

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

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

MISSION

- 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.

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, 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.

Dr. Ambedkar Institute of Technology
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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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Department of Master of Computer Applications
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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Department of Master of Computer Applications
MCA SECOND SEMESTER ELECTIVE COURSES

Elective – 1

S.No	Course Code	Course Title
1.	20MCA251	Cyber Security
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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Department of Master of Computer Applications
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/ Assignment	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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Department of Master of Computer Applications
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	Full stack 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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Department of Master of Computer Applications

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

Sl. No.	Course Code	Course Title	Teaching hours per week			Examination				Credits
			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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Department of Master of Computer Applications
 (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)							
<ul style="list-style-type: none"> 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	
<p>The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifiers in Java, The Java Class Libraries.</p> <p>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.</p> <p>Program Control Statement: Input characters from the Keyboard, 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.</p> <p>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.</p> <p>String Handling: String Fundamentals, The String Constructors, Three String-Related Language Features, The Length () Method, Obtaining the characters within a string, String comparison</p>							
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							

<p>Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.</p> <p>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.</p> <p>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.</p>	
MODULE 3: Interfaces	11 Hrs
<p>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.</p> <p>Packages :Package Fundamentals, Packages and Member Access, Importing Packages, Static Import</p> <p>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.</p>	
MODULE4:Multithreaded Programming	11 Hrs
<p>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.</p> <p>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</p> <p>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</p>	
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: <ul style="list-style-type: none">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 Hortsman, 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)							
<ul style="list-style-type: none"> Formulate and apply object-oriented programming using C++ to solve the engineering problems. 							
<ul style="list-style-type: none"> Analyse data structures and algorithms to solve the problems and evaluate their solutions. 							
<ul style="list-style-type: none"> Demonstrate different Applications of data structures. 							
<ul style="list-style-type: none"> Study the algorithms or program code segments that contains iterative constructs 							
<ul style="list-style-type: none"> 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's Algorithm, Huffman Trees. Dynamic Programming: Computing a binomial coefficient, 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:	
<ul style="list-style-type: none"> Each full question consists of 20 marks. Questions are set covering all the topics under each module 	
Textbooks:	
3. Richard F Gilberg and Behrouz A Forouzan: Data Structures - A Pseudocode Approach with C, Cengage Learning, 6th Indian Reprint 2009.	
4. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition	
Reference Books	
3. Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenenbaum: Data Structures using C and C++, 2nd Edition, Pearson Education Asia, 2002.	
4. Nanjesh Bennur, Dr. Manjaiah DH, Dr. C.K. Subbaraya: C programming skills and Data Structures primer, First Edition, IPH Publication, 2017.	
5. Cormen 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)	
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- | |
|---|
| <ul style="list-style-type: none"> • To design web pages using Bootstrap framework |
| <ul style="list-style-type: none"> • To develop different approaches of Server side scripts using PHP and NodeJs |
| <ul style="list-style-type: none"> • To design Single page web applications using Angular |
| <ul style="list-style-type: none"> • 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)							
<ul style="list-style-type: none"> 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 3 rd 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 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:	
<ul style="list-style-type: none"> 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, 8 th Edition, Pearson education, 2009.	
2. Raghu Ramakrishnan and Johannes Gehrke: Database management Systems, 3 rd Edition, 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

[illegible]

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)							
<ul style="list-style-type: none"> The primary objective of this course is to provide mathematical background and sufficient experience on various topics of discrete mathematics 							
<ul style="list-style-type: none"> 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 							
<ul style="list-style-type: none"> 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: <ul style="list-style-type: none">• 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)

- | |
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| <ul style="list-style-type: none"> • 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.	<p>a) Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading.</p> <p>b) Write a JAVA Program to implement Inner class and demonstrate its Access protection.</p>
2.	<p>Write a program in Java for String handling which performs the following:</p> <p>i) Checks the capacity of String Buffer objects.</p> <p>ii) Reverses the contents of a string given on console and converts the resultant string in upper case.</p> <p>iii) Reads a string from console and appends it to the resultant string of (ii).</p>
3.	<p>a) Write a JAVA Program to demonstrate multi-level Inheritance.</p> <p>b) Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.</p>
4.	<p>Write a JAVA program which has</p> <p>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.</p> <p>ii) A Class called LessBalanceException which returns the statement that says withdraw amount (Rs) is not valid.</p> <p>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.</p>
5.	<p>Write a java program to handle the followingsystem exceptions</p> <p>ArrayIndexOutOfBoundsException</p> <p>FileNotFoundException</p> <p>NumberFormatException</p>

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 language 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 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	

<p align="center">I SEMESTER</p> <p align="center">DATA STRUCTURES AND ALGORITHMS LAB</p>	
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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)

- | |
|---|
| <ul style="list-style-type: none"> • Design the programming codes for the implementation of data structures and algorithm concepts. |
| <ul style="list-style-type: none"> • Develop the codes to Analyse data structures and algorithms to solve the problems and evaluate their solutions. |

Sl. No	Program
1.	<p>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)</p> <ol style="list-style-type: none"> Push an element on to stack Pop an element from stack. Demonstrate how stack can be used to solve tower of Hanoi problem with n disks. Demonstrate Overflow and Underflow situations on stack. Display the status of stack. Exit. <p>Support the program with appropriate functions for each of the above operations.</p>
2.	<p>Design, Develop and Implement a Program in C++ for the following Stack Applications Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^</p>
3.	<p>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).</p> <ol style="list-style-type: none"> Insert an Element on to Circular QUEUE Delete an Element from Circular QUEUE Demonstrate Overflow and Underflow situations on Circular QUEUE Display the status of Circular QUEUE Exit <p>Support the program with appropriate functions for each of the above operations</p>

4.	<p>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</p> <ol style="list-style-type: none"> Create a SLL of N Students Data by using front insertion. Display the status of SLL and count the number of nodes in it Perform Insertion and Deletion at End of SLL Perform Insertion and Deletion at Front of SLL Demonstrate how this SLL can be used as STACK and QUEUE Exit
5.	<p>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.</p> <ol style="list-style-type: none"> Create a DLL of N Employees Data by using end insertion. Display the status of DLL and count the number of nodes in it Perform Insertion and Deletion at End of DLL Perform Insertion and Deletion at Front of DLL Demonstrate how this DLL can be used as Double Ended Queue 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	<p>Design, Develop and Implement a menu driven Program in C++ for the following operations on Binary Search Tree (BST) of Integers</p> <ol style="list-style-type: none"> Create a BST of N Integers Traverse the BST in Inorder, Preorder and Post Order Search the BST for a given element (KEY) and report the appropriate message Delete an element (ELEM) from BST 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)	
CLO-1	Identify the various types of chemical reactions and write balanced chemical equations for them.
CLO-2	Calculate the molar mass of a compound and use it to convert between mass and moles.
CLO-3	Determine the limiting reagent in a chemical reaction and calculate the theoretical yield of a product.
CLO-4	Calculate the percent yield of a chemical reaction.
CLO-5	Identify the various types of chemical reactions and write balanced chemical equations for them.
CLO-6	Calculate the molar mass of a compound and use it to convert between mass and moles.
CLO-7	Determine the limiting reagent in a chemical reaction and calculate the theoretical yield of a product.
CLO-8	Calculate the percent yield of a chemical reaction.

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| <ul style="list-style-type: none"> • To design web pages using Bootstrap framework and add effects with jQuery. |
| <ul style="list-style-type: none"> • To develop different approaches of Server side scripts using PHP and NodeJs |
| <ul style="list-style-type: none"> • 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
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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	

<p style="text-align: center;">I SEMESTER PRINCIPLES OF PROGRAMMING</p>

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:

COURSE LEARNING OBJECTIVES (CLO)	
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| <ul style="list-style-type: none"> • 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. |
| <ul style="list-style-type: none"> • Understand and appreciate the use of arrays, strings, functions, structures and Union in C |
| <ul style="list-style-type: none"> • 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 with return 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		7 Hrs
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		
MODULE 5: Pointers and File Management		8 Hrs
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.		
Question Paper Pattern:		
<ul style="list-style-type: none"> 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, 3 rd Edition, Cengage Learning, 2013		
2. M G Venkateshmurthy: Programming Techniques through C, Pearson Education, 2017		
3. Ivor Horton: Beginning C from Novice to professional, 7 th Edition, Springer, 2014		
COURSE OUTCOMES (CO)		
CO1: Design, write and execute C programs for simple applications		
CO2: Formulate and 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								
<ul style="list-style-type: none"> 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: Stripping 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: Essential 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 Seaborn.	
Question Paper Pattern: <ul style="list-style-type: none"> • 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 2 nd 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	

<p align="center">II SEMESTER</p> <p align="center">INTERNET OF THINGS</p>
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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)	
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|---|
| <ul style="list-style-type: none"> • Learn the evolution of IOT from M2M to global Context. |
| <ul style="list-style-type: none"> • Understand IoT in managing data and knowledge. |
| <ul style="list-style-type: none"> • Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks. |
| <ul style="list-style-type: none"> • Analyse the application areas of IOT . |
| <ul style="list-style-type: none"> • 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
<p>Embedded Devices: Introduction, Processor for things, Things design, Gateway design.</p> <p>Arduino: Introduction, Getting started with Arduino Feature of Arduino, Types of Arduino Board, Arduino IDE, Anatomy of Interactive devices, Blinking an LED.</p> <p>Raspberry Pi: Introduction, Essential of setting Raspberry Pi, Programming</p>	

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. Data Protocol: MQTT, CoAP, AMQP, XMPP, WebSocket. Communication Protocols: Introduction to IEEE 802.15.4, 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's IoT, Carriots, Oracle Integrated Cloud, How to select the right IoT platform.	
Question Paper Pattern:	
<ul style="list-style-type: none"> • Each full question consists of 20 marks. • Questions are set covering all the topics under each module 	
Text Books	
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 Arshdeep Bahga and Vijay Madisetti (Hands-on-Approach)", 1st Edition, 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:							
<ul style="list-style-type: none"> • Classify various software requirement process and tools 							
<ul style="list-style-type: none"> • Build software Design and Architecture using software notations and tools 							
<ul style="list-style-type: none"> • Understand, how to implement the software project using software tools and Methodologies 							
<ul style="list-style-type: none"> • Test the software and Measure the quality of Software 							
<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Each full question consists of 20 marks. • Questions are set covering all the topics under each module 	
Text Books:	
1. Software Engineering, 10 th Edition Ian Sommerville , University of St. Andrews, Pearson, 2016	
2. Software Engineering: A Practitioner’s Approach, 8/eby <u>Bruce R. Maxim</u> 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

<p align="center">II SEMESTER</p> <p align="center">RESEARCH METHODOLOGY</p>	
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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)	
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- | |
|--|
| <ul style="list-style-type: none"> • Understand basic concepts of research and its methodologies. |
| <ul style="list-style-type: none"> • To gain overview of a range of quantitative and qualitative approaches to data analysis. |
| <ul style="list-style-type: none"> • To Accurately collect, analyze and report data |
| <ul style="list-style-type: none"> • Be aware of the ethical principles of research, report writing and ethical challenges |

MODULES	TEACHING HOURS
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MODULE 1: Overview of Research	8 Hrs
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<p>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.</p>	
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MODULE 2: Introduction to research designs.	8 Hrs
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<p>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.</p>

MODULE 3: Sampling Methods	8 Hrs
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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.	
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MODULE 4: Processing & analysis of Data Statistical measures and their significance:	8 Hrs
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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.	
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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:												
<ul style="list-style-type: none">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			

<p align="center">II SEMESTER</p> <p align="center">INTERNET OF THINGS LAB</p>
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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 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:

- | |
|---|
| <ul style="list-style-type: none"> • Learn the basics of mobile app development |
| <ul style="list-style-type: none"> • Build mobile applications using database |
| <ul style="list-style-type: none"> • Develop mobile app that uses GPS location information |
| <ul style="list-style-type: none"> • 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 be 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	
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Program List	
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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	PO11	PO12
CO	M	M	H	H	M	H	H					

<p align="center">II SEMESTER</p> <p align="center">CYBER SECURITY</p>
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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)	
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- | |
|---|
| <ul style="list-style-type: none"> • To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks. |
| <ul style="list-style-type: none"> • To develop graduates that can identify, Analyse |
| <ul style="list-style-type: none"> • 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 Worms, 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:	
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- 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”, 4 th 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)							
<ul style="list-style-type: none"> • 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							
MODULE 1: INTRODUCTION TO TESTING						TEACHING HOURS	
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: <ul style="list-style-type: none"> • Each full question consists of 20 marks. • Questions are set covering all the topics under each module 	
TEXTBOOKS	
<ol style="list-style-type: none"> 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	
<ol style="list-style-type: none"> 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								

<p align="center">II SEMESTER</p> <p align="center">DATA SCIENCE USING R</p>	
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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:	
<ul style="list-style-type: none"> 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. <u>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</u> 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: <ul style="list-style-type: none"> • 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)							
<ul style="list-style-type: none"> Introduce the fundamental aspects of ethical hacking 							
<ul style="list-style-type: none"> Demonstrate different features of ethical hacking 							
<ul style="list-style-type: none"> Remediate computer security breaches, attack and defence 							
<ul style="list-style-type: none"> 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 ,Mirroring/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
<p>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.</p> <p>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.</p>	
MODULE 5: Cryptography & Security Architecture and Design	10 Hrs
<p>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.</p> <p>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 .</p>	
Practical contents	
<ol style="list-style-type: none"> 1. Scanning for Open Ports of Remote Machine 2. Gaining SSH Access of Remote Machine using hydra Tool 3. Accessing Wifi Saved Password in Windows Machine 4. Accessing Wifi 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 	
<p>Question Paper Pattern:</p> <ul style="list-style-type: none"> • 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)							
<ul style="list-style-type: none"> Learn the concept of data base technology evolutionary path which has led to the need for data mining and its application 							
<ul style="list-style-type: none"> Understand the concept of Data warehousing and OLAP, storage and retrieval technique of data from DATA CUBE and different pre processing techniques 							
<ul style="list-style-type: none"> Discover interesting patterns from large amounts of data to analyze and extract pattern to solve problems, make predictions of outcomes 							
<ul style="list-style-type: none"> Select and apply proper data mining algorithms to build analytical applications 							
<ul style="list-style-type: none"> Evaluate systematically supervised and unsupervised models with respect to their accuracy 							
<ul style="list-style-type: none"> Learn the data 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: <ul style="list-style-type: none"> • Each full question consists of 20 marks. • Questions are set covering all the topics under each module 	
TextBooks: <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 1. PaulrajPonnian, “Data Warehousing Fundamentals”, John Willey 	

2. K. Gupta: Introduction to Data Mining with Case Studies, 3 rd 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								

<p align="center">II SEMESTER</p> <p align="center">ENTERPRISE RESOURCE PLANNING</p>
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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

<p>COURSE LEARNING OBJECTIVES (CLO)</p> <p>At the end of the course, student should be able to:</p>

- **Identify the different ERP related Technologies and their benefits**

- | |
|--|
| <ul style="list-style-type: none"> • Understand the Various Business Modules |
| <ul style="list-style-type: none"> • ERP implementation using different Techniques |
| <ul style="list-style-type: none"> • Learn different ERP vendors and practice them |

MODULES	TEACHING HOURS
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MODULE 1: ERP and Related Technologies	8 Hrs
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Business	Process	Re-engineering,	Management	Information	
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<p>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</p>
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MODULE 2: Benefits of ERP	7 Hrs
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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	
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MODULE 3: Business Modules	8 Hrs
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Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	
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MODULE 4: ERP Implementation Life Cycle	8 Hrs
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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	
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MODULE 5: Different ERP Vendors	8 Hrs
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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:	
<ul style="list-style-type: none"> • 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 Fernandez , 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					

<p align="center">II SEMESTER</p> <p align="center">SUPPLY CHAIN MANAGEMENT</p>							
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)							
<ul style="list-style-type: none"> • Demonstrate knowledge of the functional logistics and supply chain management 							
<ul style="list-style-type: none"> • Illustrate the concepts and activities of the supply chain and actual organization 							
<ul style="list-style-type: none"> • Analyse the role of technology in logistics and supply chain management 							
<ul style="list-style-type: none"> • 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						8 Hrs	
Objectives, importance, decision phases, process view, competitive and 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, 3 rd and 4 th 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: <ul style="list-style-type: none"> • 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 – Strategy, Planning and Operation, Pearson/PHI,3 rd 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

[illegible]

II SEMESTER							
STORAGE AREA NETWORKS							
Course Code:				20MCA264		CIE Marks:	
Number of Lecture Hours per week:				3		SEE Marks:	
Total number of Lecture Hours:				39		SEE Hours:	
Lecture (L):		3	Practicals (P):		0	Tutorial (T):	
					0	Total Credits:	
						3	
COURSE LEARNING OBJECTIVES (CLO)							
<ul style="list-style-type: none"> Understand the need for Storage Area Network and Data protection to satisfy the information explosion requirements. 							
<ul style="list-style-type: none"> Get an insight of Storage area network architecture, protocols and its infrastructure. 							
<ul style="list-style-type: none"> 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, 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:

- 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)	
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|---|
| <ul style="list-style-type: none"> • To understand the hardware and software architecture of modern distributed systems. |
| <ul style="list-style-type: none"> • To handle process synchronization in distributed systems |
| <ul style="list-style-type: none"> • 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. Communication in Distributed Systems, Layered Protocols, ATM networks, The Client-server 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.

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)									
<ul style="list-style-type: none"> 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 to Machine 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: <ul style="list-style-type: none">Each full question consists of 20 marks.Questions are set covering all the topics under each module	
TextBooks: <ol style="list-style-type: none">Fabio Nelli, “ Python Data Analytics”, Apress,Springer Science + Business Media Finance Inc (SSBM Finance Inc).Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, 1st Edition, 2019, Pearson Publications, , ISBN 978-93-530-6669-7Machine Learning, Tom M Mitchel, McGraw Hill publications,ISBN-0070428077Machine Learning with Python: Design and Develop Machine Learning and Deep Learning, BPB Publishing, India,2018	
Reference Books <ol style="list-style-type: none">Jake Vander plas, “Python Data Science Handbook: Essential tools for working with data”, O’Reilly Publishers, I Edition.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)	
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|--|
| <ul style="list-style-type: none"> • Describe the JDBC concepts and designing an applications using JDBC. |
| <ul style="list-style-type: none"> • Introduce the concepts of server side programming using Servlets & JSP. |
| <ul style="list-style-type: none"> • Understand Java Beans and different types of enterprise java beans and implement them. Design and developing an application using springs framework. |

MODULES	TEACHING HOURS
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MODULE 1: JDBC	10 Hrs
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<p>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.</p>	
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MODULE 2: SERVLET	10 Hrs
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<p>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.</p>	
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MODULE 3: JSP	10 Hrs
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<p>Overview of JSP: JSP Technology, Benefits of JSP, Advantages of JSP, Basic syntax.</p> <p>JSP life cycle, JSP tags, looping statements, The JSP page directive, JSP Action tags, JSP implicit objects. JSP form processing, JSP database connectivity.</p>	
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MODULE 4: Annotations & EJB	10 Hrs
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<p>Annotations</p> <p>Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations with examples.</p> <p>Java Beans and EJB</p> <p>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.</p> <p>Enterprise Java Beans: The EJB Container, EJB Classes, EJB Interface. Deployment Descriptor, Session Java Bean, Entity Java Bean, Message-Driven Bean.</p>	
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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.

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.
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Enterprise Java Beans: The EJB Container, EJB Classes, EJB Interface. Deployment Descriptor, Session Java Bean, Entity Java Bean, Message-Driven Bean.
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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: <ul style="list-style-type: none">• Each full question consists of 20 marks.• Questions are set covering all the topics under each module												
Text Books: <ol style="list-style-type: none">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 <ol style="list-style-type: none">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	

<p align="center">III SEMESTER</p> <p align="center">NETWORK ARCHITECTURE AND PROGRAMMING</p>

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)	
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|---|
| <ul style="list-style-type: none"> • Classify the network protocols and identify the service |
| <ul style="list-style-type: none"> • Demonstrate the architecture of larger and emerging networks |
| <ul style="list-style-type: none"> • Implement a wired and wireless network architecture using a simulator tool |
| <ul style="list-style-type: none"> • Analyse the performance characteristics of a network with a simulator tool |

MODULES	TEACHING HOURS
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MODULES	TEACHING HOURS
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MODULE 1: Protocols and Standards	14 Hrs
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MODULE 1: Protocols and Standards	14 Hrs
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TCP/IP Reference Model, Circuit Switching, Packet Switching, InternetProtocols (TCP, IP, UDP, ICMP, ARP), Unicast Routing Protocols (OSPF, DVRP), Multicast Routing protocols (MOSPF, DVMRP)	
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MODULE 2: Larger Networks	10 Hrs
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MODULE 2: Larger Networks	10 Hrs
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Optical Networking: SONET/SDH, Frame Relay, ATM, Virtual LAN	
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MODULE 3: Wireless Networking	08 Hrs
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MODULE 3: Wireless Networking	08 Hrs
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SAN, Bluetooth, Broadband ISDN, Wireless networks, Wireless sensor Networks	
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MODULE 4: Emerging Network Technologies	08 Hrs
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MODULE 4: Emerging Network Technologies	08 Hrs
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Software Defined Network, Delay-tolerant Networking, Home Networking, Content Distributed Network, Data Center Network	
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MODULE 5: Network Simulation Software	12 Hrs
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MODULE 5: Network Simulation Software	12 Hrs
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Working on Network Simulation Tools – Building a Lan Topology with a simulation tool, Analysing the flow of packets with TCP protocol, Analysing	
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the flow of packets with UDP protocol, Simulating routing technologies (Distance Vector), wireless	
Question Paper Pattern:	
<ul style="list-style-type: none"> • 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. Uyles 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 4 th edition	
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

[illegible]

<p align="center">III SEMESTER</p> <p align="center">DIGITAL MARKETING</p>							
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)							
<ul style="list-style-type: none"> Identify the importance of the digital marketing for marketing success, to manage customer relationships across all digital channels 							
<ul style="list-style-type: none"> Able to do Web site and SEO optimization and to develop a digital marketing plan. 							
<ul style="list-style-type: none"> Create Google AdWords campaigns, social media planning and basic knowledge of Google Analytics for measuring effects of digital marketing 							
MODULES							
MODULE 1: Introduction to Digital Marketing						TEACHING HOURS	
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)						7 Hrs	
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							

<p>Generation, Redirecting Techniques .</p> <p>OffpOffpage 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 .</p> <p>Webmaster Tools: Verification Process in GWMT , Selecting Target Location, Google Webmaster Tools .</p> <p>Local SEO: Introduction, Submission to Google My Business, Completing the Profile, Local SEO Ranking Signals, Citations and Local Submissions, SEO Reporting.</p>	
MODULE 3: Google AdWords	07 Hrs
<p>PPC Advertising: Paid Marketing, Google Account setup Google AdWords, Display Advertising. Remarketing Strategy, Building Remarketing List & Custom Targets, Creating Remarketing Campaign.</p> <p>CRM:CRM platform , CRM models</p>	
MODULE 4: Web Analytics	08 Hrs
<p>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.</p> <p>Google Analytics: Installing Analytics code in site , Analytics account structure , Real Time Reports , Settings in Analytics, Traffic Reports.</p> <p>Conversion Tracking: What is conversion, Conversion Process and Funnel, Types of Conversions, Conversion Reports, Funnel Visualization, Multi-Channel Funnels , Attribution Reporting, Digital Marketing Budgeting</p>	
MODULE 5: Social Media Marketing	08 Hrs
<p>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</p>	

risks and challenges.												
Question Paper Pattern:												
<ul style="list-style-type: none">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)	

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|---|
| <ul style="list-style-type: none"> • Introduce the fundamental aspects of cloud computing |
| <ul style="list-style-type: none"> • Discuss virtualization technologies along with the architectural models of cloud computing. |
| <ul style="list-style-type: none"> • Leverage the prominent Cloud computing technologies available in the market place. |
| <ul style="list-style-type: none"> • Demonstrate different features of cloud platforms used in Industry |
| <ul style="list-style-type: none"> • 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 2.0, 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, Force.com and Salesforce.com,	
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:	
<p>Working with Amazon Web Services(AWS):</p> <ul style="list-style-type: none"> • 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 <p>Salesforce Trailhead Platform</p> <ul style="list-style-type: none"> • Create a web application to enter the students' details like name, 	

<p>USN, semester, section and CGPA to a database on Salesforce cloud platform.</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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							

<p align="center">III SEMESTER</p> <p align="center">BIG DATA ANALYTICS</p>

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)

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|---|
| <ul style="list-style-type: none"> • To impart fundamental concepts about big data and its identification. |
| <ul style="list-style-type: none"> • To analyse the design of Hadoop Distributed Files system. |
| <ul style="list-style-type: none"> • To understand and analyse Map Reduce technique for solving Big Data problems |
| <ul style="list-style-type: none"> • To analyse different hadoop related tools like Pig & Hive and manage NOSQL databases. |

MODULES	TEACHING HOURS
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MODULE 1: Big Data & Hadoop Eco system	10 Hrs
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<p>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.</p> <p>A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem</p> <p>Hadoop Releases Response.</p>	
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MODULE 2: The Hadoop Distributed File system	11 Hrs
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The Hadoop Distributed File system	
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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
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<p>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</p>	
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MODULE 4: NOSQL &Hadoop Tool-Pig	11 Hrs
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NOSQL Data bases	
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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, Grouping and 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:		
<ul style="list-style-type: none"> Each full question consists of 20 marks. Questions are set covering all the topics under each module 		
Text Books:		
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, Alexey Yakubovich, “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)							
<ul style="list-style-type: none">Learn the fundamentals of Go programming languageUnderstand the handling of various data structures in GoApply Go routines and packages to build parallel systemsDesign 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:							
<ul style="list-style-type: none">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 Addison Wesley							
b. The GO Programming Language by Alan A. A. Donovan, Brian W. Kernighan published by Addison 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)							
<ul style="list-style-type: none"> To design as web page using front end technologies 							
<ul style="list-style-type: none"> To develop application with server side scripting tools 							
<ul style="list-style-type: none"> To develop web application with REST APIs and use of framework to communicate client-server applications. 							
<ul style="list-style-type: none"> 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 Mongoddb.		
Question Paper Pattern:		
<ul style="list-style-type: none">• 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 mongoddbtechnologies		
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)	
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- | |
|--|
| • 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
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MODULES	TEACHING HOURS
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MODULE 1: Basis of Blockchain Technology	8Hrs
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Introduction to Blockchain, growth – Definition – Elements of Blockchain, Tiers, Types, Consensus, Decentralization: Methods of Decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization

Introduction to Blockchain, growth – Definition – Elements of Blockchain, Tiers, Types, Consensus, Decentralization: Methods of Decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization

MODULE 2: Blockchain Mining	8 Hrs
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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	
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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	
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MODULE 3: Usecase - Financial Markets and Smart Contracts	8 Hrs
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Trading, Exchanges, Trade Lifecycle, order anticipators, Market, Manipulation, Smart Contracts: Templates, Smart Oracles, Deploying smart contracts in Blockchain

Trading, Exchanges, Trade Lifecycle, order anticipators, Market, Manipulation, Smart Contracts: Templates, Smart Oracles, Deploying smart contracts in Blockchain

MODULE 4: Generic Use Cases	8Hrs
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Blockchain as Evidences – Digital Art -Blockchain Health–Blockchain Government
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Blockchain as Evidences – Digital Art -Blockchain Health–Blockchain Government
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MODULE 5: Technology on Ethereum	7 Hrs
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Ethereum blockchain, Ethereum network: mainnet, testnet, private net, components of Ethereum ecosystem, Ethereum Virtual Machine
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Ethereum blockchain, Ethereum network: mainnet, testnet, private net, components of Ethereum ecosystem, Ethereum Virtual Machine
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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)							
<ul style="list-style-type: none"> Understand 5G wireless features and their benefits 							
<ul style="list-style-type: none"> Outline different 5G Wireless Use Cases 							
<ul style="list-style-type: none"> Walk through current and future deployment of 5G scenarios 							
<ul style="list-style-type: none"> Illustrate 5G network architecture and components 							
MODULES						TEACHING HOURS	
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:	
<ul style="list-style-type: none"> Each full question consists of 20 marks. Questions are set covering all the topics under each module 	
Textbooks:	
<ul style="list-style-type: none"> 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:	
<ul style="list-style-type: none"> 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

[illegible]

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	Practical s (P):		0	Tutorial (T):		0	Total Credits:		3

COURSE LEARNING OBJECTIVES (CLO)	
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- | |
|---|
| <ul style="list-style-type: none"> • Identify the problems where AI is required and the different methods Available. |
| <ul style="list-style-type: none"> • Compare and contrast different AI techniques available. |
| <ul style="list-style-type: none"> • Define and explain learning algorithms. |

MODULES	TEACHING HOURS
MODULE 1: Introduction	8Hrs
Introduction to artificial intelligence, Course structure and policies, History of AI, Proposing and evaluating AI applications, Case study: What is artificial intelligence?, Problems, Problem Spaces and search, Heuristic search technique	
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 Russell, 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	

[illegible]

- | 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 |

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MODULES	TEACHING HOURS
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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

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	8 Hrs
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MODULE 2: Architecture Quality	8 Hrs
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	

MODULE 2: Architecture Quality	8 Hrs
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	

MODULE 3: Quality Tactics	8 Hrs
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MODULE 3: Quality Tactics	8 Hrs
Applying Tactics: Availability tactics; Interoperability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics	

MODULE 3: Quality Tactics Applying Tactics: Availability tactics, Interoperability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics	8 Hrs
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MODULE 4: Design Patterns - 1	8 Hrs
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MODULE 4: Design Patterns - 1	8 Hrs
<p>Architectural styles: Pipes and Filters, Data Abstraction and OO organization, Event-based, Implicit Invocation, Layered Systems, Repositories, Interpreters, Process Control</p> <p>Architectural Patterns - I: From Mud to structure; Layers; Pipes and filters; Blackboard</p>	

MODULE 4: Design Patterns - 1	8 Hrs
<p>Architectural styles: Pipes and Filters, Data Abstraction and OO organization, Event-based, Implicit Invocation, Layered Systems, Repositories, Interpreters, Process Control</p> <p>Architectural Patterns - I: From Mud to structure; Layers; Pipes and filters; Blackboard</p>	

MODULE 5: Architecture Designs Case Studies	8 Hrs
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MODULE 5: Architecture Designs Case Studies	8 Hrs
Architectural Patterns – II: Distributed systems: Broker; Interactive systems: Model-view-control	

MODULE 5: Architecture Designs Case Studies	8 Hrs
Architectural Patterns – II: Distributed systems: Broker; Interactive systems: Model-view-control	

Case Studies: Keyword to context, Instrumentation Software, Mobile

Robotics												
Question Paper Pattern:												
<ul style="list-style-type: none">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)							
<ul style="list-style-type: none"> The primary objective of this course is to provide mathematical background and sufficient experience on various topics of Graph Theory 							
<ul style="list-style-type: none"> Students will be able to formally understand and prove theorems/lemmas and relevant results in graph theory. 							
<ul style="list-style-type: none"> 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						07 Hrs	
Definitions, Walks, Trails, Paths, Circuits, Connectivity, Components Graph Operations, Cuts, Labelled Graphs and Isomorphism							
MODULE 2:TREES						08 Hrs	
Trees and Forests (Fundamental) Circuits and (Fundamental) Cut Sets , Directed Graphs, Definition , Directed Trees , Acyclic Directed Graphs							
MODULE 3: GRAPH ALGORITHMS						08 Hrs	
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							
MODULE 4: DRAWING GRAPHS						08 Hrs	
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							
MODULE 5: MATROIDS						08 Hrs	
Matroidal Systems The Circuit Matroid of a Graph, Other Basic Matroids Greedy Algorithm, The General Matroid, Operations on Matroids							

Question Paper Pattern:

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

TextBooks

1. ANDRÁSFAL, B.: Introductory Graph Theory. The Institute of Physics (1978)
2. ANDRÁSFAL, 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,PO3, 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)												
<ul style="list-style-type: none">To understand Pre-processing techniques and perform exploratory data analysis.												
<ul style="list-style-type: none">Identify and apply Machine Learning algorithms to solve real world problems												
<ul style="list-style-type: none">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												
<ul style="list-style-type: none">A team of two students must develop the mini project.Synopsis of the project must be submitted in the beginning of the 3rd semesterThe 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												
<ul style="list-style-type: none">➤ 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 internal and 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 <ul style="list-style-type: none"> ➤ 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 <ul style="list-style-type: none"> ➤ Student shall register in any IT related online courses through NPTEL, SWAYAM etc.,or any other MOOC platform (Minimum of Four weeks) <p>Note: Department will not take care of reimbursement of paid courses</p> <ul style="list-style-type: none"> ➤ 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	
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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