program. **Classes and Objects:** Classes, Structures and Classes Are Related, Unions and Classes Are Related , Anonymous Unions, Friend Functions, Friend Classes, Inline Functions, Defining Inline Functions Within a Class Parameterized Constructors,	

Constructors with One Parameter: A Static Class Members ,Static Data Members ,Static Member Functions ,When Constructors and Destructors Are Executed ,The Scope Resolution Operator, Nested Classes, Local Classes, Passing Objects to Functions ,Returning Objects ,Object Assignment.	
Module -2	**10 Hours**
Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Creating Initialized vs. Uninitialized Arrays , Pointers to Objects, Type Checking C++ Pointers , The this Pointer, Pointers to Derived Types , Pointers to Class Members , References, Reference Parameters, Passing References to Objects, Returning References, Independent References, References to Derived Types, Restrictions to References, A Matter of Style , C++'s Dynamic Allocation Operators ,Initializing Allocated Memory ,Allocating Arrays ,Allocating Objects, **Function Overloading, Copy Constructors and Default Arguments:** Function Overloading, Overloading Constructors, Overloading a Constructor to Gain Flexibility, Allowing Both Initialized and Uninitialized Objects Copy Constructors, Function Overloading and Ambiguity.	
Module -3	**10 Hours**
Operator Overloading: Creating a Member Operator Function, Creating Prefix and Postfix Forms, of the Increment and decrement Operators , Overloading the Shorthand Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function, Using a Friend to Overload ++ or – –, Friend Operator Functions Add Flexibility , Overloading new and delete, Overloading new and delete for Arrays, Overloading the nothrow Version of new and delete, Overloading Some Special Operators, Overloading [ ] , Overloading ( ), Overloading –>, Overloading the Comma Operator. **Inheritances:** Base-Class Access Control, Inheritance and protected Members, Protected Base-Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors, and Inheritance, When Constructors and Destructors Are Executed , Passing Parameters to Base-Class Constructors, Granting Access, Virtual Base Classes.	
Module -4	**10 Hours**
Virtual Functions and Polymorphism: Virtual Functions, Calling a Virtual Function Through a Base, Class Reference, The Virtual Attribute Is Inherited, Virtual Functions Are Hierarchical, Pure Virtual Functions, Abstract Classes, Using Virtual Functions, Early vs. Late Binding. **Templates:** Generic Functions, A Function with Two Generic Types, Explicitly Overloading a Generic Function, Overloading a Function Template, Using Standard Parameters with	

Template Functions , Generic Function Restrictions , Applying Generic Functions, A Generic Sort, Compacting an Array, Generic Classes, An Example with Two Generic Data Types, Applying Template Classes: A Generic Array Class, Using Non-Type Arguments with Generic Classes, Using Default Arguments with Template Classes, Explicit Class Specializations, The type name and export Keywords, The Power of Templates .**Exception Handling:** Exception Handling Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ), Setting the Terminate and Unexpected Handlers, The uncaught exception( ) Function, The exception and bad exception Classes Applying Exception Handling.	
Module -5	**10 Hours**
Standard C++ I/O Classes : Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, Creating Your Own Inserters, Creating Your Own Extractors, Creating Your Own Manipulator Functions **C++ File I/O:** fstream> and the File Classes, Opening and Closing a File, Reading and Writing Text Files, Unformatted and Binary I/O, Characters vs. Bytes, put( ) and get( ), read( ) and write( ), More get( ) Functions, getline( ) , Detecting EOF, The ignore( ) Function, peek( ) and putback( ), flush( ), Random Access, Obtaining the Current File Position , I/O Status, Customized I/O and Files. **STL**: An Overview of the STL, Containers, Algorithms, Iterators and Function Objects, The String Class, Vector Class, Lists, Maps.	
Question paper pattern: • The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice. • Each full question consists of 20 marks. • Questions are set covering all the topics under a each module. •	
Text Book 1.Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014. (Listed topics only from Chapters 11,12,13,14, 15, 16, 17, 18, 19, 20, and21) 2.K R Venugopal, RajkumarBuyya,TRavishanker: Mastering C++,Tata McGraw Hill.	
Reference Books:	

1. Stanley B. Lippmann, JoseeLajore: C++Primer, 4th Edition, Addison Wesley.
2. Stephen Prata : C++ Primer Plus, 6th Edition, Pearson Education.
3. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Students learn to differentiate between object oriented programming and procedure oriented programming & Disseminate the importance of Object oriented programming such as class and objects.

CO2: Students canimplement Arrays, Pointers, References, and the Dynamic Allocation ,students will be able to use of object oriented features such asFunction Overloading, Copy Constructors and Default Arguments:

CO3: Students learn to use C++ to demonstrate inheritance, operator overloading, and Polymorphism, and have practical experience in developing object- oriented solutions.

CO4: Students can analyze a problem description and build object-oriented programs using Virtual Functions and Polymorphism and ExceptionHandling

CO5: Students canimplement an achievable practical application and analyze issues related to Standard C++ I/O Classes and STLobject-oriented techniques in the C++ programming language.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2
CO 2	PO2,PO3,PO4
CO 3	PO2,PO3,PO4
CO 4	PO2,PO3,PO4
CO 5	PO2, PO3,PO4,PO7,PO11

DATABASE MANAGEMENT SYSTEM

SEMESTER – II

Subject Code	**MCA23**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS –4:0:0

Course Objectives :

- Students understand and implement the processes of database management system.
- Students understand the design guidelines for a relational schema and learn to query from a database
- Students understand managing multiple transactions and recovery techniques in case of transaction failures

Modules	**Teaching Hours**
Module - 1	**10 Hours**
Introduction: Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems, Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types.	
Module - 2	**06 Hours**
Relational Model Relational Model: Relational Model Concepts, Relational Model Constraints and Relational Database Schema Update Operations, Transactions and Dealing with Constraint violations.	
Module -3	**12 Hours**

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries, Additional Basic Operations, Null values, Aggregate Functions, nested Sub queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints	
Module -4	**10Hours**
Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce Codd Normal Forms, Stored Procedures and functions, Triggers.	
Module -5	**12 Hours**
Transaction Management: Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control: Lock Based Protocols, Deadlock Handling. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.	

Question paper pattern:

- The question paper will have five questions. Module 1 and 5 has internal choice
- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison -Wesley, 2011.
2. Silberschatz, Korth and Sudharshan Data base System Concepts,6th Edition, Tata McGraw Hill, 2011.

Reference Books:

1 C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education,2009.

2 Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

Course Outcome (CO):

CO1: Students are demonstrated on the fundamentals of data models and develop an ER diagram

CO2: Students can Design a relational database model for a given scenario

CO3: Students understand to query the database

CO4: Students apply the rules of normalization to Inference the database design in the real world entities

CO5: Students understand on processing of multiple transactions, concurrency control techniques and recovery

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1, PO2,PO4
CO 3	PO1, PO2,PO4,PO5,PO7
CO 4	PO1, PO2,PO4,PO5,PO7, PO8
CO 5	PO1,PO3,PO4, PO10, PO11

Operating Systems

SEMESTER – II

Subject Code	**MCA24**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives :

- Understand the features and design of an Operating Systems
- Understand the handling of Process Management and Mutual Exclusion
- Understand different approaches to memory management.
- Understand the file handling system

Modules	**Teaching Hours**
Module -1	**10 Hours**
Computer and Operating Systems Structure Basic Elements, Processor Registers, Instruction Execution, The Memory Hierarchy, Cache Memory, I/O Communication Techniques, Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real-Time Systems, Handheld Systems, Feature Migration, Computing Environments. **System Structures:** System Components, Operating System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation.	
Module -2	**10 Hours**
Process Management Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, Processes and Threads, Symmetric Multiprocessing(SMP), Microkernels, CPU Scheduler and Scheduling.	
Module -3	**10 Hours**
Mutual Exclusion and Deadlock Memory management Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem.Principlesof Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers' Problem	
Module -4	**10 Hours**

Memory Management: Swapping, Contiguous Memory Allocation,Paging,Segmentation,Segmentationwith Paging,DemandPaging,ProcessCreation,PageReplacement algorithms ,Allocation of Frames,Thrashing	
Module -5	**10 Hours**
File System and Secondary Storage File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File–System Structure, FileSystem Implementation, Directory Implementation, Allocation Methods, Free Space Management**,** Disk Structure, Disk Scheduling, Disk Management.	

Question paper pattern:

- The question paper will have five questions.
- Module 3 and 5 will have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

1. Silberschatz, Galvin, Gagne, "Operating System Concepts" John Wiley, Sixth Edition, 2004
2. William Stallings, "Operating System Internals and Design Principles" Pearson, 6^{th}edition, 2012

Reference Books:

1. Chakraborty,"OperatingSystems"JaicoPublishingHouse,2011.
2. DhananjayM.Dhamdhere,"OperatingSystems–AConcept–BasedApproach",TataMcGraw–Hill,3rd Edition, 2012.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understand the Basics of Computer and Operating Systems Structure.
CO2: Realize the concept of Process Management.
CO3: Understand the concepts of the Mutual Execution and Deadlock.
CO4: Understand the concepts of different approaches to memory Management.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1
CO 2	PO1, PO3
CO 3	PO1, PO3
CO 4	PO1, PO3, PO7

PROFESSIONAL COMMUNICATION & ETHICS

SEMESTER – II

Subject Code	**MCA25**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives (CLO):

- Discuss a variety of communication strategies and techniques as they pertain to professional communication.
- Demonstrate the most effective oral communication skills that fit their personal and professional communication style
- Cover topics including: resume and cover letter writing; professional business documents –memo, letter, and email
- Demonstrate the most effective oral communication skills that fit their personal and professional communication style
- Discuss Professional communication strategies in corporate settings.
- Discuss ethics in business word.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Introduction to Communication Introduction, Basics of Communication, Purpose and Audience, Cross-Cultural Communication, Language as a Tool of Communication, Communication Skills – LSRW, Effective Communication, Modes of Communication, Importance of Technical Communication **Barriers to Communication** Introduction, Classification of Barriers, Informal Gap Principle, Filters. **Basics of Technical Communication** Introduction, Objectives and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Visual Aids in Technical Communication	
Module -2	**10 Hours**
Active Listening Introduction, Reasons for poor Listening, Traits of good Listener, Listening Modes, Types of Listening, Barriers to Effective Listening, Listening for General Content and Specific Information. **Effective Speaking** Introduction, Achieving Confidence, Clarity, and Fluency, Paralinguistic Features, Barriers to Speaking, Types of Speaking, Persuasive Speaking, Public speaking. **Listening and Speaking** Introduction, Conversations, Telephonic Conversations and Etiquette	

Module -3	**10 Hours**
Effective Presentation Strategies Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Controlling Nervous-ness and Stage Fright. **Interviews** Introduction, Objectives of Interviews, Types of Interviews, Job Interviews **Group Communication** Introduction, Forms of Group Communication, Use of Body Language in Group Communication, Discussions, Group Discussions, Organizational GD, GD as part of a Selection Process **Letters, Memos, and Email** Introduction, Letter Writing, Resumes, Emails: Email Etiquette.	
Module -4	**10 Hours**
Basic Concepts Introduction, Terminology, Governing Edicts, Personal Ethics, Professional Ethics, Ethical Di-lemmas, Emotional Intelligence, Thoughts on Ethics, Value Education, Dimensions of Ethics, Setting Goals in Life. **Ethics Theories** Introduction, Basic Ethical Principles, Moral Development Theories, Classification of Ethical Theories, Some Basic Theories, Moral Issues, Moral Dilemmas, Moral Autonomy, Religion and Ethics, Types of Enquiry, Use of Ethical Theories.	
Module -5	**10 Hours**
Responsibilities and Rights of Professionals Professional Responsibilities, Professional Rights. **Global Issues** Case Studies: Infosys Foundation, Computer Ethics, Intellectual Property Rights, Professionals and Ethics. **Ethical Codes** Sample codes: Institute of Electrical and Electronics Engineers, Computer Society of India,	

Question paper pattern

- The question paper will have five questions. All questions are compulsory Each full question consists of 20 marks.
- In module 1 and 2 shall have internal choice.
- Questions are set covering all the topics under a each module.

Text Books:

1. Technical Communication - Principles and Practices, Second Edition, MeenakshiRaman and Sangeeta Sharma, Oxford University Press, 2013. Chapters: 1, 2, 3, 4, 6, 7, 8, 9, 10, and 17
2. Professional Ethics, R. Subramanian, Oxford University

Press, 2013. Chapters: 1, 3, 6, 7, and 8.

Reference Books:

1. Ethics in Information Technology, George Reynolds, Fourth Edition, Thomson Course Technology, 2012.
2. Effective Technical Communication by M.AshrafRizivi, 1st Edition, Tata McGraw Hill, 2005.
3. Ethics in Engineering by Mike W Martin and Ronald Schinzinger, 3rd Edition, Tata McGraw Hill, 2003

Course Outcome (CO): At the end of this course, the students will be able to

CO-1: Demonstrate communication skills required for a profession. Work effectively in groups or teams to solve a problem.

CO-2: Acquire skills to face the interview.

CO-3: Demonstrate writing skills to seek employment or carryout business. Adopt ethical practices in day to day life and profession.

CO-4: Explain the purpose and advantages of IPR, computer ethics and ethical codes required in the profession

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO9
CO 2	PO11
CO 3	PO3, PO12
CO 4	PO6, PO11

PYTHON PROGRAMMING LAB			
Laboratory Code	**MCAL26**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

CREDITS – 0:0:1.5

Course Objectives:

- To Learn Syntax and Semantics and create Functions in Python.
- To Handle Strings and Files in Python.
- To Understand Lists, Dictionaries in Python.
- To Implement Object Oriented Programming concepts in Python
- To Build GUI applications

Laboratory Experiments:

PART A
Marks:30

1.Write a program to sum all the elements from n1 to n2 where n1 and n2 are positive integers

2. Input an array of n numbers and find separately the sum of positive numbers and negative numbers.

3. Write a program to search an element using linear search

4. Write a program to search an element using binary search.

5. Write a program to simulate stack.

6. Given n, generate Pascal triangle for n rows. Use list of lists.

If n = 5, output should be

```
    1
   1 1
  1 2 1
 1 3 3 1
```

1 4 6 4 1 Check : str.format for formatting and replication operator to get # of spaces
7. Write a program to multiply two matrices.
8. Write a program to find the roots of a quadratic equation
9. Write a program to Insert a number in a sorted array.
10. Write a Python Program to check whether the given string is palindrome or not using built in string manipulation methods.
11. Write a Python Program to read a word and prints the number of letters, vowels and percentage of vowels in the word using dictionary
12. Write a Python Program to check a given sentence is a pangram or not using function/Module.
13. Do the following using regular expressions:- • Find all occurrences of a word in a multiline string. The search must be case insensitive. Also find and display the starting index of each matched word in the input string. • Given a line of text find all characters other than vowels and space characters. Given a list of strings find all strings that start with a digit or an underscore.
14.Write an Object oriented Python program to create two Time objects: current Time, which contains the current time; and bread Time, which contains the amount of time it takes for a bread maker to make bread. Then we'll use add Time to figure out when the bread will be done. Write the print Time function to display the time when the bread will be done by the bread maker.
PART B **Marks:20** 1. Using a stack evaluate an arithmetic expression.
2.Write a Python Event driven Program for file operations Press 1: to open file in read mode 2: open the file in write mode 3: current position of the file pointer #4: Reposition the pointer at the beginning 5: exit
3.Create a dictionary for words and their meanings. Write functions to add a new entry (word: meaning) , search for a particular word and retrieve meaning, given meaning find words with same meaning , remove an entry, display all words sorted alphabetically. [Program must be menu driven]
Note 1: In the practical Examination each student has to pick one question from a lot of all 14questions and one from part B.
Course Outcome (CO): At the end of this course, the students will be able to **CO1:** Students implementsdynamic interactive real-world Python Applications using language idioms, data structures, standard library, dictionaries and object-oriented programming concepts.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

OBJECT ORIENTED PROGRAMMING USING C++ LAB			
Laboratory Code	**MCAL17**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

CREDITS – 0:0:1.5

Course Objectives:

- Understand concepts of Object Oriented Programming and design programs using classes and objects for C++ .
- Construct applications to provide flexible options for the creation of new definitions for some of the operators.
- Specifying mechanism of deriving a new class from older classes through inheritance.
- Implement methods to select appropriate member function during run time.
- Design programs using Templates, exceptions and handle file I/Os

Laboratory Experiments:

PART-A

1. Write a C++ program to find the sum for the given variables using function with default arguments.
2. Write a C++ program to swap the values of two variables and demonstrates a function using call by value.
3. Write a C++ program the swap the values of two variables and demonstrates a function using Call by reference.
4. Write a program to find the largest, smallest & second largest of three numbers. (use inline function MAX and MIN to find largest & smallest of 2 numbers)
5. Write a program to calculate the volume of different geometric shapes like cube, cylinder and sphere and hence implement the concept of Function Overloading.
6. Write a C++ program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles.

PART-B

1. Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.
2. Write a C++ program to create a class called COMPLEX and implement the following

overloading functions ADD that return a complex number: (i) ADD (a, s2) – where 'a' is an integer (real part) and s2 is a complex number (ii) ADD (s1, s2) – where s1 and s2 are complex numbers.
3. Friend functions and friend classes: *a)* Write a program to define class name HUSBAND and WIFE that holds the income respectively. Calculate and display the total income of a family using Friend function. *b)* Write a program to accept the student detail such as name and 3 different marks by get_data() method and display the name and average of marks using display() method. Define a friend class for calculating the average of marks using the method mark_avg().
4. Create a class called MATRIX using two-dimensional array of integers. Implement the following operations by overloading the operator == which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by overloading the + and – operators respectively. Display the results by overloading the operator <<. If (m1== m2) then m3 = m1+m2 and m4 = m1- m2 else display error.
5. Write a program to create an HUMAN class with features Head, Legs, Hands.(NOTE: Head, Legs and Hands are of integer/float types) a. Create an object HUMAN1 using default constructor. (Default features to have 1 Head, 2 Legs and 2 Hands) b. Create an object HUMAN2 with customized inputs using Parameterized Constructor C. Create an object HUMAN3 using existing object HUMAN1 (Copy Constructor). D. Create an object HUMAN4 using Default Arguments Constructor (1 Head, 2 Legs and 2 Hands. E. All Humans die after their lifetime.(Destructor)
6. Demonstrate Simple Inheritance concept by creating a base class FATHER with data members FirstName, SurName, DOB and BankBalance and creating a derived class SON, which inherits SurName and BankBalance feature from base class but provides its own feature FirstName and DOB. Create and initialize F1 and S1 objects with appropriate constructors and display the Father & Son details.
7. Create an abstract base class EMPLOYEE with data members: Name, EmpID and BasicSal and a pure virtual function Cal_Sal().Create two derived classes MANAGER (with data members: DA and HRA and SALESMAN (with data members: DA, HRA and TA). Write appropriate constructors and member functions to initialize the data, read and write the data and to calculate the net salary. The main() function should create array of base class pointers/references to invoke overridden functions and hence to implement run-time polymorphism.
8. I/O streams and functions. Write a program to implement FILE I/O operations on characters. I/O operations includes inputting a string, Calculating length of the string, Storing the string in a file, fetching the stored characters from it.
9. Write a program to implement Exception Handling with exceptions Classes.
10. Write a simple C++ program to store and display integer elements using STL Vector class.

In the practical Examination each student has to pick one question from PART-A and PART-B .
Course Outcome (CO): At the end of this course, the students will be able to **CO1:**Student will be able to apply and implement object oriented concepts using C++.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO7,PO11

DATABASE MANAGEMENT SYSTEMS LAB			
Laboratory Code	**MCAL28**	CIE Marks	**50**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**
Total Number of Lecture Hours	**56**	SEE Hours	**03**
CREDITS – 0:0:2			

Course Objectives:

- To execute SQL commands.
- To implement simple exercises on relational database schema.
- To design a relational database schema for specific database application using SQL.

DBMS Lab Experiments:

Instructions for the Exercises:
1. Draw an ER diagram based on given scenario.
2. Create Relational Database Schema based on the above scenario using Mapping Rules.
3. Perform the given queries using any RDBMS Environment.
4. Suitable tuples have to be entered so that queries are executed correctly
5. The results of the queries may be displayed directly

Exercise: 1

Notown Records has decided to store information about musicians who perform on its albums. Each musician that records at Notown has an SSN, a name, an address, and a phone number. No musician has more than one phone. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date and a format (e.g., CD or MC). Each song recorded at Notown has a title and an author. Each musician may play several instruments, and a given instrument may be played by several musicians. Each album has a number of songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians, and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Queries

a) List musician name, title of the song which he has played, the album in which song has
occurted.
b) List the details of songs which are performed by more than 3 musicians.
c) List the different instruments played by the musicians and the average number of instruments played.
d) Retrieve album title produced by the producer who plays guitar as well as flute
e) List the details of musicians who can play all the instruments present.

Exercise: 2

Professors have a PROFID, a name, an age, a rank, and a research specialty. Projects have a project number, a sponsor name (e.g. UGC/AICTE/…), a starting date, an ending date, and a budget. Graduate students have an USN, a name, an

age, and a degree program (e.g. MCA/MPhil/BE/ME ..). Each project is managed exactly by one professor (known as the project's principal investigator). Each project is worked on by one or more professors (known as the project's co-investigators). Professors can manage/work on multiple projects. Each project is worked on by one or more graduate students (known as the project's research assistants). Graduate students can work on multiple projects. Each professor can supervise many students. A student who is working on a project can be supervised by only one professor.

Queries

a) Retrieve the names of all professors who do not have an ongoing project of more than 1 lakh.

b) Retrieve the names of all graduate students along with their professors under whom they work and project sponsor.

c) List the professors and sum of the budget of their projects started after 2005 but ended in 2010.

d) List the names of professors who has a total worth of project greater than the average budget of projects sanctioned

e) List the professors who work on all the projects.

Exercise: 3

A bank has many branches and a large number of customers. Bank is identified by its code. Other details like name, address and phone for each bank are also stored. Each branch is identified by its bank. Branch has name, address and phone. A customer can open different
kinds of accounts with the branches. An account can belong to more than one customer. Customers are identified by their SSN, name, address and phone number. Age is used as a factor to check whether customer is a major. There are different types of loans, each identified by a loan number. A customer can take more than one type of loan and a loan can be given to more than one customer. Loans have a duration and interest rate. Make suitable assumptions and use them in showing maximum and minimum cardinality ratios.

Queries:

a) List the details of customers who have joint account and also have at least one loan.

b) List the details of the branch which has given maximum loan.

c) List the details of saving accounts opened in the SBI branches located at Bangalore.

d) List the name of branch along with its bank name and total amount of loan given by it.

e) Retrieve the names of customers who have accounts in all the branches located in a specific city.'

Exercise: 4

Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name; it has an address and one phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. Each pharmacy has a name, address, and phone number. Each patient is checked up by some doctor. Every doctor has at least one

patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, supervisor and the text of the contract.

Queries:

a) List the details of patients who are 20 years old and have been checked by eye-specialist.

b) List the details of doctors who have given the prescription to more than 20 patients in year 2013.

c) List the details of pharmaceutical companies who supply drug to more than 10 pharmacies d) List the details of drug supplied by only one pharmaceutical company.

e) List the details of drug supplied by all pharmaceutical companies.

Exercise; 5

Data requirements of movie industry are captured. Each movie is identified by title and year of release. Each movie has length in minutes and classified under one genres (like action, horror etc.). Each movie has a plot outline. Production companies are identified by name and each has an address. A production company produces one or more movies. Actors are identified by id. Other details like name and date of birth of actors are also stored. Each actor acts in one or more movies. Each actor has a role in movie. Directors are identified by id. Other details like name and date of birth of directors are also stored. Each director directs one or more movies. Each movie has one or more actors and one or more directors and is produced by a production company.

Queries:

a) List the details of horror movies released in 2012 and directed by more than 2 directors.

b) List the details of actors and total number of movies acted between 2000 and 2010.

c) List the details of production companies producing maximum movies.

d) List the details of movies where director and actor have same date of birth.

e) Retrieve the names of directors directed all the movies produced by any one production company.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Design an ER diagram and implement a database schema for a given problem domain and query the tables.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4, PO7

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications (Autonomous)

Aided By Govt. of Karnataka

MCA Syllabus (2016 – 2019)

III Semester

Subject Code	Name of the Subject	Credits			Total Credits	Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicale			CIE	SEE	
MCA31	Computer Networks	4	---	---	4	3	30	70	100
MCA32	Java Programming	4	---	---	4	3	30	70	100
MCA33	Analysis and Design of Algorithms	4	---	---	4	3	30	70	100
MCA34	Software Engineering	4	---	---	4	3	30	70	100
MCA35	Elective - I	4	---	---	4	3	30	70	100
MCAL36	Computer Networks Lab	---		2	2	3	50	50	100
MCAL37	Java Programming Lab	---		1.5	1.5	3	50	50	100
MCAL38	Analysis and Design of Algorithms Lab	---		1.5	1.5	3	50	50	100
	Total	20	---	5	25	24	300	500	800

ELECTIVE - I			
MCA351	Intellectual Property Rights	MCA353	Operations Research
MCA352	Data Analysis using Spread Sheets	MCA354	Principles of User Interface Design

IV Semester

Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicale	Total Credits		CIE	SEE	
MCA41	Advanced Java Programming	4	---	---	4	3	30	70	100
MCA42	Software Testing and Practices	4	---	---	4	3	30	70	100
MCA43	Advanced Web Programming	4	---	---	4	3	30	70	100
MCA44	Elective-2	4	---	---	4	3	30	70	100
MCA45	Management Elective-3	4	---	---	4	3	30	70	100
MCAL46	Advanced Java Programming Lab	---		1.5	1.5	3	50	50	100
MCAL47	Software Testing Lab	---		1.5	1.5	3	50	50	100
MCAL48	Advance Web Programming Lab	---		2	2	3	50	50	100
	Total	20	---	5	25	24	300	500	800

ELECTIVE - II		MANAGEMENT ELECTIVE - III	
MCA441	Data Warehousing & Mining	MCA451	Software Project Management
MCA442	Artificial Intelligence	MCA452	Supply Chain Management
MCA443	Software Architecture	MCA453	Enterprise Resource Planning
MCA444	Machine Learning	MCA454	E-Commerce and Management Information System

V Semester

Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicale	Total Credits		CIE	SEE	
MCA51	Object-Oriented Modeling and Design Patterns	4	---	---	4	3	30	70	100
MCA52	Programming Using C# & .NET	4	---	---	4	3	30	70	100
MCA53	Mobile Applications	4	---	---	4	3	30	70	100
MCA54	Elective-4	4	---	---	4	3	30	70	100
MCA55	Elective-5	4	---	---	4	3	30	70	100
MCAL56	Software Design Laboratory	---		1.5	1.5	3	50	50	100
MCAL57	Net Laboratory	---		1.5	1.5	3	50	50	100
MCAL58	Mini Project : (Mobile Applications Development using Android /iOS/Windows etc.,)	---		2	2	3	50	50	100
	Total	20	---	5	25	24	300	500	800

ELECTIVE - IV		ELECTIVE - V	
MCA541	Cloud Computing	MCA551	Storage Area Networks
MCA542	Web Engineering	MCA552	Mobile and Adhoc Sensor Networks
MCA543	Service Oriented Architecture	MCA553	Cyber Security
MCA544	Internet of things	MCA554	Big Data Analytics
MCA545	System Simulation & Modeling	MCA555	Software Defined Networks

III SEMESTER

Computer Networks				
Subject Code	**MCA31**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Enumerate the layers of the OSI model and TCP/IP
* Identify the different types of network devices and their functions within a network
* Understand and build the routing mechanisms.
* Gain knowledge on the implementation of various application layer protocols

Unit No.	Modules	Teaching hours
1.	**Introduction to Computer Networks and Physical Layer :** Networking Devices, Classification of Computer Networks, Network Protocol Stack (TCP/IP and ISO-OSI),Data Transmission Concepts, Analog and Digital Data Transmission, Transmission Impairments, Guided and Wireless transmission, communication media, Digital modulation techniques (FDMA,TDMA,CDMA) and mobile telephone systems (1G,2G,3G and 4G).	08
2.	**Data Link layer :** Data link layer design issues, Data Link Protocols and Sliding window protocols. **Medium Access Sub Layer :** The Channel Allocation Problem, Multiple access protocols and Examples: Broadband Wireless, Bluetooth.	10
3.	**Network Layer :** Network Layer Design issues, Routing algorithms (DVRP, SPRP, Broadcast routing, Multicast routing, routing for mobile host) Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet	12
4.	**The Transport Layer :** The Transport Service, Elements of Transport Protocols, Congestion Control, The Internet Transport Protocol: UDP, The Internet Transport Protocols – TCP, Performance Issues.	10
5	**The application Layer :** DNS: Domain Name Space, Domain Resource Records, Domain Name Servers. Electronic mail: SMTP, The World Wide Web: Static and dynamic web pages, web applications, HTTP, real-time conferencing,	10

Question paper pattern:

1. The question paper will have five questions. Module 2 and 3 has internal choice
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under each module.

Text Books:

1. “Computer Networks” by Andrew S Tanenbaum, David J Wetheral, 5th Edition, Pearson 2012

Chapter 1, 2.2, 2.3, 2.5, 2.7, 3.1, 3.2, 3.3, 3.4,4.1, 4.2, 4.4, 4.6
Chapter 5, Chapter 6 (excluding 6.7), Chapter 7.

2. “Data and Computer Communications” by William Stallings , Above 7th Edition, 2004 Chapter 3

Reference Books:

1.“Computer Networks” Principles, Technologies and Protocols for Network Design, by NATALA OLIFER and VICTOR OLIFER , Wiley, 2010

2. http://www.ietf.org/rfc.html relevant RFC document could be used to get more detailed information about any of the concepts prescribed in the syllabus like RFC 2460 can be referred to get a detailed information about IPV6

Course Outcome (CO): At the end of this course, the students will be able to

CO 1: Understand the basis and structure of layered protocol model and the transmission medium

CO 2: Analyse the various datalink, network and transport layer protocols

CO 3: Study and analyse the strategies of routing protocols and methodologies to improve the traffic flow.

Cos	Mapping with Pos
CO1	PO1, PO3
CO2	PO1, PO3
CO3	PO1, PO3, PO5

Java Programming				
Subject Code	**MCA32**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Understand the different object oriented concepts and implement basic programs.
* Develop applications using inheritance and interface concepts.
* Apply multithreading programming concepts and handling errors efficiently.
* Design client server application in java
* Facilitatejava.lang package & java collection framework.

Unit No.	Modules	Teaching hours
1.	**Java Programming Fundamentals** The Java Language, The Key Attributes of Object-Oriented Programming, TheJava Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifies in Java, The Java Class Libraries. **Introducing Data Types and Operators** Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions. **Program Control Statements** Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops. **More Data Types and Operators** Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators. **String Handling** String Fundamentals, The String Constructors, Three String-Related Language Features, The Length () Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, String Buffer and String Builder.	**10**

2.	**Introducing Classes, Objects and Methods :** Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword. **A Closer Look at Methods and Classes :** Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments. **Inheritance :** Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.	**10**
3.	**Interfaces :** Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. **Packages :** Package Fundamentals, Packages and Member Access, Importing Packages, Static Import **Exception Handling :** The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.	**10**
4.	**Multithreaded Programming :** Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads. **Enumerations, Auto boxing and Annotations :** Enumerations, J ava Enumeration are class types, The Values () and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata), Generics	**10**

	Applets : Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets.	
5.	**Networking with Java.net :** Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class. **Exploring Collection Framework :** Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class. **Introduction to Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under a each module.

Text Books:

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013.
(Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

Reference Books:

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
2. Java 6 Programming, Black Book, KoGenT ,Dreamtech Press, 2012.
3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Course Outcomes:

CO1: Demonstrate the basic object oriented concepts & apply them to create java applications.
CO2: Apply inheritance and interface concepts to design java applications.
CO3: Design java applications with multithreading concepts and demonstrate the error handling concepts.
CO4: Design client server applications.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO2	PO1,PO2,PO3,PO5,PO7,PO9
CO3	PO1,PO2,PO3,PO5,PO7,PO9
CO4	PO1,PO2,PO4,PO5,PO7,

Analysis and Design of Algorithms				
Subject Code	**MCA33**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Analyse the asymptotic performance of algorithms.
* To understand and apply algorithms and design techniques
* To solve problems using appropriate design techniques
* To analyze the complexities of various problems in different domains.
* Identify the limitations of algorithms power.

Unit No.	Modules	Teaching hours
1.	**Introduction, Fundamentals of the Analysis of Algorithm Efficiency :** Notion of Algorithm, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search and String Matching.	**08**
2.	**Divide-and-Conquer :** Merge sort, Quicksort, Binary Search, Binary tree Traversals and related properties, Multiplication of large integers, Stressan's Matrix Multiplication. **Greedy Technique :** The General method, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffmann Trees.	**12**
3.	**Dynamic Programming :** Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions **Decrease-and-Conquer :** Depth First and Breadth First Search, Topological sorting. **Transform and Conquer** Introduction, Heap Sort.	**08**
4.	**Backtracking:** n-Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. **Branch-and-Bound:** Assignment Problem, Knapsack Problem, Traveling Salesperson Problem.	**08**
5.	**Limitations of Algorithm Power :** Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems. **Space and Time Tradeoffs :** Sorting by Counting, Input Enhancement in String Matching, Hashing.	**08**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory.
2. Module 2 and 3 shall have internal choice.
3. Each full question consists of 20 marks.
4. Questions are set covering all the topics under each module.

Text Books:

AnanyLevitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition.(Chapters 1.1-1.4, 2.1-2.5, 3.1, 3.2, 3.4, 4.1-4.5, 5.1-5.4, 7.1-7.3, 8.1, 8.2, 8.4, 9.1-9.4, 11.1-11.3, 12.1-12.3)

Reference Books:

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI 1998.

2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication 2001.

3. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India

4. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill

COURSE OUTCOMES:

CO1: Analysetime and space complexity of recursive and non- recursive algorithms.

CO2: Analyze algorithms and solve real time problems using various algorithm design Techniques.

CO3: Design and analyse algorithms to solve the optimization problems.

CO4: Design and analyze algorithms associated with space–time tradeoffs with the limitations of Algorithm power.

Cos	Mapping with Pos
CO1	PO1,PO2
CO2	PO1,PO2,PO3
CO3	PO1,PO2,PO3
CO4	PO2,PO3

Software Engineering				
Subject Code	**MCA34**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Demonstrate the software engineering process by identifying the requirements when given a real life software development project.

* Translate the requirement specification into design model for developing software systems of various complexities while developing a software project.

* Apply verification and validation techniques to software systems for developing any quality software.

* Analyze effort, schedule and cost estimation techniques for better and efficient software project management.

Unit No.	Modules	Teaching hours
1.	**Overview :** Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies **Software Process & Agile Software Development :** Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, The rational Unified process. Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.	**10**
2.	**Requirements Engineering :** Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management **Component-based software engineering :** Components and component model, CBSE process, Component composition.	**10**
3.	**System Modeling, Architectural Design :** Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering, Software architecture: the role of software architecture, architectural views, component and connector view, Architectural styles for C&C view, Documenting architectural design	**10**

4.	**Design and implementation :** Design: Design concepts, Function oriented design, detailed design, verification, matrix (Complexity matrix for function oriented design) **Distributed Software engineering :** Distributed system issues, Client-server computing, Architectural patterns for distributed systems, Software as a service.	**10**
5.	**Planning a software Project :** Process planning, Effort estimation, Project scheduling and staffing, Software configuration management plan, Quality plan, Risk Management, Project monitoring plan. **Software Testing :** Testing fundamentals, Black-box testing, White-box testing, Testing process	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.

2. Each full question consists of 20 marks.

3. Questions are set covering all the topics under a each module.

Text Books:

1. Ian Sommerville : Software Engineering, 9th edition, Person Education Ltd, 2011. (Chapters-: 1, 2, 3, 4, 5, 17, 18)

2. PankajJalote: Software Engineering, Wiley India Pvt Ltd (2010) (Chapters-:4, 6.1, 6.2, 6.5, 6.6)

Reference Books:

1. Roger S Pressman: Software Engineering-A Practitioners approach, 6th Edition, McGraw-Hill, 2010.

2. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley–India, 2010

Course Outcomes :

CO-1: Student is able to understand the software development and process.

CO-2: Student Understands functional and software requirement and knows about system design and implementation

CO-3: Student understand component model, planning and testing the software.

Cos	Mapping with Pos
CO1	PO7,PO8,PO9
CO2	PO3,PO8,PO10
CO3	PO3,PO6,PO7,PO8,PO9

Intellectual Property Rights				
Subject Code	**MCA351**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Identify which of the four main different types of intellectual property rights may be presented by an output

* Analyse an innovative or creative output in terms of intellectual property rights generated

* Discuss the appropriateness, or not, of registering an intellectual property right

* Apply the appropriate ownership rules to intellectual property he / she has been involved in creating

* Suggest ways of exploiting intellectual property rights created in his / her own work.

Unit No.	Modules	Teaching hours
1.	**INTRODUCTION:** Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Provision of IPR under TRIPS and WTO. Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secretand trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	**10**
2.	**PATENT RIGHTS AND COPY RIGHTS—** Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.	**10**
3.	**TRADE MARKS—** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties, domain names.	**10**
4.	**DESIGN-** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention of design-types and functions. Semi conductor Integrated circuits and layout design Act-2000.	**10**
5.	**BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000-**Cyber Crimes, digital signature and E-Commerce.Types of Cyber crimes, Offences under IT Act 2000.	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 2 and 3 shall have internal choice.

2. Each full question consists of 20 marks.

3. Questions are set covering all the topics under a each module.

Text Books:

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy

2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra

3. IPR by P. Narayanan

4. Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.

Reference Books:

1. PrabhuddhaGanguli: ' Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi

2. J Martin and C Turner "Intellectual Property" CRC Press Richard Stimm "Intellectual Property" Cengage Learning

Reference Books:

1. PrabhuddhaGanguli: ' Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi

2. J Martin and C Turner "Intellectual Property" CRC Press Richard Stimm "Intellectual Property" Cengage Learning

Course Outcomes (CO) :

CO1 : Identify which of the four main different types of intellectual property rights may be presented by an output

CO2 : Analyse an innovative or creative output in terms of intellectual property rights generated

CO3 : Discuss the appropriateness, or not, of registering an intellectual property right

CO4 : Apply the appropriate ownership rules to intellectual property he / she has been involved in creating

Cos	Mapping with Pos
CO1	PO9
CO2	PO11
CO3	PO3, PO12
CO4	PO6, PO11

DATA ANALYSIS USING SPREADSHEETS				
Subject Code	**MCA352**	CIE Marks	**30**	**CREDITS : 3:1:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO) :

* Apply and demonstrate various built in functionalities of spreadsheet
* Leverage VBA procedures and functions
* Perform data analysis using Spreadsheet data analysis tools for the given data set

Unit No.	Modules	Teaching hours
1.	**Basics of Application Development using Spreadsheets:** Spread sheet basics, Formula and Techniques, Essentials of Spreadsheet Application Development	10
2.	**Understanding GUI for Spreadsheet Applications:** Introduction, Programming Fundamentals, Working with Function and Procedures	10
3.	**Advanced Programming Techniques:** Working with Pivot Tables, Working with Charts, Understanding Events	10
4.	**Data Analysis using Spreadsheets** **Descriptive Statistics:** Histogram, Descriptive Statistics: Mean, Median, Mode, Standard Deviation, Range, Skegness and Kurtosis, Rank and Percentile. Hypothesis Testing: t-Test, z-Test, F-Test	10
5.	**Data Analysis using Spreadsheets** Regression and Correlation: Covariance, Correlation and Regression. Time Series Forecasting: Moving Average, Exponential Smoothing	10

Laboratory : Students shall implement programs which supplement the theory concepts

Question paper pattern

1. The question paper will have five questions. All questions are compulsory. Each full question consists of 20 marks.
2. In module 4 and 5 shall have internal choice.
3. Questions are set covering all the topics under a each module.

Reference Books:

1. John Walkenbach: Excel® 2013 Power Programming with VBA, Willey, 2013.
2. Robert de Levie: Advanced Excel® for Scientific Data Analysis, OXFORD University Press, 2012.
3. ChandanSengupta: Financial Modelling using EXCEL and VBA, John Wiley & Sons, Inc, 2004.
4. Kirkup: Data Analysis with Excel, Cambridge University Press, 2003.

Course Outcomes (CO):

CO1: Apply various built in functions of spreadsheet

CO2: Analyse large data sets using pivot tables

CO3: Develop procedure and functions using VBA

CO4: Perform data analysis using Spreadsheet data analysis tools for the given Data set

Cos	Mapping with Pos
CO1	PO9
CO2	PO11
CO3	PO3, PO12
CO4	PO6, PO11

Operation Research				
Subject Code	**MCA353**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* To understand the concept of LPP and the techniques of programming
* To implement the algorithmic concepts of simplex method, big-M method
* Explore the various techniques of dual and Primal Problems.
* To solve problems using Transportation and assignments.
* Analyze the concept of Games theory and CPM and PERT

Unit No.	Modules	Teaching hours
1.	**Introduction and Overview of the OR Modelling Approach** The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, Introduction to Linear Programming, Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, additional example	10
2.	**Solving LPP - the Simplex Method** The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method (Two Phase method, Big-M method).	10
3.	**Duality Theory and Sensitivity Analysis** The essence of duality theory, economic interpretation of duality, primal dual relationship, adapting to other primal forms, the dual simplex method	10
4.	**Transportation and Assignment Problems** The transportation problem, a stream line simplex method for the transportation problem, the assignment problem, a special algorithm for the assignment problem	10
5.	**PERT and CPM** Network representation, Critical path (CPM) computations and PERT networks. **Game Theory** The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, solving by linear programming, extensions	10

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 2 and 5 shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under a each module.

Text Books:

1. Frederick S.Hillier& Gerald J.Lieberman: Introduction to Operations Research, 8thEdition, Tata McGraw Hill, 2006. (Chapters 1.1-1.3, 2.1-2.6, 3.2-3.4, 4.1-4.7, 6.1-6.7, 7.1, 8.1-8.4, 13.1-3.4, 14.1-14.6)

2. Hamdy A Taha: Operations Research - An Introduction, 7th Edition, Pearson Education 2007 Chapter 6.6(except 6.6.3 and 6.6.4

Reference Books:

1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.

2. Theory and Problems of Operations Research, Richard Bronson and Govindasami Naadimuthu, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.

Course Outcomes :

CO1: Categorize problems based on their characteristics and practical Importance.

CO2: Develop LPP programs using iterative/recursive approach

CO3: Compute the Transportation and Assignment problems

CO4: Design CPM/PERT problem

Cos	Mapping with Pos
CO1	PO9
CO2	PO11
CO3	PO3, PO12
CO4	PO6, PO11

Principles of User Interface Design				
Subject Code	**MCA354**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Describe the guidelines, principles and theories of User Interface Design.
* Summarizes the development processes and evaluating the Interface Design.
* Draw the interactive style of form fill, Menus and dialog boxes.
* Characterize the command and natural languages and design issues.
* Evaluate the user documentation, Information and visualization.

Unit No.	Modules	Teaching hours
1.	**Introduction :** Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories.	**10**
2.	**Development Processes :** Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues. **Evaluating Interface Design :** Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	**10**
3.	**Interaction Styles :** Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays	**10**
4.	**Command and Natural Languages :** Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing.	**10**

	Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large **Design Issues** Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Non-anthropomorphic Design, Display design, web page design, Window Design, Color	
5.	**User Documentation and Online Help :** Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process. **Information Search and Visualization** Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, Advanced filtering and Search Interfaces, Information Visualization : Introduction, Data tyoe by task taxonomy, Challenges for information visualization.	**10**

Text Books:

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010.

Reference Books:

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRusselBealel: Human-Computer Interaction, III Edition, Pearson , Education, 2008.

2. Eberts: User Interface Design, Prentice Hall, 1994

3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

Course Outcomes :

CO-1: Appreciate the importance of the user interface in software development. & Understand key aspects of human psychology to determine user actions at and satisfaction of the interface.

CO-2: Implement and Active use, goals and understand commonly used survey and types of menus, guidelines for dialog box.

CO-3: Apply Command organization strategies, error message, and Advanced filter for user interface design.

Cos	Mapping with Pos
CO1	PO9
CO2	PO11
CO3	PO3, PO12
CO4	PO6, PO11

Computer Networks Laboratory				
Subject Code	**MCAL36**	CIE Marks	**50**	**CREDITS : 0:0:2**
Number of Lecture Hours/Week	**4**	SEE Marks	**50**	
Total Number of Lecture Hours	**56**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Understand network topologies, routing, error detection and correction techniques, protocol packet analysis using open source NS2/NS3

1. Write a TCL script to simulate the network described below
Consider a small network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds. Write a Tcl script (in the text area below) to simulate this scenario. Once you have written your simulation script, click on the "Run" button to execute it. You can verify your code by clicking on the "View Solution" button at the bottom of the page.

2. Write a TCL script to simulate a file transfer with ns2

Consider a client and a server. The server is running a FTP application (over TCP). The clientsends a request to download a file of size 10 MB from the server. Write a script to simulate this scenario. Let node #0 be the server and node #1 be the client. TCP packet size is 1500 B.Assume typical values for other parameters.

Note: This simulation require transfer of a fixed size file. Therefore, time required for the transfer would be constant for a given bandwidth of a link. To verify this, determine the time that would roughly be required for the transfer. Then look at the bottom of the trace file and verify whether there is any transmission beyond the time calculated. To verify that the client has downloaded the entire file, plot the "Bytes Received " curve for node #1. The y-axis is in Kbits. Convert it to MB and verify whether it approximates the specified file size. TCP headers would effectively increase the count of received bytes at node # 1.

3. Setting up a local area network with ns2

In this exercise you will be simulating a CSMA/CD based LAN with ns2. Consider the LANwith seven nodes to be an isolated one i.e. not connected to the Internet. Node # 0 in the LANact as a UDP traffic source, and node # 6 is the destination node. Assume CBR traffic to be flowing between the nodes. The simulation lasts for 25 seconds. In Ethernet a packet is broadcasted in the shared medium, and only the destination node accepts the packet. Other nodes simply drop it. What should be the number of hops a packet from node # 0 to node # 6 travel? Verify this from the "Hop Count" plot.

Additional Task :
Suppose the above LAN is to be connected to the Internet. Add node # 7 into the network so that it act as the gateway. Connect node # 0 and # 7 with a 1 Mb wired link. Move the UDP source to node # 7. How the hop count should get affected in this case? Verify from the plot.

4. Simulating link errors

Consider the following network diagram

Here node # 2 act as a router. Any traffic to or from the LAN passes through it. Consider node #1 running a FTP server, and node # 5 is downloading a file of size 4 MB. However, the link

between node # 2 and # 3 is fault. It drops packets with a fixed probability of 0.2. Implement a link error model to reflect this.It may be noted here that the file download time will be more than the we had in exercise # 2 ofexperiment # 1. Try different values of the simulation time to ensure that the file has beenentirely transferred. Is the plot of bytes received a linear curve or non-linear? Why? Presence of link errors cause one or more packets to be retransmitted. Verify this from the "Packet Retransmissions" plot.

5. Measuring Network Performances
Bottleneck in the network
Consider a dumbbell topology with eight nodes as shown as in the following figure.

Considernodes# 2 and 3 to be two routers connecting two different networks. When the bandwidth of the link 2-3 is much lower than the sum of bandwidths of the other links in the network, it act as abottleneck. Assume node # 0 running a FTP application (over TCP) and sending data to node # 6. Node # 1is sending CBR data node # 7. Assume all the links except 2-3 has a bandwidth of 1 Mb, propagation delay of 10ms and queue type as Drop Tail. (All are duplex links).

Tasks: The link 2-3 has a propagation delay of 10 ms. Vary it's bandwidth from 0.5 Mb to 2.5 Mb in

steps of 0.25Mb.

* Compute the throughput for node # 3 in each case

* Plot the throughput vs. bandwidth data in the "Custom Plot" section below

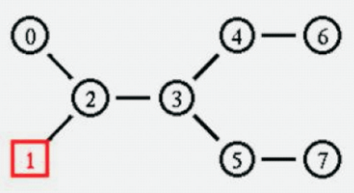
Based on the above plots, suggest what should be the recommended bandwidth of the link 2-3.

Now, plot the end-to-end delay between nodes 0 and 6 for the above chosen values of link 2-3 bandwidth. Revisit your previous answer (i.e. optimum bandwidth of link 2-3) based on these graphs.

Measuring Network Performances

6. Bandwidth sharing between TCP and UDP

Consider the dumbbell topology from our previous exercise:



Node # 0 is a TCP source, and the corresponding sink is at node # 6. Node # 1 is a UDP source

(CBR traffic) with a null agent attached to node # 7. These two traffic flows through the common link 2-3. The aim of this exercise is to examine how TCP and UDP share the band width between themselves when the rate of CBR traffic is changed. Set the TCP packet size to 1460 B. The UDP and CBR packet sizes are 1500 B. All the links inthe network have same bandwidths (say, 4 Mb), delay and queue types.

Part 1:

* Set the initial rate of CBR traffic to 0.5 Mb. Run the simulation, and plot the "BytesReceived" by node #s 4 and 5 (sinks for TCP and UDP traffic)

* Now, increment the rate up to 4 Mb, the link bandwidth, in steps of 0.5 Mb. Run the simulation and plot the graphs again.

How does the graphs change after each run? In particular, what's the nature of the graphs when the rate of CBR traffic is 50% of the bandwidth?

Part 2: Behaviour of UDP

Reduce the bandwidth of the link 2-3 to say, 2 Mb. Repeat the above steps and observe the graphs in this case. From the graphs plotted observe how UDP occupies a larger portion of the bandwidth. How does the behaviour change for other variations of TCP (Newreno, Vegas)?

7. Write a TCL script to simulate the following scenario with ns2 simulator.
Consider six nodes, (as shown in the figure below) moving within a flat topology of 700m x 700m.

The initial positions of nodes are 0 (150,300) ,1 (300,500),2 (500,500),3 (300,100), 4(500,100)

and 5(650,300) respectively. A TCP connection is initiated between node 0 (source) and node 5(destination) through node 3 and node 4 i.e the route is 0-3-4-5.At time t = 3 seconds the FTP application runs over it.After time t=4.0 sec, node 3 (300,100) moves towards node 1 (300,500) with a speed of5.0m/secand after some time the path break, then the data transmit with a new path via node 1 and node 2i.e the new route 0-1-2-5.

The simulation lasts for 60 secs. In the above said case both the route has equal cost. Use DSR as the routing protocol and the IEEE 802.11 MAC protocol. Now Analyze the trace file and determine when the use of second route commence, and Plot the number of packets received by each node over the entire time duration of the simulation

8. Simulate a wired network and demonstrate Distance Vector Routing algorithm

9. Simulate a network which will create congestion in the network. With the trace file created identify the points at which congestion occurs by writing sed / awk scripts. Also write a mechanism to correct/control the congestion.

Note : Network Free and open source software simulators like NS2 / NS3 could be used. IfNS2 is used tcl scripting should be introduced . If NS3 is used c++ with python has to be introduced during first two or three weeks of the labs. Only above 9 experiments should be included for the laboratory exam.

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Implement network topologies, routing, error detection and correction techniques, protocol packet analysis using open source NS2/NS3

Cos	Mapping with Pos
CO1	PO1, PO3, PO5

Java Programming Laboratory

Subject Code	**MCAL37**	CIE Marks	**50**	**CREDITS : 0:0:1.5**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**	
Total Number of Lecture Hours	**42**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Design & Develop the fundamentals of Object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
* Design & Develop exception handling and multithreading concepts.
* Develop efficient Java applets and applications using OOP concepts.
* Design & Develop basic understanding of network application programs.

1. a) Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading.
   b) Write a JAVA Program to implement Inner class and demonstrate its Access protection.

2. Write a program in Java for String handling which performs the following:
   i) Checks the capacity of StringBuffer objects.
   ii) Reverses the contents of a string given on console and converts the resultant string in upper case.
   iii) Reads a string from console and appends it to the resultant string of (ii).

3. a). Write a JAVA Program to demonstrate Inheritance.
   b). Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

4. 1. Write a JAVA program which has
   i) A Class called Account that creates account with 500Rs minimum balance, a deposit()method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than 500Rs.
   ii) A Class called Less Balance Exception which returns the statement that says withdraw amount (Rs) is not valid.
   iii) A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception take appropriate action for the same.

5. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

6. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws).

7. Complete the following:
   1. Create a package named shape.
   2. Create some classes in the package representing some common shapes like Square,Triangle, and Circle.
   3. Import and compile these classes in other program.

8. Write a JAVA Program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday( ) to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek.SUNDAY.isWorkDay ( ) returns false.

9. Write a JAVA program which has
   i). A Interface class for Stack Operations
   ii). A Class that implements the Stack Interface and creates a fixed length Stack.
   iii).A Class that implements the Stack Interface and creates a Dynamic length Stack.
   iv). A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.

10. Write a JAVA program to print a chessboard pattern

11. Write a JAVA Program which uses FileInputStream / FileOutPutStream Classes.

12. Write JAVA programs which demonstrates utilities of LinkedList Class.

13. Write a JAVA program which uses Datagram Socket for Client Server Communication.

14. Write a JAVA applet program, which handles keyboard event.

Note 1: In the practical Examination each student has to pick one question from a lot of all the 14 questions.

CO1: Understand Java programming language fundamentals and run time environment. Gain knowledge and skill necessary to write java programs. Learn the object oriented concepts and its implementation in Java Implement the multithreading and client side programming.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

Analysis and Design of Algorithms Laboratory				
Subject Code	**MCAL38**	CIE Marks	**50**	**CREDITS : 0:0:1.5**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**	
Total Number of Lecture Hours	**42**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Analyze recursive algorithms and find their performance.
* Understanding concepts like Greedy technique, Divide & Conquer using real time application
* Implement algorithms on Dynamic programming concepts and backtracking techniques.

1. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n and analyze the time complexity.
2. Sort a given set of elements using Quick sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
4. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm
5. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
6. Implement 0/1 Knapsack problem using dynamic programming.
7. a). Implement Floyd's algorithm for the All-Pairs- Shortest-Paths Problem.

   b). Compute the transitive closure of a given directed graph using Warshall's algorithm.
8. Check whether a given graph is connected or not using DFS method.
9. Obtain the Topological ordering of vertices in a given graph using Source removal method.
10. Sort a given set of elements using the Heap sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

11. Find a subset of a given set S = {s1,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8}and d = 9 there are two solutions {1, 2, 6}and {1, 8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
12. Implement N Queen's problem using Back Tracking.
13. a) Implement Horspool algorithm for String Matching.
    b) Find the Binomial Co-efficient using Dynamic Programming.

Note 1: In the practical Examination each student has to pick one question from a lot of all the 13 questions.

Course Outcomes(CO):

CO1: Implement various algorithm design techniques and find their time complexities.

CO2: Choose an efficient algorithm to give optimize solution.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications (Autonomous)

Aided By Govt. of Karnataka

MCA Syllabus (2016 – 2019)

IV Semester

Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicale	Total Credits		CIE	SEE	
MCA41	Advanced Java Programming	4	---	---	4	3	30	70	100
MCA42	Software Testing and Practices	4	---	---	4	3	30	70	100
MCA43	Advanced Web Programming	4	---	---	4	3	30	70	100
MCA44	Elective-2	4	---	---	4	3	30	70	100
MCA45	Management Elective-3	4	---	---	4	3	30	70	100
MCAL46	Advanced Java Programming Lab	---		1.5	1.5	3	50	50	100
MCAL47	Software Testing Lab	---		1.5	1.5	3	50	50	100
MCAL48	Advanced Web Programming Lab	---		2	2	3	50	50	100
	Total	20	---	5	25	24	300	500	800

ELECTIVE - II		MANAGEMENT ELECTIVE - III	
MCA441	Data Warehousing & Mining	MCA451	Software Project Management
MCA442	Artificial Intelligence	MCA452	Supply Chain Management
MCA443	Software Architecture	MCA453	Enterprise Resource Planning
MCA444	Machine Learning	MCA454	E-Commerce and Management Information System

IV SEMESTER

ADVANCED JAVA PROGRAMMING

Subject Code	**MCA41**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

* Designing database access with java applications usingJ2EE concepts.
* Discuss the concepts of server side programming using Servlets &jsp.
* Analyze and implement Annotations in Java
* Design and implement the different types of enterprise java beans.

Unit No.	Modules	Teaching hours
1.	**Talking to Database :** Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions.	10
2.	**Servlet and JSP and Controlling the Structure of generated Servlets :** Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, SingleThreadModel interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking. Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax	10
3.	**JSP and Controlling the Structure of generated servlets** Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: The JSP page directive, import attribute, session attribute, isElignore attribute, buffer and autoflush attributes, info attribute, errorPage and iserror Page attributes, isThreadSafe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents	10

4.	**Annotations and Java Beans :** Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations with examples. Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence, Java Beans API.	10
5.	**EJB and Server Side Component Models :** Server Side Component Types, Session Beans, MessageDriven Beans, Entity Beans, The Java Persistence Model. Container services. Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB. Preparation, Definitions, naming conventions, convention for the Examples, coding the EJB, the contract, the bean Implementation class, out of Container Testing, Integration Testing. Models: The Stateless Session Bean, the Stateful Session Bean, the Singleton SessionBean, Message-Driven Beans. EJB and PERSISTENCE. Persistence Entity manager Mapping Persistence objects, Entity Relationships.	10

Question paper pattern:

* The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
* Each full question consists of 20 marks.
* Questions are set covering all the topics under each module.

Text Books :

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).

2. Java 6 Programming Black Book, Dreamtech Press. 2012 (Chapter 17,18,19,20, 21,22,27,28,29,30).

3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books:

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008.

2. Herbert Schildt, Java The Complete Reference, 8th Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.

Course Outcomes:

After completing the course the students are able to:

CO1: Develop an application using database access with java.

CO2: Develop of server sideprogramming using Servlets &jsp.

CO3: Implement the concept of annotations

CO4: Design, Develop enterprise java beans and implement them.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO8
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5

SOFTWARE TESTING AND PRACTICES				
Subject Code	**MCA42**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. The process of Software Testing Life Cycle and Types of Testing.
2. Differentiate between Manual Testing and Automation in Testing
3. Design of Test Cases using the testing tool Selenium IDE and Web Driver.
4. Identify different web Elements and apply them to design test cases.

Unit No.	Modules	Teaching hours
1.	**Introduction to Testing :** Introduction and Fundamentals of Testing, Myths and Facts of Software Testing, Quality Assurance and Quality Control, Testing Objectives, Software Testing Life Cycle (STLC), Test Planning, Test-case Design Technique, Equivalence Partitioning and Boundary Values, **Types of Testing :** White Box testing, Black Box Testing, Integration Testing, Regression Testing, Validation Testing, Alpha Testing, Beta Testing, Acceptance Testing. **Defect Management:** Defect Management Process, JIRA Defect Tracking Tools.	**10**
2.	**Software Test Automation:** Fundamentals of Test Automation, Manual Testing Vs Test Automation, Terms used in Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Challenges in Automation. Introduction to Selenium, Components of Selenium, Advantages and Disadvantages of Selenium, Installation of Selenium IDE & Firebug Add-on, Writing the Test Cases, Selenium Commands, Assert, Verify, Locators, Enhancements, Variables, Echo, Alert, and Popup.	**10**
3.	**Selenium –WebDriver:** Introduction to WebDriver , Comparison with Selenium RC, Architecture, Installation of Selenium Web Driver, Creating the Scripts in WebDriver, WebDriver Commands: Browser Commands, getUrl(), getTitle(), getPageSource(),close(), Quit(),Navigation Commands, backward(0,forward(),to(),refresh() WebElements Commands, Isselected(), IsEnabled(), getAttribute(), getText(),notify(), sendKeys(), submit(), wait()	**10**

4.	Web Element Locators,Xpath , id, LinkText, CSS Selector, Class Name, TagNameFindElement and FindElements Command, CheckBox and Radio Button Operation, DropDown and Multiple select Operations	**10**
5.	Handle Alert in WebDriver : dismiss(), accept(), getText(), sendKey(), Popup window handling in Web Drivers, getWindowHandle(), Wait commands in Web Drivers, Mouse Event using Action commands, Handling Multiple Windows, and IFrames, Running Test in Invisible Mode, Handling Dynamic Web Pages. Running selenium WebDriver in different popular Browser	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. 4 & 5 units shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under a each module.

Text Books:

1. Rex Black: Advanced Software Testing—Vol. 1, Shroff Publishers, 2011.
2. Srinivasan DesikanGopalaswamy: Software Testing Principles and Practices, 5th Edition, Pearson Education, 2007.
3. Paul C. Jorgensen: Software Testing A Craftman's Approach, 3rd Edition, Auernac Publications, 2008
4. David Burns: Selenium 2 Testing Tools: Beginner's Guide, PACKTPUBLISHING, 2012.

Reference Books:

Rex Black: Advanced Software Testing—Vol. 2, Shroff Publishers, 2011. 3. Gundecha Unmesh: Selenium Testing Tools Cook Book, PACKT PUBLISHING, 2012.

COURSE OUTCOME(CO):

CO1 : The process of Software Testing Life Cycle and Types of Testing.
CO2 : Differentiate between Manual and Automation in Testing
CO3 : Design of Test Cases using the testing tool Selenium IDE and Web Driver.
CO4 : Identify different web Elements and apply them to design test cases.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO8
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5

ADVANCED WEB PROGRAMMING

Subject Code	**MCA43**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. To design web pages using Bootstrap framework.
2. To develop different approaches of Web technologies using PHP and Ruby on Rails.
3. Design and develop web applications using MVC architecture
4. Visualize data driven documents for web apps.

Unit No.	Modules	Teaching hours
1.	**Bootstrap -** Introduction, **Layout** : Container, Grid, **Content**: Typography, Code, Images, Tables, **Components**: Alerts, Breadcrumb, Buttons / Buttons group, List group, Tabs/pills, Pagination/Pager, Drop down, Modal, Carousel, Collapse, Media objects, Form, Input group, Progress bar, Scrollspy, Tooltip	**10**
2.	**Introduction to PHP** - Client/server communication, server side scripts, how web works - Setting up the environment (LAMP/ WAMP server).Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files handlers. **Building Web applications with PHP**, tracking users, cookies, sessions, Using databases, Handling XML.	**10**
3.	**Introduction to Ruby and Rails**- Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching. **Web Development with Rails** - MVC Architecture, Overview of Rails, Document requests, processing forms, Rails directory structure, Scaffolding, Views and Layouts, Ruby on Rails- AJAX, File uploading, Rails applications with Databases.	**10**
4.	**jQuery** - Basics, Selecting elements, Handling Events - mouse events, keyboard events, fom events, document/window events, jQuery effects / Animation-show / hide, fade, animate, stop, DOM manipulation methods, Sending data with AJAX-load(), $.get() and $.post() methods.	**10**

5.	**D3.js (Data Driven Documents): Data visualization tool for web apps** Introduction to D3: Building a Simple Subway Train Status Board, Graphing Mean Daily Plaza Traffic. Scales, Axes, and Lines, Graphing Turnstile Traffic, Interaction and Transitions, Subway Connectivity, Scheduled Wait Time Distribution	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 2 and 3 shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under each module.

Text Books:

1. "Bootstrap Essentials",Snig Bhaumik, PACKT publishing
2. Robert W. Sebesta: Programming the World Wide Web, 7th Edition, Pearson Education, 2012.
3. David Sawyer McFarland,"Javascript and Jquery-The missing manual", 3rd edition, O'Reilly, 2014
4. Mike Dewar: "Getting Started with D3": O'Reilly Media, 2012

Reference Books:

1. Steven Holzner "Complete Reference-PHP ", Tata Mc Graw Hill,2008
2. "Bootstrap programming cook book"-Fabio Cimo,Web Code Geeks
3. jQuery comuunity experts,"Javascript and Jquery", 3rd edition, O'Reilly, 2010.

Course Outcome (CO): students will be able to

CO-1 : Design web applications using Responsive designs.
CO-2 : Design and develop web applications using PHP and SQL
CO-3 : Apply MVC architecture to design & develop web applications
CO-4 : Building web portals & create data visualizations for web apps.

Cos	Mapping with Pos
CO1	PO5,PO11
CO2	PO2,PO4,PO5,PO11
CO3	PO2,PO4,PO5,PO7,PO11
CO4	PO5,PO11

Data Warehousing & Data Mining				
Subject Code	**MCA441**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. Learn the concept of Data warehousing and OLAP.
2 Understand storage and retrieval technique of data from DATA CUBE.
3. Analyze different types of data and different preprocessing techniques.
4. Evaluate various Association algorithms and its applications.
5. Apply different Classification technique and evaluate them.
6. Analyze different clustering techniques and their applications

Unit No.	Modules	Teaching hours
1.	**Data warehousing and OLAP :** Data Warehouse basic concepts Data Warehouse Modeling, Data Cube and OLAP: Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.	**10**
2.	**Data Mining and its Applications :** Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Which technologies are used, which kinds of applications are targeted by Data Mining Which technologies are used, which kinds of applications are targeted by Data Mining , Types of Data, Data Mining Applications, Data Preprocessing	**10**
3.	**Association Analysis: Basic Concepts and Algorithms :** Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns	**10**
4.	**Classification : Methods, Improving accuracy of classification** Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, and Nearest Neighbor Classifiers. Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of classification methods, Evaluation criteria for classification methods, Multiclass Problem.	**10**
5.	**Clustering Techniques and Outlier Analysis :** Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical	**10**

	Methods, Density Based Methods, Quality and Validity of Cluster Analysis, Outlier detection methods, Statistical Approaches, Clustering based applications.	

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory.
2. Module1 and 4 shall have internal choice.
3. Each full question consists of 20 marks.
4. Questions are set covering all the topics under each module.

Text Books:

1. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.

2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison- Wesley, 2005.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.

2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

3. Alex Berson and Stephen J.Smith: Data Warehousing, Data Mining, and OLAP Computing McGrawHill Publisher, 1997.

Course Outcome (CO): At the end of this course, the students will be able to

CO-1: Student is able to understand the basic concepts of Data Warehousing and OLAP & Data cube implementation.

CO-2: Understands about Data Mining Challenges, applications & Pre-processing techniques.

CO-3: Understands different concepts and algorithms used for Associations Analysis.

CO-4: Demonstrate different Classification techniques and evaluate accuracy of classification methods.

CO-5: Student understand the usage of different Clustering techniques and approaches of different Outlier detection methods.

ARTIFICIAL INTELLIGENCE

Subject Code	**MCA442**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO) :

1. Understand about agent, behavior and structure
2. Learn different search strategies and fuzzy methodology
3. Representation of knowledge and reasoning
4. Gain knowledge about planning and learning strategies

Unit No.	Modules	Teaching hours
1.	Artificial Intelligence: Introduction: over view of AI, Importance of AI, AI- History AI and related fields, search control strategy: preliminary concepts, AI-Applications, Turing Test, Application areas, Problem Space, Problem Characteristics, and AI Problems.	**10**
2.	Fuzzy logic: Introduction, fuzzy set theory, classical sets, membership function, fuzzy rule generation, compliment, Intersections, Unions, combinations of operations, Aggregation operations. Fuzzy number, Linguistic variables, arithmetic operations on intervals and numbers, lattice of fuzzy numbers, fuzzy equations, fuzzy relations, fuzzy projections, fuzzy systems, fuzzy propositions, fuzzy inference, fuzzyfications, and defuzzification.	**10**
3.	Search Strategies: Introduction, Brute Force Techniques- Breadth first Search(BFS), Depth First Search(DFS), DFS with Iterative Deepening, Examples, Bi-directional search, Translating between English and logic notation, logical operators, Truth tables, complex truth table, Tautology, Equivalence. Proposition logic, predicate calculus. Heuristic Search : Introduction, heuristic search, Techniques : Hill Climbing, Best First Search, Admissibility, and Monotonicity.	**10**
4.	Probabilistic Reasoning: Bayesian probabilistic inference, Bayes Theorem, Knowledge based system, representation of knowledge origination, knowledge manipulation.	**10**
5.	Planning: Introduction, Example, Components of a Planning System, Goal Stack Planning, Hierarchical Planning. Natural Language Processing: Introduction, overview of linguistics, grammers and languages. Basic parsing techniques, expert system architecture, characteristics of expert systems, Rules for Knowledge in Language Understanding, Syntax Analysis, Semantic Analysis, Natural Language Applications.	**10**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory.
2. Module4 and 5 shall have internal choice.
3. Each full question consists of 20 marks.
4. Questions are set covering all the topics under each module.

Text Books:

1. "Artificial Intelligence-A modern Approach" Stuart Russel, Peter Norvig, second edition, PHI/Pearson Education, 2010
2. " Introduction to Artificial Intelligence and Expert Systems", by DAN W PATTERSON
3. Artificial Intelligence – Structures and Strategies for Complex Problem Solving, George F. Luger, Pearson Education, 4/e, 2003.
4. Fuzzy logic of Engineering Applications, PHI. Thimothi and Ross:

Reference Books:

1. Artificial Intelligence and Intelligent Systems, N. P. Padhy, Oxford Press, 4/e, 2008.
2. Artificial Intelligence: A new Synhesis Approach, Nils J. Nilson, Morgan Kaufmann, 1998.
3. G.J.Klir and B.Yuan: Fuzzy sets and Fuzzy logic, PHI, 1995

Course Outcome (CO): At the end of this course, the students will be able to

CO1: Understanding of Artificial intelligent concepts.

CO2: Apply different Search strategies in problem solving.

CO3: Represent knowledge and perform reasoning.

CO4: Apply Planning strategies and machine learning techniques.

Cos	Mapping with Pos
CO1	PO1,PO12
CO2	PO7,P12
CO3	PO1,PO2
CO4	PO5,PO7, PO12

SOFTWARE ARCHITECTURE				
Subject Code	**MCA443**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Outcome (CLO):

1. Designed to understand emerging field of software architecture in software development and the critical need for the development of such architectures.
2. Develop ability to perform the analyses necessary to formulate effective software architectures.
3. The successful student will be able to analyse Software Engineering problems in terms of architectural thinking.
4. The student will have a firm working grasp of the architectural concepts of platform, framework, pattern

Unit No.	Modules	Teaching hours
	Introduction and Context of Software Architecture The Architecture Business Cycle. Where do architectures come from? Software process and business cycle. What makes a 'Good Architecture'? What it is and what it is not. Other points of view. Architectural patterns, reference models and reference architectures. Importance. Architectural Structures and Views	**12**
2.	Architecture and Quality attributes: System Quality attributes, Quality attribute scenarios in practice. Other system quality attributes; Business qualities; Architectural Qualities; Achieving Quality	**08**
3.	Introducing Tactics: Availability tactics, modifiability tactics, performance tactics, Security tactics, Testability tactics, Usability tactics	**08**
4.	Architectural Styles: Pipes and Filters, Data Abstraction and OO organization, Event-based, Implicit Invocation, Layered Systems, Repositories, Interpreters, Process Control Architectural Patterns: Mud to Structure: Layers, Pipes and Filters, Black board	**10**
5.	Architectural Patterns: Distributed Systems: Broker Interactive Systems: MVC Case Studies: Keyword in Context, Instrumentation software, Mobile Robotics, Three Vignettes in mixed style,	**12**

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory.
2. Module 1 and 4 shall have internal choice.
3. Each full question consists of 20 marks
4. Questions are set covering all the topics under each module.

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3d Edition, Pearson Education, 2013

2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern- Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2012

Course Outcomes(CO)

CO 1: To acquire the knowledge of the context and importance of software architecture

CO 2: To apply the knowledge of various architectural tactics and styles in given scenario

CO 3: To comprehend an architectural style described as patterns.

CO 4: To analyse and apply architectural style in multiple contexts

Cos	Mapping with Pos
CO1	PO1,PO3
CO2	PO1,P3,PO8
CO3	PO1,PO3,PO8
CO4	PO1,PO3, PO8,PO10

Machine Learning				
Subject Code	**MCA445**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Outcome (CLO):

1. Learn the concepts of feed forward neural networks.
2. Understand the basic mathematical elements of the theory of fuzzy sets, fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems.
3. Analyse the design of a genetic algorithm, and comment its weaknesses and strengths
4. Develop genetic algorithms for single and multiple objective optimization problems

Unit No.	Modules	Teaching hours
1.	**Neural Networks :** History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perception Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.	**10**
2.	**Fuzzy Logic :** Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations .Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets	**12**
3.	**Neuro-Fuzzy Systems :** Architecture of Neuro Fuzzy Networks, Applications of FuzzyLogic: Medicine, Economics etc.	**08**
4.	**Artificial Intelligence :** AI problems, AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation. Searching: Searching for solutions, uniformed search strategies, Heuristic functions. Constrain satisfaction problems: Game Playing Alpha-Beta pruning, Evaluation functions, cutting of search, Knowledge Representation & Reasons logical Agents, logic,	**10**

	propositional logic, Resolution patterns in propositional logic, Resolution, Forward & Backward Chaining, Planning – Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state.	
5.	**Genetic Algorithms :** An Overview, GA in problem solving, and Implementation of GA, Genetic Algorithms: survival of the fittest principle in Biology, Genetic Algorithms, Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms.	**10**

Text Books:

1. Anderson J.A.: An Introduction to Neural Networks, PHI, 1999.

2. Hertz J. Krogh, R.G. Palmer: Introduction to the Theory of Neural Computation, Addison- Wesley, 1991.

3. G.J. Klir& B. Yuan: Fuzzy Sets & Fuzzy Logic, PHI, 1995.

4. Stuart Russel, Peter Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, PHI/Pearson Education.

5. Patrick Henry Winston, "Artificial Intelligence", 3rd Edition, Pearson Education.

6. Melanie Mitchell: An Introduction to Genetic Algorithm, PHI, 1998.

Course Outcomes(CO)

CO1: Understand the fundamental principles of Neural Networks
a good knowledge of responsibilities of fuzzy logic.

CO2: Understandthe different methods and techniques used for Genetic Algorithm.

CO3: Understand the concept of Neuro fuzzy logic and activity of neural networks.

CO4: Understand and Creating the Framework and technique Monitoring.

CO5: Understand how to manage the people using different techniques

Cos	Mapping with Pos
CO1	PO1,PO5
CO2	PO1,PO2
CO3	PO1,PO3,PO4
CO4	PO3
CO5	PO11, PO12

SOFTWARE PROJECT MANAGEMENT				
Subject Code	**MCA451**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. Understand the practices and methods for successful software project management

2. Identify techniques for requirements, policies and decision making for effective resource management

3. Apply the evaluation techniques for estimating cost, benefits, schedule and risk

4. Devise a framework for software project management plan for activities, risk, monitoring and control

5. Devise a framework to manage people

Unit No.	Modules	Teaching hours
1.	**INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT** Introduction, Why is Software Project Management important? What is a Project?, Contract 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	**10**
2.	**PROJECT EVALUATION & FINANCE :** Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programmes.	**10**
3.	**ACTIVITY PLANNING :** Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward Pass, Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks. Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification.	**10**
4.	**MONITORING AND CONTROL :** 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.	**10**

5.	**MANAGING PEOPLE AND WORKING IN TEAMS :** Introduction, Understanding Behavior, Organizational Behavior: 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 Working In Teams, Becoming a Team.	**10**

Question Paper Pattern:

The question paper will have ten questions.

1. The question paper will have five questions. All questions are compulsory.

2. Module 3 and 5 shall have internal choice.

3. Each full question consists of 20 marks Questions are set covering all the topics under each module.

Text Books:

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011.

2. "Accounting for Management" JawaharLal, 5th Edition, Wheeler Publications, Delhi

Cos	Mapping with Pos
CO1	PO2
CO2	PO2
CO3	PO8,PO9
CO4	PO8,PO9
CO5	PO11, PO12

Supply Chain Management				
Subject Code	**MCA452**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Outcome (CLO):

1. Understand and able to apply metrics supply chain assessed.
2. Define the principles to scheduling & planning.
3. Apply the principles of strategies/master planning of resource in supply chain.
4. Identify the principles of customer & supplier relationship management.
5. Learn the principles of quantity & learning manufacturing.

Unit No.	Modules	Teaching hours
1.	**Introduction to supply chain ,Performance of supply chain** What is a Supply Chain; Decision phases in a supply Chain; Process view of a Supply Chain; The importance of Supply Chain Flows; Examples of Supply Chains. Competitive and Supply Chain strategies; Achieving strategic fit; Expanding strategic scope. Supply chain drivers and obstacles, designing distribution network. Drivers of Supply Chain Performance; A framework for structuring drivers;Facilities, Inventory, Transportation, and Information; Obstacles to achievestrategic fitThe role of distribution in the Supply Chain; factors influencing distribution network design; Design options for a distribution network; the value of distributors in the Supply Chain; Distribution Networks in practice.	**10**
2.	**Network Design** The role of network design in the Supply Chain; Factors influencing Network design Decisions; A framework for Network Design Decisions; Models for facility Location and Capacity Allocation; making Network Design decisions in practice. The impact of uncertainty on Network design; Discounted cash flow analysis; Representations of uncertainty; Evaluating Network Design decisions using Decision Trees; Making Supply Chain decisions under uncertainty in practice. Purchasing and vendor management: Centralized and decentralized purchasing, function of purchase department and purchase policies, vendor rating/ evaluation, single vendor concept ,management of stores, account for materials, just in time &Kanban systems of inventory management **Demand forecasting, Aggregate planning** The role of forecasting in a Supply Chain; Characteristics of forecast; Components of a forecast andforecasting methods; Basic approach of Demand	**10**

	forecasting; Time seriesforecasting methods; Measures of forecast errors; The role of aggregateplanning in a supply Chain; The aggregate planning problem; Aggregateplanning strategies.	
3.	**Inventory Management** The role of cycle inventory in a supply Chain;Economies of scale to exploit fixed costs, quantity discounts; Short-term discounting; Managing multi-echelon cycle inventory; Estimating cycle inventory related costs in practice. The role of cycle inventory in a supply Chain; Economies of scale to exploit fixed costs, quantity discounts; Short-term discounting; Managing multi-echelon cycle inventory; Estimating cycle inventory related costs in practice.	**10**
4.	**Pricing and Revenue management , coordination** The role of revenue management in Supply Chain; revenue management for multiple customer segments, perishable assets, seasonal demand, and bulk and spot contracts; Using revenue management in practice Lack of Supply Chain coordination and Bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in the Supply Chain; managerial levers to achieve coordination; Building strategic partnerships and trust within a supply Chain; Achieving coordination in practice.	**10**
5.	**IT, Internet and Supply chain** The role of IT in the Supply Chain; The Supply Chain IT framework; CRM; Internal SCM; Supplier Relationship Management; The transaction management foundation; The future if IT in SCM; Supply Chain It in practice. The role of E-Business in Supply Chain; The E-Business frame work; TheB2B addition to the E-Business framework; E-Business in practice	**10**

Question Paper Pattern:

1. The question paper will have five questions. All questions are compulsory. Module 1 and 2 shall have internal choice.

2. Each full question consists of 20 marks.

3. Questions are set covering all the topics under a each module.

Books:

1. Sunil Chopra and Peter Meindl, Supply Chain Management - Strategy, Planning and Operation, Pearson/PHI, 3rd Edition, 2007.

2. Coyle, Bardi, Longley, The management of Business Logistics - A supply Chain Perspective, Thomson Press, 2006.

3. Supply Chain Management by Janat Shah Pearson Publication 2008.

Reference Books:

1. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition, 2008.

2. Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, 2005.

3. David Simchi-Levi et al, Designing and Managing the Supply Chain Concepts,

Course Out Comes:

CO1: Communicate effectively both orally and in writing

CO2: Knowledge of the legal &ethical environment impacting business organization, & exhibit an understanding appreciation of the ethical implication of decision

CO3: Enage in critical thinking by analyzing situation & constructing selecting viable situation to solve problems

CO4: Demonstrate an ability to work effectively with others.

CO5: Knowledge of current information theories and models techniques and practices in all of the major business disciplines including the general areas of accounting and finance information technologies management marketing and quantitative analysis.

Cos	Mapping with Pos
CO1	PO3, PO6
CO2	PO9
CO3	PO7
CO4	PO12
CO5	PO12

ENTERPRISE RESOURCE PLANNING				
Subject Code	**MCA453**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. Identify the factors that led to the development of ERP system
2. ERP implementation using different Techniques
3. Learn the of business development modules
4. Analize the ERP Market, E-Commerce and Internet

Unit No.	Modules	Teaching hours
1.	**Introduction To ERP** Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On–line Analytical Processing, Supply Chain Management	10
2.	**ERP Implementation :** Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring	10
3.	**Business Modules :** Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	10
4.	**ERP Market :** ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.	10
5.	**ERP–Present And Future :** Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.	10

Question paper pattern:

1. The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under a each module.

Text Books :

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.

2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 2001.

Reference Books:

1. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning concepts and Planning”, Prentice Hall, 1998.
2. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

Course Out Comes:

CO1: Acquire knowledge of Benefits of ERP, Process Re-engineering Project management and Monitoring

CO2: Analyze the performance of ProjectQuality management

CO3: Know how ERP evolves in market place Develop the ERP system, ERP with E-Commerce & Internet

Cos	Mapping with Pos
CO1	PO3, PO6
CO2	PO9
CO3	PO7

E-commerce and Management Information System				
Subject Code	**MCA454**	CIE Marks	**30**	**CREDITS : 4:0:0**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**	
Total Number of Lecture Hours	**50**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. Able to explain why information system are so important today for business and management.
2. Evaluate the role of the major types of information system in a business environment and their relationship to each other.
3. Define an IT infrastructure and describe its components
4. Learn the core activities in the system development process.

Unit No.	Modules	Teaching hours
1.	**Information and Knowledge** Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge, **Introduction of MIS** MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system. MIS: organization effectiveness **Decision Making and DSS** Decision making concepts; decision making process, decision-making by analytical modeling, Behavioral concepts in decision making, organizational decision-making, Decision structure, DSS components, Management reporting alternatives	**10**
2.	**Electronic Business systems :** Enterprise business system – Introduction, cross-functional enterprise applications, real world case, Functional business system, - Introduction, marketing systems, sales force automation, CIM, HRM, online accounting system, Customer relationship management, ERP, Supply chain management (real world cases for the above) **Client Server Architecture and E-business Technology** Client server architecture, implementation strategies, Introduction to E-business, model of E-business, internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, Web enabled business management, MIS in Web environment.	**10**

3.	**E-Commerce Introduction** Course overview; Introduction to e-commerce, E-commerce Business Models and Concepts, Ecommerce Infrastructure: The Internet and World Wide Web, Web design, JavaScript Internet Information Server (IIS); Personal Web Server (PWS).	**10**
4.	**E-Commerce techniques and Issues** Introduction to Active Server Pages (ASP), Building an E-Commerce Web Site, E-Commerce Payment Systems, E-Commerce Marketing Techniques, Building product catalogue, Search product catalogue, Web Spider and search agent, Ethical, Social and Political Issues in E-Commerce	**10**
5.	**Internet Communication** Transaction Systems, Shopping Carts, XML, E-Commerce Applications: Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business (B2B), Digital Government, Marketplaces, and Communities, Security and Encryption, Web Security.	**10**

Question Paper Pattern:

1. The question paper will have five questions. All questions are compulsory. Module 4 and 5 shall have internal choice.
2. Each full question consists of 20 marks.
3. Questions are set covering all the topics under a each module.

Text Books:

1. Waman S Jhawadekar: Management Information System, 3rd Edition, Tata McGraw Hill.
2. James A O'Brien and George M Marakas: Management Information System, 7th Edition, Tata McGraw Hill, 2006,
3. Turban, Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
4. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How to Programe, Prentice hall, 2001

Reference Books:

1. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang: E-Commerce Fundamentals and Applications, Wile India Edition
2. Ralph M Stair and George W Reynolds: Principles of Information Systems, 7th Edition, Thomson, 2010 .
3. Steven Alter: Information Systems - The Foundation of E-Business, 4th Edition, Pearson Education, 2001

Course Outcomes :

CO1: Recognize the roles and uses of technology in business systems, operations and describe organizational structure &business processes.Apply the knowledge in the development of a suitable electronic file storage system for a business

CO2: Demonstrate an understanding of the process in systems design, development and

CO3: Describe several generic business applications of data communications technology Define, analyze the principles of E-commerce, basics of World Wide Web and analyzing the concept of electronic data interchange, its legal, social and technical aspects.

CO4: Identify the fundamental principles of e-commerce and its applications in business like E-banking, electronic payment system, the security issues over the web, the available solutions and future aspects of e-commerce security.

Cos	Mapping with Pos
CO1	PO3, PO6
CO2	PO9
CO3	PO7
CO4	PO12

ADVANCED JAVA PROGRAMMING LABORATORY				
Subject Code	**MCAL46**	CIE Marks	**50**	**CREDITS : 0:0:1.5**
Number of Lecture Hours/Week	**03**	SEE Marks	**50**	
Total Number of Lecture Hours	**42**	SEE Hours	**03**	

Course Learning Objectives (CLO):

1. Developing the java applications using database.
2. Create java applicationsusing Servlet services methods, auto web page refresh, Session tracking using cookie and Http Session in Servlet.
3. Demonstrate JSP (page attributes, action tags and all basic tags) and types of EJB application.

Unit No.	Program Statements
1.	Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries (For example update, delete, search etc…).
2.	Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).
3.	Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).
4.	Write a JAVA Servlet Program to implement and demonstrate get() and Post methods(Using HTTP Servlet Class).
5.	Write a JAVA Servlet Program using cookies to remember user preferences.
6.	Write a JAVA Servlet program to track HttpSession by accepting user name and password using HTML and display the profile page on successful login using Database.
7.	Write a JAVA JSP Program which uses jsp:include and jsp:forward action to display a Webpage.
8.	Write a JAVA JSP Program which uses <jsp:plugin> tag to run a applet
9.	Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean class, populate Bean and display the same information through another JSP.

10.	Write a JSP program to implement all the attributes of page directive tag.
11.	An EJB application that demonstrates Session Bean (with appropriate business logic).
12.	An EJB application that demonstrates MDB (with appropriate business logic).
13.	An EJB application that demonstrates persistence (with appropriate business logic).
14.	Case Study: Develop a small java Application using the above concepts.

Note 1: In the practical Examination each student has to pick one question from a lot of all the 14 questions.

Course Outcomes: After completing the course the students are able to:

CO1 : Design and create the J2EEapplications using database access with java applications. Apply the concepts of servers ide programming using Servlets and jsp., Demonstrate the application concept of remote method invocation.design, Develop enterprise java beans and implement them. Apply full development cycle of java application using struts and hibernate concepts

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO5,PO7,PO9,PO12

SOFTWARE TESTING LABORATORY				
Subject Code	**MCAL47**	CIE Marks	**50**	**CREDITS : 0:0:1.5**
Number of Lecture Hours/Week	**03**	SEE Marks	**50**	
Total Number of Lecture Hours	**42**	SEE Hours	**03**	

Course Learning Objectives :

1. Develop test cases for various web sites manually.
2. Design automates test cases for various web sites using Selenium IDE.
3. Develop java codes for designing automates test cases for various web sites using Selenium WebDriver.

Unit No.	Program Statements
1.	Design a Login and Registration web page and write the manual test cases for the same.
2.	Write a test suite containing minimum 4 test cases for any two web- sites using Selenium IDE, (use Asset and Verify commands)
3.	Write a java program to perform the folowing operation in Selenium WebDriver I. Launch a new Browser II. Open any Website III. Get Page Title name and Title length IV. Print Page Title and Title length on the Eclipse Console. V. Get Page URL and verify if the it is a correct page opened VI. Get Page Source (HTML Source code) and Page Source length VII. Print Page Length on Eclipse Console. VIII. Close the Browser.
4.	Write a java program to demonstate Browser Navigation Commands in selenium WebDrivers performing the following Operation I. Launch new Browser II. Open any Website (Example : www.newtours.demoaut.com) III. Click on Registration link using xpath and click command IV. Come back to Home page V. Again go back to Registration page VI. Again come back to Home page VII. Refresh the Browser VIII. Close the Browser

5.	Write a java program to demonstate Radio Buttons and Checkboxes Commands in selenium WebDrivers performing the following Operation I. Launch new Browser I. Open any webpage which has radio buttons and checkboxes II. Select the deselected Radio button III. Select the radio button Using Id attribute IV. Check the Checkbox Using Value attribute to match the selection V. Check the Check Box Using CSS Selector
6.	Write a java program to demonstateFindElement and FindElements Commands in selenium WebDrivers performing the following Operation I. Launch new Browser II. Open a login form for any web site III. Type User Name and password Using Name locator IV. Click on the Link using 'patialLinkTest' locator and search for a given word V. Click on the Link using 'linkTest' locator VI. Identify Submit button with 'tagName', convert it in to string and print it on the console VII. Click on Submit button Using ID locator
7.	Write a java program to demonstateFindElement and FindElements Commands in selenium WebDrivers performing the following Operation I. Launch new Browser II. Open a login form for any web site III. Type User Name and password Using Name locator IV. Click on the Link using 'patialLinkTest' locator and search for a given word V. Click on the Link using 'linkTest' locator VI. Identify Submit button with 'tagName', convert it in to string and print it on the console VII. Click on Submit button Using ID locator
8.	Write a java program to demonstrate Multiple Select Operations in selenium WebDrivers performing the following Operation I. Launch new Browser II. Open URL "www.automationpractice.com" III. Use Name locator to identify the element and Select an element from Multiple selection box IV. Use selectByIndex and deselectByIndex to Select any option and then deselect it V. Use selectByVisibleText and deselectByVisibleText to Select an then deselect it VI. Print and select all the options for the selected Multiple selection list. VII. Deselect all options VIII. Close the browser

9.	Demonstrate how to Handle Alerts and popUp boxes using Selenium WebDriver.
10.	Demonstrate how to Handle multiple windows in selenium webDriver

Note 1: In the practical Examination each student has to pick one question from a lot of all the 10 questions.

CO1 : Design test cares for different websites in selenium IDE and web drawees.

Cos	Mapping with Pos
CO1	PO1,PO2,PO3,PO5,PO7,PO9,PO12

Advanced Web Programming Laboratory

Subject Code	**MCAL48**	CIE Marks	**50**	**CREDITS : 0:0:2**
Number of Lecture Hours/Week	**04**	SEE Marks	**50**	
Total Number of Lecture Hours	**56**	SEE Hours	**03**	

Course Outcomes (CO): At the end of this course, the students will be able to

CO-1: To design a web applications using Responsive web designing tools.

CO-2: Design and develop web applications using PHP, MYSQL and with MVC frameworks.

NOTE:

1. **In the examination, one exercise from part A is asked for 30 marks**
2. **Mini project student group size is limited to two students only.**
3. **The mini project under part B has to be evaluated for 20 marks.**
4. **Project report duly signed by the Guide and HOD, need to be submitted during examination.**

1.	a. Design a web page using Grid system to display Pascal's triangle. b. Design a web page to create Photo gallery using grid system.
2.	Design a webpage which shows a modal for Sign Up and Sign In. Sign In and Sign Up should be shown using Pills/Tabs.
3.	a. Design a web page for Photo Gallery using Bootstrap Carousel b. Design a web page using Pagination component to display first 5 records in first page and next 5 records in second page and so on.
4.	a) Write a PHP program to store current date-time in a COOKIE and display the' Last visited on' date-time on the web page upon reopening of the same page. b) Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page
5.	Create XHTML form with Name of License Holder, Gender, Vehicle ID, Make of the vehicle ,License plate, Vehicle type and Date of Model. On submitting, store the values in MySQL table. Retrieve and display the data based on name.
6.	Build a Rails application to accept book information viz. accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
7.	Write jQuery program to solve the following : a) Limit character input in the text area including count. b) Based on check box, disable / enables the form submit button.

8.	Create a XHTML form to collect Viewers Opinion based on rating (1 to 5). Finally Display the survey report in terms of a bar-graph using D3-JS	**10**

Note 1: Student has to pick one question from a lot of 8 questions

PART - B

Develop a bootstrap based web application project using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.

NOTE:

1. In the examination, one exercise from part A is asked for 30 marks.
2. The mini project under part B has to be evaluated for 20 marks.
3. A team of two students must develop the mini project.
However during the examination, each student must demonstrate the project individually.
4. The team must submit a brief project report (25-30 pages) that must include the following

- Introduction
- Requirement Analysis
- Software Requirement Specification
- Analysis and Design
- Implementation
- Testing

5. The report must be evaluated for 5 Marks. Demonstration and Viva for 15 Marks.

6. Project report duly signed by the Guide and HOD need to be submitted during examination

Cos	Mapping with Pos
CO1	PO5, PO11
CO2	PO2, PO4, PO5, PO11

Dr. Ambedkar Institute of Technology, Bengaluru-56
(An Autonomous Institute, Affiliated to V T U, Belagavi)
Nationally Accredited by NAAC with 'A' Grade

Master of Computer Applications Program
Accredited by National Board of Accreditation

MCA V and VI semester

(2016 – 2019)

Dr. Ambedkar Institute of Technology, Bengaluru – 560056

Master of Computer Applications

Institute - Vision and Mission

VISION

To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

MISSION

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
- To generate new knowledge by engaging faculty and students in research, development and innovation leading to newer knowledge.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
- To install moral and ethical values with social and professional commitment

DEPARTMENT - VISION AND MISSION

VISION

To create a quality human resource with good technical competence to face the global challenges.

MISSION

- To create a Center of Excellence through industry institute interaction.
- To prepare students for utilizing more creativity, innovativeness and leadership Qualities.
- To inculcate a sense of commitment to the students towards socio-economic development of the nation

Program Educational Objectives

- **PEO 1:** Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.
- **PEO 2**: Graduates are prepared to be employed in academics and research environment.
- **PEO 3**: To provide an opportunity to students to learn the latest trends in computer technology and make them ready for life-long learning process with leadership skills and corporate social responsibilities.

Program Outcomes:

PO 1: Ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems.

PO 2: Graduates will be able to demonstrate with excellent programming, analytical, logical and problem solving skills.

PO 3: Graduates will be able to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.

PO 4: An ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO 5: An ability to select modern computing tools and techniques and use them with dexterity.

PO 6: An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.

PO 7: An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

PO 8: Develop and maintain medium to large scale application software using theoretical and applied knowledge of software engineering and project management.

PO 9: An ability to communicate effectively.

PO 10: An ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.

PO 11: An ability to execute the project either individually or in a group.

PO 12: An ability to become an Entrepreneur in the field of information technology to create a value and wealth for the betterment of the individual and society at large.

		I Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA11	Data structures using C	4	--	-	4	3	30	70	100
MCA12	Unix Programming	4	--	-	4	3	30	70	100
MCA13	Web Technologies	4	--	-	4	3	30	70	100
MCA14	Computer Organization	4	--	-	4	3	30	70	100
MCA15	Discrete Mathematical Structures	4	--	-	4	3	30	70	100
MCAL16	Data structures using C Lab	--		1.5	1.5	3	50	50	100
MCAL17	Unix Programming Lab	--		1.5	1.5	3	50	50	100
MCAL18	Web Programming Lab	--		2	2	3	50	50	100
	Total	20	-	5	25	24	300	500	800

		II Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA21	Python Programming	4	--	-	4	3	30	70	100
MCA22	Object oriented programming using C++	4	--	-	4	3	30	70	100
MCA23	Database Management Systems	4	--	-	4	3	30	70	100
MCA24	Operating Systems	4	--	-	4	3	30	70	100
MCA25	Professional Communication & Ethics	4	--	-	4	3	30	70	100
MCAL26	Python Programming Lab	--		1.5	1.5	3	50	50	100
MCAL27	Object oriented programming using C++ lab	--		1.5	1.5	3	50	50	100
MCAL28	DBMS Lab	--		2	2	4	50	50	100
	Total	20	-	5	25	24	300	500	800

		III Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Seminar	Practicals	Total Credits		CIE	SEE	
MCA31	Computer Networks	4	--	-	4	3	30	70	100
MCA32	Java Programming	4	--	-	4	3	30	70	100
MCA33	Analysis and Design of Algorithms	4	--	-	4	3	30	70	100
MCA34	Software Engineering	4	--	-	4	3	30	70	100
MCA35	Elective -1	4	--	-	4	3	30	70	100
MCAL36	Computer Networks Lab	--		2	2	3	50	50	100
MCAL37	Java Programming Lab	--		1.5	1.5	3	50	50	100
MCAL38	Analysis and Design of Algorithms Lab	--		1.5	1.5	3	50	50	100
	Total	20	-	5	25	24	300	500	800

ELECTIVE-1	
MCA351	**Intellectual Property Rights**
MCA352	**Data Analysis using Spread Sheets**
MCA353	**Operations Research**
MCA354	**Principles of User Interface Design**

		IV Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA41	Advanced Java Programming	4	--	-	4	3	30	70	100
MCA42	Software Testing and Practices	4	--	-	4	3	30	70	100
MCA43	Advanced Web Programming	4	--	-	4	3	30	70	100
MCA44	Elective-2	4	--	-	4	3	30	70	100
MCA45	Management Elective-3	4	--	-	4	3	30	70	100
MCAL46	Advanced Java Programming Lab	--		1.5	1.5	3	50	50	100
MCAL47	Software Testing Lab	--		1.5	1.5	3	50	50	100
MCAL48	Advanced Web Programming Lab	--		2	2	3	50	50	100
Total		20	-	5	25	24	300	500	800

ELECTIVE—2		MANAGEMENT ELECTIVE-3	
MCA441	Data Warehousing & Mining	MCA451	Software Project Management
MCA442	Artificial Intelligence	MCA452	Supply Chain Management
MCA443	Software Architecture	MCA453	Enterprise Resource Planning
MCA444	Machine Learning	MCA454	E-commerce and Management Information System

		V Semester							
Subject Code	Name of the Subject	Credits				Exam Duration in Hours	Marks		Total Marks
		Lecture	Tutorial	Practicals	Total Credits		CIE	SEE	
MCA51	Object-Oriented Modeling and Design Patterns	4	--	-	4	3	30	70	100
MCA52	Programming Using C# & .NET	4	--	-	4	3	30	70	100
MCA53	Mobile Applications	4	--	-	4	3	30	70	100
MCA54	Elective-4	4	--	-	4	3	30	70	100
MCA55	Elective-5	4	--	-	4	3	30	70	100
MCAL56	Software Design Laboratory	--		1.5	1.5	3	50	50	100
MCAL57	.Net Laboratory	--		1.5	1.5	3	50	50	100
MCAL58	Mini Project : (Mobile Applications Development using Android/iOS/Windows etc.,)	--		2	2	3	50	50	100
Total		20	-	5	25	24	300	500	800

ELECTIVE-4		ELECTIVE-5	
MCA541	Cloud Computing	MCA551	Storage Area Networks
MCA542	Web Engineering	MCA552	Mobile and Adhoc Networks
MCA543	Service Oriented Architecture	MCA553	Cyber Security
MCA544	Internet of things	MCA554	Big Data Analytics
MCA545	System Simulation & Modelling	MCA555	Software Defined Networks

VI Semester

Subject Code	Name of the Subject	Internal	External	Dissertation Evaluation	Viva	Total Marks	Credits
MCA61	Research Methodology	30	70	-		100	2
MCAI62	Internship & Seminar	100	-			100	3
MCAP63	Project Work	50	-	150	100	300	20
Total		180	70	150	100	500	25

Grand Total (I to VI Semesters): 4500 Marks : 150 Credits

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institute, Affiliated to VTU, Belagavi)

Master of Computer Applications Program
(Accredited by National Board of Accreditation)

MCA V and VI semester

Syllabus

(2016 – 2019)

OBJECT-ORIENTED MODELING AND DESIGN PATTERNS

SEMESTER – V

Subject Code	**MCA51**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**

CREDITS – 4:0:0

Course Learning Objectives (CLO):

- To Design an Application Using Object Management group's UML for Modeling, Describing, Analyzing and Designing an application
- To develop a proven successful system by applying the best practices and works done by Booch, Rumbaugh, and Jacobson.
- To implement design patterns to provide solutions to real world software design problems.

Modules	**Teaching Hours**
Module -1	**12 Hours**
Modeling Concepts & Class Modeling : What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models. **Object and class concepts**: Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages	
Module -2	**10 Hours**
State Modeling and Interaction Modeling: State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; **Interaction Modeling:** Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models Collaboration diagrams.	
Module -3	**10 Hours**
System Conception and Analysis: System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. **Overview of analysis**: Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; adding	

operations.	
Module -4	**10 Hours**
Patterns: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Singleton ,Counted Pointer example.	
Module -5	**10 Hours**
Design Patterns : Introduction, Model View Controller, Structural decomposition- Whole-Part, Access Control- Proxy; Creational Patterns – Factory Method, Singleton Structural Patterns – Adapter, Management Patterns- Command processor, Publisher-Subscriber	

Question paper pattern:

1. The question paper will have 5 questions.
2. Each full question consists of 20 marks.
3. Module 1 and 3 shall have internal choice.
4. The students will have to answer 5 full questions

Text Books:

1. Michael Blaha, James Rumbaugh, "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 9, 11 to 14.10,15.1 to 15.8)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, "Pattern-Oriented Software Architecture, A System of Patterns", Volume 1, John Wiley and Sons, 2006. (Chapters 1, 2.4, 3)
3. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object- Oriented Software, Addison-Wesley, 1995.

Reference Books:

1. Grady Booch et al, "Object-Oriented Analysis and Design with Applications", 3rd Edition, Pearson, 2007.
2. Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, Tata McGraw-Hill, 2003.
3. K. Barclay, J. Savage, "Object-Oriented Design with UML and JAVA", Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I., "The Unified Modeling Language User Guide", 2nd Edition, Pearson, 2005.
6. Michael R Blaha, James R Rumbaugh, "Object Oriented Modeling and Design with UML", 2nd Edition, Prentice Hall, 2004

Course Outcomes (CO): After studying this course, students will be able to:

CO1: Acquire knowledge of Modelling and UML Concepts.
CO2: Analyze the development of Object Oriented Software models in terms of Static behaviour and Dynamic behaviour
CO3: Analyze the domain module and application analysis for solving problems in software.
CO4: Use patterns and idioms to design solution to a problem.
CO5: Evaluate and implement various Design patterns.

CO	Mapping with PO's
CO1	PO1,PO2,PO5
CO2	PO1,PO2,PO5
CO3	PO7,PO10
CO4	PO3,PO5
CO5	PO3,PO5,PO10

Subject Code	**MCA52**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Objectives :

- To describe the Fundamentals of .Net framework
- To demonstrate Object Oriented Programming concepts using C#
- To implement delegates, event handling and exception handling
- To develop Web applications using ASP.NET,ADO.NET

Modules	**Teaching Hours**
Getting started with .NET Framework 4.0 and C# Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ. **Introducing C#** Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and UnBoxing , Variables and Constants . Expression and Operators : Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements	**10Hours**
Module -2	**10 Hours**
Namespaces, Classes and Object Oriented Programming Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of assessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.System.Object Class **Encapsulation:** Encapsulation using assessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. **Polymorphism:** Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.	
Module -3	**11 Hours**

Delegates, Events, Exception Handling **Delegates:** Creating and using Delegates, Multicasting with Delegates. **Events:** Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. **Exception Handling**: The try/catch/throw/finally statement, Custom Exception. System. Exception, Handling Multiple Exception	
Module -4	**10 Hours**
Graphical User Interface with Windows Forms Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.	
Module -5	**11 Hours**
Web App Development and Data Access using ADO.NET Introduction to Web Basics, Multitier Application Architecture, First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking. Set up the sample database, Create the forms and add controls, Store the connection string, Retrieve the connection string, Write the code for the forms, Test your application. **ASP.NET AJAX :** Exploring AJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, ScriptManager control, Update Panel, Update Progress Control, Creating Simple Application using AJAX Server Controls	

Question paper pattern:

- The question paper will have 5 questions. Each full question consists of 20 marks.
- Module 2 and 5 having internal choice.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley-Dream Tech Press. (Chapters: 1, 10, 11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19 and 27.3)

Reference Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley- Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.

Course Outcomes (CO):

CO1**:** Distinguish the features of C# and client-server concepts using .Net Frame Work Components.

CO2: Demonstrate delegates, events and exception handling with ASP, Win Form, ADO.NET.
CO3: Develop Graphical User Interface with Window Forms
CO4: Develop Web based and Console based applications with back end connectivity and MVC

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO8
CO 2	PO1,PO2,PO3,PO4
CO 3	PO1,PO2,PO3,PO4,PO5
CO 4	PO1,PO2,PO3,PO4,PO5

MOBILE APPLICATION DEVELOPMENT USING ANDROID FRAMEWORK
SEMESTER – V

Subject Code	**MCA53**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives :

- Illustrate effective user interfaces that leverage evolving mobile device capabilities
- Develop applications using software development kits (SDKs), frameworks and toolkits
- Establish various methods to integrate database and server-side technologies
- Design and develop open source software based mobile applications

Modules	**Teaching Hours**
Introduction **Introduction to Mobile Application Development Ecosystems**- History of Mobile Application Development, Understanding Ecosystems, Hybrid Application Frameworks, Challenges by Mobile Application Layers, System Software, Mobile Application Testing **Fundamentals of Android Development** Introduction to Android**,** The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB),Launching Android Applications on a Handset, Anatomy of an Android Application. **Android Application Life Cycle** Introducing the Android Application Class; The Android Application Life Cycle; Activity Life Cycle; Creating User Interfaces; Layout Managers; Hello World Android Application; View Click Handling; Let's Make a Toast; Fundamental Android UI Design, Introducing Views, Creating and Using Menus; Introducing Intents, Types of Intents; Creating Dialogs; Bundle; Shared Preferences; Types of Preferences; Storing and Retrieving Data from Shared Preferences. Working with Files (Reading and Writing Files). Asynchronous Tasks, Working with Threads; Events and exception handling.	**12 Hours**
Module -2	**12 Hours**
SMS Messaging, Networking and Android Services Sending SMS Messages programmatically, Getting Feedback after Sending the Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Caveats and Warning, Sending E-Mail **Networking** Downloading Binary Data, Downloading Text Files, Accessing Web Services Using the GET Method, Performance Asynchronous Calls **Android Services** Services in Android; Types of Services; Local Service; Remote Service; Intent Service. Broadcast Receivers; Types of Broadcasts; Creating a Broadcast	

Receivers; Introducing Notifications	
Module -3	**10 Hours**
Introduction to Android Databases Introducing Android Databases Introducing SQLite, Working with SQLite Databases, OnCreate() and onUpgrade() methods. Cursors and Content Values, Creating a New Content Provider, Using Content Providers, Creating and Using an Earthquake Content Provider, Accessing Android Content Providers.	
Module -4	**10 Hours**
Location Based Services and Applications Creating Location Based Services Applications- Displaying Maps, Creating the Project, Obtaining the Maps API Key, Displaying the Map, Displaying the Zoom Control, Changing Views, Navigating to a specific Location, Adding Markers, Geocoding and Reverse Geocoding, Getting Location Data.	
Module -5	**08 Hours**
Publishing Android Applications Setting Versioning Information of an Application, Generating a Certificate, Digitally Signing the Android Applications, and Generating the APK, Distributing Applications with Google Play.	

Question paper pattern:

- The question paper will have 5 questions. Each full question consists of 20 marks.
- Module 1 and 4 having internal choice.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", 1st Edition, 2012, ISBN: 978-1-118-20390-3

Reference Books:

1. Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011.
2. Reto Meier, "Professional Android 4 Application Development", Wrox Publications 2012

Course Outcomes:

CO1: Analyze the fundamentals of Mobile application development.

CO2: Analyze the problems to build Mobile apps by assessing the basic framework and usage of SDK.

CO3: Design and develop Android applications using various resources and built-in classes.

CO4: Develop the skills in designing and deploying the sophisticated mobile applications and Design and deploy Android applications with compelling User Interfaces.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	PO1,PO2,PO3,PO4,PO5
CO2	PO1,PO2,PO3,PO4

CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5,PO8

SOFTWARE DESIGN LABORATORY

SEMESTER – V

Course Code	**MCAL56**	**CIE Marks**	**50**
Number of Practical Hours/Week **Number of Instructional Hours/Week**	**02** **01**	**SEE Marks**	**50**
Total Number of Practical Hours	**42**	**SEE Hours**	**03**

CREDITS – 0:0:1.5

Laboratory Experiments:

The student has to draw the necessary UML diagrams using any suitable UML drawing tool and implement a program in Java or C++ or C# to demonstrate the design pattern specified by the examiner. For analysis and design models -**Class Diagram, Use-Case, Sequence diagrams** should be drawn.

Course Learning Objectives (CLO):

- To Design an Application Using Object Management group's UML for Modeling, Describing, Analyzing and Designing an application
- To develop a proven successful system by applying the best practices and works done by Booch, Rumbaugh, and Jacobson.
- To implement design patterns to provide solutions to real world software design problems.

NOTE: ANY SUPPORTING TOOL MAY BE USED.

Design and Implement following patterns.

1. Expert pattern
2. Publisher-Subscriber pattern
3. Command pattern
4. Proxy pattern
5. Polymorphism pattern
6. Whole-Part pattern
7. Controller Design Pattern
8. Adapter pattern
9. Factory pattern.
10. Façade pattern

Note 1: In the practical Examination each student has to pick one question from a lot of all the 7 questions.

Note 2: Change of program is not permitted in the Practical Examination.

Note 3: In the Examination partial marks can be given for Class Diagram, Use-Case, Sequence diagrams

Course Outcomes (CO):

CO1: Implement and evaluate object oriented design model with the help of modern tool, Rational software Architect for various design patterns applicability.

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CO's	Mapping with PO's
CO1	PO2,PO3,PO5

.NET LABORATORY
SEMESTER V

Laboratory Code	**MCAL57**	CIE Marks	**50**
Number of Lecture Hours/Week	**3**	SEE Marks	**50**
Total Number of Lecture Hours	**42**	SEE Hours	**03**

CREDITS – 0:0:1.5

Course Objectives

- Demonstrate basics of C# programming language using .Net platform.
- Implement object oriented concepts using C# under .Net framework.
- Develop a project for the given case studies using ADO.NET and ASP.Net

PART A **Marks:30**

1.Write a Program in C# to demonstrate Command line arguments processing for the following.
a) To find the square root of a given number.
b) To find the sum & average of N numbers.

2. Write a Program in C# to demonstrate the following
Boxing and Unboxing b) Invalid Unboxing.

3. Write a program to demonstrate Operator overloading.

4. Find the sum of all the elements present in a jagged array of inner arrays.

5. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling for both built in and user defined exception handling.

6. Demonstrate Use of Virtual and override key words in C# with a simple program.

7. Write a program to demonstrate different delegates.

8. Write a program to demonstrate abstract class and abstract methods in C#.

9. Write a program to illustrate the use of different properties in C#.

10. Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.

PART B **Marks:20**

1. Consider the Database db_EMS (Employee Management System) consisting of the following tables :
tbl_Designations (IdDesignation: int, Designation: string)
tbl_EmployeeDetails(IdEmployee: int, EmployeeName: string, ContactNumber: string, IdDesignation: int, IdReportingTo: int)

Develop a suitable window application using C#.NET having following options.

1. Enter new Employee details with designation & Reporting Manager.
2. Display all the Project Leaders (In a Grid) reporting to selected Project Managers (In Combo box).
3. Display all the Engineers (In a Grid) reporting to selected Project Leader (In a Combo box
4. Display all the Employees (In a Grid) with their reporting Manager (No Value for PM).

NOTE: tbl_Designation is a static table containing the following Rows in it.

1	Project Manager
2	Project Leader
3	Engineer

2.Consider the Database db_LSA (Lecturer Subject Allocation) consisting of the following tables:

tbl_Subjects(IdSubject: int, SubjectCode: string, SubjectName: string)
tbl_Lecturers(IdLecturer: int, LecturerName: string, ContactNumber: string)
tbl_LecturerSubjects(IdSubject: int, SubjectCode: string, IdLecturer: int)

Develop a suitable window application using C#.NET having following options.

1. Enter new Subject Details.
2. Enter New Lecturer Details.
3. Subject Allocation with Lecturer Name in a Combo box and subjects to be allocated Grid with checkbox Column.
4. Display all the subjects allocated (In a Grid) to the selected Lecturer (In a Combo Box).

3. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string,CourseID: int, YrOfAdmsn: int)

Develop suitable windows application using C#.NET having following options:

1. Entering new course details.
2. Entering new student details.
3. Display the details of students (in a Grid) who belong to a particular course. Display the details the students who have taken admission in a particular year.

4. Develop a Web Application using C#.NET and ASP.NET for an educational institution. The master page should consist of Institution Name, Logo and Address. Also, it should provide hyperlinks to Departments, Facilities Available and Feedback. Each department page and facilities page should be designed as static pages. The hyperlinks should navigate to these static pages in the form of Content Pages associated with Master Page designed. The Feedback page should have fields to enter Name, Email and Message with Submit and Cancel Buttons. Database should be created to store these three data and display the contents of database in grid.

5. Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables: tbl_Bank (BankID: int, BankName: string) tbl_Branch (BranchID: int, BankID: int, BranchName: string) tbl_Account (AccountNo:int, BankID: int, BranchID: int, customerName: string, Address: string, ContactNo: int,Balance: real) (Note: AccountNo and BankID together is a composite primary key).

The master page of this web application should contain hyperlinks to New Bank Entry,New Branch Entry (of selected Bank), New Customer Entry (based on branch and bank) andReport Generation. The hyperlinks should navigate to respective content pages. Thesecontent pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:

1. Display all records of particular bank.
2. Display all records of a branch of particular bank.
3. The balance should be displayed for the entered account number (Bank and Branchare input through ComboBox controls and Account number is input through TextBox).

Note 1: In the practical Examination each student has to pick one question from a lot of all the questions and one from part B.

Course Outcomes (CO):

CO1: Implement & develop a web based and Console based application using .NET Framework

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO11

MINI PROJECT USING MOBILE APPLICATIONS

SEMESTER – V

Course Code	**MCAL58**	**CIE Marks**	**50**
Number of Practical Hours/Week **Number of Instructional Hours/Week**	**03** **01**	**SEE Marks**	**50**
Total Number of Lecture Hours	**42**	**SEE Hours**	**03**

CREDITS – 0:0:2

Course Learning Objectives:

- Learn the basics of mobile app development
- Build mobile applications using database
- Develop mobile app that uses GPS location information
- Students will learn to develop a mobile app project using multiple features learnt

Laboratory Programs:

The laboratory can be carried out only using any mobile application software.

Note:

1. Students are required to execute one question from Part A and give demo from Part B.
2. Part A has to be evaluated for 20 marks and Part B has to be evaluated for 30 marks along with the report.
3. The project should be carried out with a team strength of maximum two.
4. Students are expected to work for mini project apart from lab hours also with the contact of guides.

PART – A

1. Demonstrate layout
2. Demonstrate widgets
3. Demonstrate life cycle
4. Demonstrate Intents in Android, Shared preferences
5. Demonstrate Fragments in android
6. Demonstrate Animations
7. Demonstrate Email and SMS sending
8. Demonstrate Databases and content providers
9. Demonstrate Services
10. Demonstrate Sensors and location based services
11. Demonstrate Audio playback and image capture
12. Android Native app development with PHP or Java compatibility with swift.

PART – B

Mini-Project

Students should be able to build a complete mobile app using multiple features learnt in Part – A with user interfaces and database connectivity. The Project should be deployed on the cloud like any cloud tool (ex.MS Azure, AWS etc..).

The team must submit a brief project report (25-30 pages) that must include the following

a. Introduction
b. Requirement Analysis
c. Software Requirement Specification
d. Analysis and Design
e. Implementation
f. Testing

4. The report must be evaluated for 10 Marks. Demonstration and Viva for 20 Marks.
Course Outcome: **CO1:** Design and develop various android mobile applications.

CLOUD COMPUTING

SEMESTER – V **Elective-IV**

Subject Code	**MCA541**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**

CREDITS – 4:0:0

Course Learning Objectives (CLO):

1. To learn how to use Cloud Services.
2. To implement Virtualization
3. To implement Task Scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. To build Private Cloud.

Modules	**Teaching Hours**
Module -1	**10 Hours**
Introduction, Cloud Infrastructure: Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing: an old idea whose time has come, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges, **Cloud Infrastructure:** Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lock-in, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.	
Module -2	**10 Hours**
Cloud Computing: Application Paradigms.: Challenges, existing and new application opportunities, Architectural styles of cloud applications: single , multi ,hybrid cloud site, redundant, non redundant , 3 tier, multi tier architectures, Workflows coordination of multiple activities, Coordination based on a state machine model -the Zoo Keeper, The Map Reduce programming model, Apache Hadoop, A case study: the GrepTheWeb application, **Applications**: Healthcare, Energy systems, transportation, manufacturing, Education, Government, mobile communication, application development.	
Module -3	**11 Hours**
Cloud Resource Virtualization: Definition, merits and demerits, types & Techniques, Layering, Virtual machine monitors, Hardware support for virtualization Case study: *Xen* -a VMM based on paravirtualization, Optimization of network virtualization in *Xen* 2.0, *vBlades* -paravirtualization targeting a *x86-64* Itanium processor, A performance comparison of virtual machines, The darker side of virtualization, Software fault isolation.	
Module -4	**11 Hours**

Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based web services, Resource bundling, combinatorial auctions, fair queuing, Start time fair queuing, borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling mapreduce applications subject to deadlines, Resource management and application scaling	
Module -5	**10 Hours**
Cloud Security, Cloud Application Development: Storage systems: Evolution, Storage models, file systems, databases, DFS, General parallel File system, GFS, Hadoop, Locks & Chubby, TPS, NOSQL, Big Table, Mega store. **Cloud security:** Risks, Security, privacy, Trust. Security of OS, VM, VMM, shared image, management OS, Xoar.	

Question paper pattern:

1. The question paper will have 5 questions.
2. Each full question consists of 20 marks.
3. Module 3 and 5 shall have internal choice.
4. The students will have to answer 5 full questions

Text Books:

1. Dan C. Marinescu, Cloud Computing: Theory and Practice, Elsevier Science, 2013, 1st Edition, Print Book ISBN :9780124046276, eBook ISBN :9780124046412
Chapter 1 - Introduction *Pages 1-19*, Chapter 2 - Parallel and Distributed Systems *Pages 21-65*, Chapter 3 - Cloud Infrastructure *Pages 67-98*, Chapter 4 - Cloud Computing: Applications and Paradigms *Pages 99-130*, Chapter 5 - Cloud Resource Virtualization *Pages 131-161*, Chapter 6 - Cloud Resource Management and Scheduling *Pages 163-203*, Chapter 8 - Storage Systems *Pages 241-271*, Chapter 9 - Cloud Security *Pages 273-300*,, Chapter 11 - Cloud Application Development *Pages 317-359*

2. Cloud Computing : A hands on Approach, Arshdeep Bagha - Vijay Bagha Madisetti , 2013, ISBN/EAN13: 1494435144 / 9781494435141, web links: www.cloudcomputingbook.info.
Chapter 1-1-19 pages, Chapter 4-64-93 pages, Chapter 5- 94-113 pages, Case studies and examples.

Reference Books:

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, 1st edition, 2014, Morgan Kaufmann Publishers, Inc., San Francisco. ISBN-13: 978-0124166752, ISBN-10: 012416675X
2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture • ISBN-10: 0133387526 • ISBN-13: 9780133387520 ©2013 • Prentice Hall • Cloth, 528 pp
3. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
4. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra and Geoffrey Fox, Morgan Kaufmann, 20111.
5. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Fill, 2010.

Course Outcomes (CO): After studying this course, students will be able to:

CO1: Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
CO2: Design different workflows according to requirements and apply map reduce programming model.
CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds.Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO1	PO1, PO5, PO8
CO2	PO3, PO5, PO8
CO3	PO5, PO8, PO10
CO4	PO5, PO8, PO10

WEB ENGINEERING

SEMESTER – V **Elective-IV**

Course Code	MCA542	**CIE Marks**	30
Number of Lecture Hours/Week	04	**SEE Marks**	70
Total Number of Lecture Hours	52	**SEE Hours**	03

CREDITS – 4:0:0

Course Learning Objectives :

- To create awareness on web technologies and web engineering
- Understand the information architecture.
- Understand the cloud architecture and web service technologies.
- Analyze and choose an appropriate programming environment for building cloud applications.

Modules	Teaching Hours
Module -1	**10 Hours**
Introduction to Web Engineering An Introduction to Web Engineering, History of web Development, Time line, Motivation, Categories of We Applications, Characteristics of Web Applications. Evolution and Need for Web Engineering, Web Engineering Models, Software Engineering v/s Web Engineering. World Wide Web: Introduction to TCP/IP and WAP, DNS, Email, TelNet, HTTP and FTP, Introduction to Browser and search engines, Search fundamentals, Search strategies, Directories search engines and Meta search engines, Working of the search engines, Miscellaneous Web Browser details, Introduction to Web Servers: Features of web servers, caching, case study-IIS, Apache, Configuring web servers.	
Module -2	**10 Hours**
Information Architecture for Web Engineering Information Architecture: The role of the Information Architect, Collaboration and Communication, Organizing Information, Organizational Challenges, Organizing Web sites parameters and Intranets Creating Cohesive Websites: Conceptual Overview Website Development, Website Design issues, Conceptual Design, High-Level Design, Indexing the Right Stuff, Grouping Content. Architectural Page Mockups, Design Sketches, Navigation Systems. Searching Systems Good & bad web design	
Module -3	**10 Hours**
XML Language Basics, XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation -XML Infrastructure, Overview Of SOAP - HTTP - XML-RPC -SOAP: Protocol - Message Structure - Intermediaries - Actors -Design Patterns And Faults - SOAP With Attachments.	
Module -4	**10 Hours**
Web Services Overview - Architecture - Key Technologies - UDDI - WSDL -ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE, XML SECURITY- Security Overview - Canonicalization- XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice	
Module - 5	**12 Hours**
Cloud Services	

Collaborating on Calendars, Schedules, and Task Management, Collaborating on Event management, Collaborating on Contact management, collaborating on Project Management, Collaborating on Word Processing, Collaborating on Spread sheets, Collaborating on Databases, Collaborating on presentations, Storing and sharing Files and other online content, sharing Digital Photographs, controlling the collaborations with Web-Based Desktops.	
Question paper pattern: • The question paper will have 5 questions. Each full question consists of 20 marks. • Module 2 and 4 having internal choice. • The students will have to answer 5 full questions, selecting one full question from each module.	

Text Books:

1. Roger S.Pressman, David Lowe, "Web Engineering", Tata Mcgraw Hill Publication,2007
2. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
3. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.

Reference Books:

1. Cloud Computing a Practical approach, Anthony TVelte, Toby J Velte, Robert Elsenpeter,
2. Tata McGraw-HILL, 2010 Edition Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.
3. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers,2005
4. Cloud Computing-Web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education, 2009 Edition

Course Outcome (CO)

CO1: Able to understand the methods and techniques used in web-based system development.
CO2: Web Engineering methods and techniques must incorporate unique aspects of the problem domain
CO3: use previous programming and computing experience to develop practical web development and maintenance skills.
CO4: To gain insight on cloud service and architecture. Understand to build and deploy web services.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO2
CO 2	PO1,PO2, PO4, PO5
CO 3	PO2, PO4, PO5, PO10
CO 4	PO10, PO11, PO12

SERVICE ORIENTED ARCHITECTURES (SOA)

SEMESTER – V **Elective-IV**

Subject Code	**MCA543**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**

CREDITS – 4:0:0

Course Learning Objectives:

- Learn the evolution of SOA in the service industry
- Understand the architecting techniques for applications in service industry
- Design a modern solution architecture for enterprise applications

Modules	Teaching Hours
Module -1:	**10 hours**
Introduction to SOA, Evolution of SOA: Fundamentals of SOA, Common characteristics of contemporary SOA, Common tangible benefits of SOA, A SOA timeline (from XML to Web Services to SOA), The continuing evolution of SOA (standards organizations and Contributing vendors), The roots of SOA (comparing SOA to Past Architectures) **Web Services and Primitives of SOA:** The Web Services framework, Services (as Web Services), Service Description (with WSDL), Messaging (with SOAP)	
Module -2	**12 hours**
Web Services and Contemporary SOA: Message Exchange patterns, Service Activity; Coordination, Atomic Transactions, Business Activities, Orchestration, Choreography, Addressing, Reliable Messaging, Correlation, Policies, Meta data Exchange, Security, Notification and eventing.	
Module -3	**12 hours**
Principles of Service: Orientation Services- Orientation and the enterprise, Anatomy of service-oriented Architecture, Common Principles of Service Orientation; How Service Orientation principles interrelate, Service Orientation and object orientation, Native Web Service support for service orientation principles	
Module -4	**10 hours**
Service Layers: Service Orientation and contemporary SOA, Service Layer Abstraction, Application service layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration scenarios.	
Module -5	**08 hours**
Enterprise Applications: Architectural Considerations, Solution Architecture for Enterprise Applications, Solution Architecture for Enterprise Applications based on SOA	
Question paper pattern:	

- The question paper will have 5 questions. Each full question consists of 20 marks.
- Module 2 and 3 will have internal choice.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1.Thomas Erl: Service Oriented Architecture- Concepts, Technology and Design, Pearson Education, 2013.

2. Shankar Khambhapaty, Service Oriented Architecture for Enterprise and Cloud Applications, 2nd Edition, Wiley-India, 2012.

Course Outcome:

CO 1. Students understand the significance of SOA and its evolution in service industry

CO 2. Apply contemporary service operations and messages to model a business case

CO3: Transition to the implementation of the design solutions in real-world service applications

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1,PO3, PO5
CO2	PO1,PO3,PO8
CO3	PO3,PO10,PO11

Modules	Teaching Hours

INTERNET OF THINGS (IOT)

SEMESTER – V **Elective-IV**

Subject Code	**MCA544**	**IA Marks**	**30**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**70**
Total Number of Lecture Hours	**52**	**Exam Hours**	**03**

CREDITS – 4:0:0

Course Learning Objectives :

- Learn the evolution of IOT from M2M to global Context
- Understand IoT in managing data and knowledge
- Learn the architecture of IoT and its industrial application

Module-1	**10 Hours**
M2M to IoT Introduction: The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.	
Module -2	**10 hours**
M2M to IoT A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT M2M to IoT-An Architectural Overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline	
Module -3	**10 Hours**
M2M and IoT Technology Fundamentals Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Knowledge Management	
Module -4	**12 Hours**
IoT Architecture-State of the Art Architecture Reference Model - Introduction, Reference Model and architecture, IoT reference Model	
Module-5	**10 Hours**

IoT Reference Architecture Introduction, Functional View: Functional Groups, Information View: Flow and Lifecycle, Information Handling Use Cases: Asset Management, Hazardous Goods Management	

Question Paper Pattern:

- The question paper will have 5 questions.
- Each full question consists of 20 marks.
- Module 2 and 4 having internal choice.
- Selecting one full question from each module.

Text Books:

Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet ofThings: Introduction to a NewAgeof Intelligence",** 1st Edition,AcademicPress, 2014.

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

2 Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013

Course Outcomes :

CO1: Analyse the constraints and opportunities of wireless and mobile networks for Internet of Things.
CO2: Implement the architecture of IoT and its impact on real-world applications.
CO3: Analyze, design or develop parts of an Internet of Things solution and map it toward selected business model(s)

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO3, PO5
CO 2	PO5,PO6
CO 3	PO5, PO10, PO11

Simulation and Modeling

SEMESTER – V			Elective-IV
Subject Code	**MCA545**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives :

- Categorize problems based on their characteristics and practical importance.
- Develop GPSS programs using iterative/recursive approach
- Compute the efficiency of programs
- Design programs using an appropriate design paradigm for solving a given problem
- verification, validation of model building
- Implement programs using various design strategies

Modules	Teaching Hours
Module -1	**10 Hours**
Introduction When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.	
Module -2	**10 Hours**
Random-Number Generation, Random-Variate Generation Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers, Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.	
Module -3	**12 Hours**
Queuing Models Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System General Principles, Simulation Software Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java;	
Module -4	**10 Hours**
Input Modeling Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models, uniformity and independence, Chi-Square test, K-S Test.	
Module -5	**10 Hours**
Verification and Validation Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models.	

Question Paper Pattern:

- The question paper will have 5 questions.

- Each full question consists of 20 marks.
- Module 3 and 4 having internal choice.
- Selecting one full question from each module.

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson, 2010. (Listed topics only from Chapters1 to 12)

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

Course Outcome (CO):

CO1: Able to understand the methods and techniques used in System simulation and modeling.
CO2: simulation methods and techniques must incorporate unique aspects of the problem domain
CO3: This course draws upon previous programming and computing experience to develop practical simulation programming and maintenance skills.
CO4: To gain insight on simulation service and architecture.Understand to build and deploy simulation modeling.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO1, PO5
CO 2	PO1,PO2
CO 3	PO1, PO2, PO4
CO 4	P03, PO11, PO12

STORAGE AREA NETWORKS

SEMESTER – V			Elective-V
Course Code	**MCA551**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives (CLO):

- Understand the fundamentals of storage and storage networking concepts
- Analyze Network Attached and Storage Area Networks Requirements
- Design a secured, scalable SAN / NAS enterprise solutions.

Modules	Teaching Hours
Module -1	**10 hours**
Concepts of Storage Networking The Data Storage and Data Access Problem, The Battle for Size and Access Decoupling the Storage Component: Putting Storage on the Network, Decoupling the Storage Component: Creating a Network for Storage	
Module -2	**10 *hours***
Storage Fundamentals Storage Architectures, Device Overviews, Connectivity Options, Data Organizational Methods	
Module -3	**10 *hours***
Network Attached Storage Putting Storage on the Network, NAS Hardware Devices , NAS Software Components, NAS Connectivity Options	
Module -4	**10 *hours***
Storage Area Networks Architecture Overview, Hardware Devices, Software Components, Configuration Options for SANs.	
Module -5	**12 *hours***
Application Defining the I/O Workload, Applying the SAN Solution, Applying the NAS Solution Considerations When Integrating SAN and NAS **Management** Planning Business Continuity, Managing Availability, Maintaining Serviceability, Capacity Planning and Security Considerations **Case Studies** NAS Case Study, SAN Case Study, SAN/NAS Management Case Study	

Question paper pattern:

- The question paper will have 5 questions.
- Each full question consists of 20 marks.
- Module 4 and 5 having internal choice.
- Selecting one full question from each module.

Text Books:

1. The Complete Reference " Storage networks" , Robert Spalding, Mc Graw Hill Education (India) 2003

Reference Books:

1. Information Storage and Management (Misl-Wiley) : 2nd Edition, Emc Education Services, Wiley; Second edition (29 August 2012), ISBN-13: 978-8126537501
2. Storage Are networks Essentials : A complete guide to understanding and Implementing SANs, Richard Barker, Paul Massiglia, Wiley

Course Outcomes (COs):

- Analyse the significance of storage component in networking.
- Analyse the significance of the architectural components for NAS and SAN.
- Design secured, scalable SAN / NAS enterprise solutions.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO3, PO5
CO 2	P03, PO5, PO8
CO 3	P05, PO8, PO10

Mobile And Adhoc Sensor Networks			
SEMESTER – V			**Elective-V**
Subject Code	MCA552	**CIE Marks**	30

Number of Lecture Hours/Week	04	**SEE Marks**	70
Total Number of Lecture Hours	52	**SEE Hours**	03

CREDITS – 4:0:0

Course Learning Objectives (CLO):

- To learn the latest developments on wireless networking.
- The challenges related to various wireless communications.
- The protocol design and algorithmic challenges in Ad Hoc Networks are identified by the students.

Modules	**Teaching Hours**
Module -1	**10 hours**
Introduction Mobile Ad-Hoc Networking with a View of 4G Wireless: Imperatives and Challenges, Off the-Shelf Enables of Ad Hoc Networks, IEEE 802.11 in Ad Hoc Networks: Protocols, Performance and Open Issues, Scatter net Formation in Bluetooth Networks, Antenna Beam forming and Power Control for Ad Hoc Networks.	
Module -2	**10 hours**
Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks, Location Discovery, Mobile Ad Hoc Networks (MANETs): Routing Technology for Dynamic, Wireless Networking, Routing Approaches in Mobile Ad Hoc Networks.	
Module -3	**10 hours**
Energy-Efficient Communication in Ad Hoc Wireless Networks, Ad Hoc Networks Security, Self- Organized and Cooperative Ad Hoc Networking, Simulation and Modeling of Wireless, Mobile, and Ad Hoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization, Algorithmic Challenges inAdHocNetworks.	
Module -4	**10 hours**
Introduction and Overview of Wireless Sensor Networks: Applications of Wireless Sensor Networks, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology. Basic Wireless Sensor Technology: Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends.	
Module -5	**12 hours**
Wireless Transmission Technology and Systems: Radio Technology Primer, AvailableWireless Technologies. Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study, IEEE 802.15.4 LR-WPANs Standard Case Study.	

Question Paper Pattern:

- The question paper will have 5 questions.
- Each full question consists of 20 marks.
- Module 2 and 4 having internal choice.
- Selecting one full question from each module.

Text Books:

1. "Adhoc and Sensor Networks" by Stefano Basagni, Silvia Giordano, Ivan Stojmenvic. IEEE Press, A John Wiley & Sons, Inc., Publication 2004.

Reference Books:

1. Kazem Sohraby, Daniel Minoli, Taieb Znati. Wireless Sensor Networks, A John Wiley & Sons, Inc., Publication 2007.

Course Outcomes(CO):

CO1: Indetify the technologies and challenges for 3G/4G Networks.
CO2: Categorize the research challenges for different layer of wireless communication
CO3: TO setup a simulation environment required for the evaluation of protocols.
CO4: Summarize the sensor networks applications and their challanges.

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	P03
CO 2	P03, PO5
CO 3	P03, PO5,PO10, PO12
CO 4	PO3,PO5,PO10,PO12

CYBER SECURITY

SEMESTER – V **Elective-V**

Subject Code	**MCA553**	CIE Marks	**30**

Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**52**	SEE Hours	**03**

CREDITS – 4:0:0

Course Learning Objectives :

- Introduce students to the area of cybercrime and Forensics.
- To understand the motive and causes for cybercrime, detection and handling.
- To know the areas affected by cybercrime and investigation tools used in cyber forensic. To get knowledge of report writing and forensic ethics

Modules	**Teaching Hours**
Module -1	**10 Hours**
INTRODUCTION: The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defence, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption algorithms, The Data Encryption Standard, The AES Encryption Algorithms, Public Key Encryptions, Uses of Encryption.	
Module -2	**10 Hours**
Cyber Security Basics: Sphere, Terminology, Vulnerability in the Cyber Structure and Infrastructure, Cyber threats and Weaponry, Cyber Defense, Cyber Attack Detection and Prevention, Information Security Testing, Cyber Security Investigation/assessment, Cyber Deterrence.	
Module -3	**10 Hours**
Cyber Crimes and Cyber Laws: Classification of Cyber Crimes, IT laws & Cyber Crimes-Internet, Hacking, Password Cracking, Viruses, Virus Attacks, Reasons for Commission of Cyber Crimes, Malware and its type Adware, Spyware, Browser hijacking software, Virus, Worms, Trojan Horse, Scareware, Kinds of Cyber Crime,	
Module -4	**12 Hours**
Cryptography and Network Security: A model for Network Security, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Block Ciphers and the Data Encryption Standard: Simplified DES, Block Cipher Principles, the data Encryption Standard, Differential Cryptanalysis Attack, Linear Cryptanalysis, Cipher Block Chaining Mode	
Module -5	**10 Hours**
Cyber Crime Investigation: Firewalls and Packet Filters, Password Cracking,	

Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, Buffer Overflow, Attack on Wireless Networks.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory.
- Module 3 and 5 shall have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under a each module.

Text Books:

- SunitBelapure and Nina Godbole, " Cyber Security: Understandign Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN:978-81-265-2179-1. Publish Date 2013.
- Bill Nelson, Amelia Philips and Christopher Steuart, " Guide to Computer Fores=nsics and Investigations", 4th Edition. Cengage Learning. 2015.

Reference Books:

- Thomas J. Mowbray, " Cybersecurity: Managing Systems, Conducting Testing, and Investigating Instrusions", Copyright@2014 by John Wiley & Sons, Inc. ISBN:978-1-118-84965-1.2014.
- James Graham. Ryan Olson. Rick Howard. "Cyber Security Essentials", CRC Press. 15-Dec-2010.

Course Outcomes:

CO1.AcquireKnowledge on the cyber security, cybercrime and forensics.

CO2: Examine a tools and methods used in cybercrime and know about the tools and techniques for the forensics.

CO3: Ability to follow strict policies and procedures with meticulous record keeping.

CO4: Describe the fundamentals of digital forensics

CO5: Ability to write reports on technical issues in a non-technical manner.

COs	**Mapping with PO's**
CO1	PO2,PO6
CO2	PO5,PO6

CO3	PO5
CO4	PO6
CO5	PO8,PO10,PO11

SEMESTER – V **Big Data Analytics**			
Subject Code	**MCA554**	CIE Marks	**30**
Number of Lecture Hours/Week	**04**	SEE Marks	**70**
Total Number of Lecture Hours	**50**	SEE Hours	**03**

CREDITS – 4:0:0	
Course Learning Objectives (CLO): • To impart fundamental concepts about data and its identification. • To analyse the design of Hadoop Distributed Files system. • To understand and analyse Map Reduce technique for solving Big Data problems. • To analyse different hadoop related tools like Hbase,Pig & Hive.	
Modules	**Teaching Hours**
Module -1	**10 Hours**
Big Data and Analytics Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , types of Data Sources, Sampling, Types of data elements, data explorations, exploratory statistical analysis, missing values, outlier detection and Treatment, standardizing data labels, cloud and Big Data – Predictive Analytics.	
Module -2	**12 Hours**
The Hadoop Distributed File system A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response. The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The CommandLine Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces ,The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow Anatomy of a File Read ,Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced, Hadoop Archives	
Module -3	**10 Hours**
Map Reduce A Weather Dataset ,Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a MapReduce Application.	
Module -4	**10 Hours**
NOSQL Data Management Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding – Map reduce – partitioning and combining – composing map-reduce calculations	
Module -5	**10 Hours**
Hadoop Related Tools Hbase – data model and implementations – Hbase clients – Hbase	

examples –praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts, User-Defined Functions – A Filter UDF, An Eval UDF, A Load UDF. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.	

Question paper pattern:

- The question paper will have five questions. All questions are compulsory. Module 2 and 4 shall have internal choice.
- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module.

Text Books:

1. Bart Baesens, " Analytics in a Big Data World : The Essential Guide to Data Science and its Applications" Wiley
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Pramod J Sadalge,"NoSQL Distilled",2013 Pearson Education Inc.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Alan Gates, "Programming Pig", O'Reilley, 2011.

Reference Books:

1. Chris Eaton, Dirk deroos et al. , "Understanding Big data", McGraw Hill, 2012.
2. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.

Course Outcomes (CO):

CO 1: Understands Big data Technology and Basic Nomenclature.
CO 2: Analyse Hadoop ecosystem and Ilustrate the design of Hadoop Distributed File system.
CO 3. Developing and run a MapReduce application.
CO 4: Illustrate and analyse different Hadoop related tools.

COs	Mapping with Pos
CO1	PO2
CO2	PO2,PO5
CO3	PO5,PO8
CO4	PO1,PO2,PO5,PO8

SOFTWARE DEFINED NETWORKS

SEMESTER – V **Elective V**

Course Code	**MCA555**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**70**
Total Number of Lecture Hours	**52**	**SEE Hours**	**03**
CREDITS – 4:0:0			

Course Learning Objectives:

- To understand the SDN concepts, architecture, and network design elements.
- Understand how SDN-enabled applications can dynamically control network behavior
- Deploying new network solutions more efficiently and with less time-consuming.

Modules	Teaching Hours
Module -1	**10 Hours**
Introduction to SDN Introduction - Basic Packet-Switching Terminology, The Modern Data Center, Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Can We Increase the Packet-Forwarding IQ? Open Source and Technological Shifts. **Why SDN**? Evolution of Switches and Control Planes, Cost, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs.	
Module -2	**10 Hours**
Working of SDN Forerunner of SDN ,Software Defines Networks is Born, Sustain SDN interoperability, Open source contribution, Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods.	
Module -3	**10 Hours**
The Open Flow Specifications Open Flow Overview, Open Flow Basics, Open Flow 1.0 additions, Open Flow 1.1 additions, Open Flow 1.2 additions, Open Flow 1.3 additions, Open Flow limitations. **Alternative Definitions of SDN:** -SDN via APIS, SDN via Hypervisor-Based Overlays, SDN via Opening up the device, Network function virtualization, Alternative Overlap and Ranking.	
Module -4	**10 Hours**
SDN in the Data Center- Data Center Definition, Data Center Demands, Tunneling Technologies for the Data Center, Path Technologies in the Data Center, Ethernet Fabrics in the Data Center, SDN Use Cases in the Data Center, Open SDN versus Overlays in the Data Center, Real-World Data Center Implementations.	
Module -5	**12 Hours**
SDN Applications- Reactive versus Proactive Applications, Reactive SDN Applications, Proactive SDN Applications, Analyzing Simple SDN Applications, Creating Network Virtualization Tunnels, Offloading Flows in the Data Center, Access Control for the Campus, Traffic Engineering for Service Providers SDN Futures - Potential Novel Applications of Open SDN, Applying Programming Techniques to Networks, Security Applications, Segregating IP Sec Traffic in Mobile Networks, Roaming in Mobile Networks, Traffic Engineering in Mobile Networks.	

Question paper pattern: • The question paper will have five questions.Each full question consists of 20 marks. • Module 3 and 5 having internal choice. • The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Paul Goransson, Chuck Black: Software Defined Networks A Comprehensive Approach ,Elsevier, 2014. 1. Software Defined Networking by Thomas D Nadeau and Ken Gray. 2. Software Define Networks, A Comprehensive Approach, Paul Goransson, Chuck Black. MK Publications.	
Reference Books: 1. Software Defined Networking for Dummies brought you by cisco, Brian Underdahl and Gary Kinghorn. 2. Thomas D.Nadeau & Ken Gray: SDN Software Defined Networks O'Reilly publishers, First edition, 2013.	
Course Outcomes (CO): After studying this course, students will be able to: **CO1:** Understand the basics of Software Defined Networks Operations and evaluation of switches. **CO2:** Recognize the fundamentals and characteristics of Software Defined Networks **CO3:** Analyse alternative definitions of Software Defined Networks **CO4:** Discriminate use of Software Defined Network in Data. Apply different Software Defined Network Operations in real world problem.	

Course Outcomes(CO)	**Mapping with Program Outcomes(PO)**
CO 1	PO3, PO5
CO 2	P03, PO5
CO 3	P05, PO8, PO10
CO 4	P05, PO8, PO10

Master of Computer Applications Program

(Accredited by National Board of Accreditation)

MCA VI semester

(2016 – 2019)

Syllabus

RESEARCH METHODOLOGY			
Subject Code	**MCA61**	**CIE Marks**	**30**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**70**

Total Number of Lecture Hours	26	SEE Hours	03

CREDITS – 2:0:0

Course Learning Objectives (CLO):

1. To have a basic understanding of the underlying principles of quantitative and qualitative research.
2. To identify the overall process of designing a research study from its inception to its report.
3. To choose the most appropriate research method to address a particular research question.
4. To gain overview of a range of quantitative and qualitative approaches to data analysis.
5. To learn to write research report.

Modules	Teaching Hours
Module -1 Overview of Research Research and its types, identifying and defining research problem and introduction to different research designs. Essential constituents of Literature Review. Basic principles of experimental design, Primary data and Secondary Data, methods of primary data collection, classification of secondary data, designing questionnaires and schedules.	**8 Hours**
Module -2	
Sampling Methods Probability sampling: simple random sampling, systematic sampling, stratified sampling, cluster sampling and multistage sampling. Nonprobability sampling: convenience sampling, judgment sampling, quota sampling. Sampling distributions.	**6 Hours**
Module -3	
Processing and analysis of Data Statistical measures and their significance: Central tendencies, variation, skewness, Kurtosis, time series analysis, correlation and regression, Testing of Hypotheses: Parametric (t and Chi Square).	**6 Hours**
Module -4	
Essential of Report writing and Ethical issues: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Ethical issues related to Research, Plagiarism and self- Plagiarism, Publishing**.**	**6 Hours**

Question paper pattern:

- The question paper will have five questions.Each full question consists of 20 marks.
- Module 3 and 4 having internal choice.

- Select one full question from each module.

Text Books:

1. Kothari C.R., Research Methodology Methods and techniques by, New Age International Publishers, 3rd Edition, 2013.

Reference Books:

1. Krishnaswami K N, Sivakumar A I and Mathirajan M, "Management Research Methodology", Pearson Education, 2006.
2. 2. Levin R I and Rubin D S, Statistics for Management, 7th Edition, Pearson Education, 2008.

Course Outcomes (CO):

CO1: Student will be able to describe a range of quantitative and qualitative research designs and identify the advantages and disadvantages associated with these designs.
CO2: Students will be able to choose appropriate quantitative or qualitative method to collect data.
CO3: Students will be able to analyze and test the given data using appropriate methods.
CO4: Students will be able to design an appropriate mixed-method research study to answer a research question.
CO5. Students will be able to write the research report.

NOTE:

- Students have to attend two hours of theory class on every Saturday for 26 hours.
- Students should pass both CIE and SEE theory examinations.

Cos	Mapping with POs
CO1	PO4, PO7, PO8
CO2	PO4, PO7, PO8
CO3	PO4, PO7, PO8
CO4	PO4, PO7, PO8
CO5	PO4, PO7, PO8

Guidelines:

MCAI62: Internship & Seminar

Internship Guidelines

- The students should undergo an internship for 4 weeks during the vacation soon

after the 5th semester SEE.

- The internship shall be carried out in an Industry/R&D labs or Institution.
- The student should submit the internship report and make the presentation to the internal panel.
- The internal panel will evaluate the internship work for 50 Marks.

Seminar Guidelines

1. Selection of topic/area : Select a paper according to the specialization of students. Papers from any reputed journals shall be selected.

2.Obtain the approval from the guide for the selected topic.

3. Study of topic: Students are informaed to acquire a thorough knowledge on the subject by referring back papers and reference books (These may be included as references at the end of the paper) on the corresponding area.

4. Preparation of slides for presentation: Slides may be presented in MS power point. Time allowed for presentation is 20 minutes for presentation and 5 minutes for discussions. So, number of slides may be around 20 - 25 to adhere the time limit.

5. Organization of slides:

- The first slide will be a title page showing the title, name of student (presenter), USN. and Semester.
- 2nd page will contain overview of the seminar
- Successive pages will contain
  - Objectives of the paper
  - Introduction
  - Body of the paper includes system dynamics, methodology, graphs, block diagrams etc. arranged in a logical sequence depending on the problem.
  - Results and discussions
  - Conclusion
- Last page will contain references and bibliography. References must be presented in IEEE format

6. Each slide consists of 4 or 5 lines with enough space between lines.

7. All equations must be typed using equation editor (available with MS office/other office suite)

8. Each slide will have a title and each figure have a caption.

9. The internal panel will evaluate the seminar presentation for 50 Marks.

MCAP63: Project Work

Synopsis

- Synopsis of the project must be submitted before the end of the first month of 6th semester
- The synopsis of the project must include:
    a) Problem formulation and literature survey.
    b) Details of the required tools and technologies for the development of project.
    c) Write up shall not exceed 15 pages.
- Internal assessment for synopsis presentation and evaluation of the synopsis by the internal examiner/guide is for 50 marks.

Dissertation:

- The project shall be carried out in the same institution or in industry/R&D labs based on software tools and technologies learnt in MCA course/internship for minimum period of 16 weeks.
- Internal assessment shall be evaluated by the internal panel/guide for 50 marks.
- For continuous evaluation of project work by the internal examiner/guide with progress reports is for 10 marks each. (3 progress reports x 10 marks= 30)
- Final presentation for the entire project is evaluated for 20 marks.
- The internal examiners (Project Guide with at least 2 years of experience) and the external examiners shall be appointed by the authorities of the college for the final evaluation of the project.
- Internal and external examiners shall carry out the evaluation of Dissertation report for 150 marks individually. The average of the marks allotted by the internal and external examiners shall be the final marks for the project Dissertation report evaluation.
- The project presentation and Viva-voce shall be evaluated jointly by both the internal and external examiners for 100 marks.
- The student should be encouraged to present/publish the part/outcome of the project as an article in the conferences/journals.

Guidelines for preparing PG (Autonomous) Dissertation/Project Report

Sl No.	Department	PG Program	Colour of the Project report	No of reports* (Minimum)	CD
1	Civil	Structural Engg	Grey	4	2
2	Mechanical	Machine Design	Sky Blue	4	2
3	EEE	Power Electronics	Purple	4	2
4	ECE	VLSI Design and Embedded Systems	Purple	4	2
5	CSE	Computer Science and Engineering	Cream	4	2
6	ISE	Computer Networking Engineering	Cream	4	2
7	TE	Digital Communication and Networking	Purple	4	2
8	E&IE	Electronics	Purple	4	2
9	MBA	MBA	Light Pink	4	2
10	**MCA**	**MCA**	**Light Pink**	**4**	**2**

*(Student copy + Guide copy + Library copy + Department copy)

1. Preparation of dissertation report using Latex software is desirable.
2. Project reports should be typed neatly on one side of the paper with 1.5 line spacing on A4 size bond paper/75GSM (210 x 297 mm).
3. The margins should be: Left – 1.25″, Right – 1″, Top and Bottom – 0.75″.
4. The total number of reports to be prepared are:
5. One copy to the candidate.
   One copy to the department
   One copy to the concerned guide(s)
   One copy to the college library
   Two copies to the sponsoring agency, if any
   Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.
6. For making copies, dry tone Xerox is suggested.
7. Every copy of the report must contain
   Outer title page (Hard bound of specified colour)
   Inner title page (White)
   Certificate in the format specified both from the college and the organization where the project is carried out.
   An abstract or synopsis indicating salient features of the work.
   The organization of the report should be as follows:

Acknowledgements

Table of Contents

List of figures

List of tables

usually numbered in roman (lower case/small letters)

Chapters (to be numbered in Arabic) containing Introduction, which usually specifies the scope of work and its importance and relation to previous work and the present developments. Main body of the report divided appropriately into chapters, sections and subsections.

The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.

The chapter number must be left justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 12.

The figures and tables must be numbered chapter wise for e.g.: Fig. 2.1 Block diagram of a serial binary adder, Table 3.1 Primitive flow table, etc.

The last chapter should contain the summary of the work carried out, contributions if any, their utility along with the scope for further work.

Reference: The references should be numbered serially in the order of their occurrence in the report and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

For textbooks – A.V. Oppenheim and R.W. Schafer, Digital Signal Processing, Englewood, N.J., Prentice Hall, 3rd Edition, 1975.

For papers –

Authors name, "Title of the Dissertation Report", *Name of the Journal or Conference*, Vol. 71, No. 5, pp. 45-56, 2017.

Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g.

V = IR ……. (3.2)

All equation numbers should be right justified.

The project report should be in brief and include descriptions of work carried out by others (literature survey/ related work) only to the minimum extent necessary. Verbatim reproduction of material available elsewhere should be strictly avoided. Proper attention is to be paid not only to the technical contents but also to the organization of the report and clarity of the expression. Due care should be taken to avoid spelling and typographical errors. Report writing plays an important role in the evaluation of the project.

Hardware projects must include: the component layout, complete circuit with the component list containing the name of the component, numbers used, etc. and the main component data sheets as Appendix. At the time of report submissions, the students must hand over a copy of these details to the department PG coordinator and see that they are entered in proper registers maintained in the department.

Software projects must include a virus free disc, containing the software developed by them along with the read me file. Read me file should contain the details of the variables used, salient features of the software and procedure of using them, compiling procedure, details of the computer hardware/software requirements to run the same, etc. If the developed software uses any public domain software downloaded from some site, then the address of the site along with the module name etc. must be included on a separate sheet. It must be properly acknowledged in the acknowledgments.

Sponsored Projects must also satisfy the above requirements along with statement of accounts, bills for the same duly attested by the concerned guides to process further, they must also produce NOC from the concerned guide before taking the internal viva examination.

The reports submitted to the department/guide(s) must be hard bounded.

Separator sheets, used if any, between chapters, should be of thin paper.

Dean (A) Principal

(COVER PAGE)

PROJECT TITLE

A Dissertation submitted in partial fulfillment of the requirements for the award of degree of

MASTER OF COMPUTER APPLICATIONS of

Visvesvaraya Technological University

By

STUDENT NAME

(USN Number)

Under the Guidance of

GUIDE NAME

logo

Department of Master of Computer Applications, Institute Name, Address, Place, Pincode.

June 2019

(Inner Title Page)

PROJECT TITLE

A Dissertation submitted in partial fulfillment of the requirements for the award of degree of

MASTER OF COMPUTER APPLICATIONS of

Visvesvaraya Technological University

Accredited by National Board of Accreditation

By

STUDENT NAME

(USN Number)

Under the Guidance of

Internal Guide:	**ExternalGuide:**
Guide Name	**Name**
Affiliation	Affilation
Address	Address
Email :	*Email :*

logo

Department of Master of Computer Applications, Institute Name, Address, Place, Pincode.

June 2019

(Certificate)

INSTITUTE NAME

Address

LOGO

Department of Master of Computer Applications

CERTIFICATE

This is to Certify that **Student Name** bearing **USN** has completed his/her final semester project work entitled **"******"** as a partial fulfillment for the award of Master of Computer Applications degree, during the academic year 2019 under my (our joint) supervision.

Signature of Internal Guide	**Signature of External Guide**
Guide Name	**Guide Name**
Affiliation	Affiliation
Address	Address
Head of the Dept.	**Principal**

Declaration

I, <**Name of student**>, student of 6th MCA, <**College Name**>, bearing USN **<USN of student>** hereby declare that the project entitled <**Project Title**> has been carried out by me under the supervision of External Guide /(or Guide) **<Name of the Guide>**, <**Designation of Guide**> and Internal Guide (or Co-guide) <**Name of the Guide>,** <**Designation of Guide**> and submitted in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications by the **Visvesvaraya Technological University** during the academic year 2019. This report has not been submitted to any other Organization/University for any award of degree or certificate.

Name:

Signature: