Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and affiliated to SPPU, Pune

Curriculum Structure and Syllabus

First Year Master of Computer Application

(Course 2023)

Department of Master of Computer Application

(Effective from Academic Year 2023-2024)

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

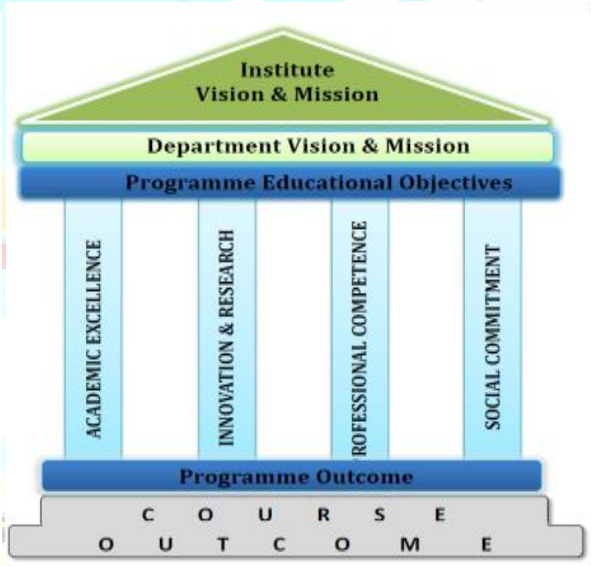
1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute

2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education

3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



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List of Course Abbreviations

Abbreviations	Course Full Name
PCC	Professional Core Course
PEC	Professional Elective Course
BSC	Basic Science Course
MGT	Management Course
SEM	Seminar
PROJ	Project
MOOC	MOOC Course
AC #	Audit Course

Note:

* # - Indicates courses conducted at Institute Level.

CURRICULUM FRAMEWORK

The MCA Program is the based on the following type of course:

SR. NO.	TYPE OF COURSE	ABBREVIATION
1.	Professional Core Course	PCC
2.	Professional Elective Course	PEC
3.	Basic Science Course	BSC
4.	Management Course	MGT
5.	Seminar	SEM
6.	Project	PROJ
7.	MOOC Course	MOOC
8.	Audit Course	AC

The Course and Credit Distribution is as under

Sr. No.	Type of Course	Number of Courses	Total Credit	Credit Per (%)
1	Professional Core Course	11	36	37.5
2	Management	2	6	6.25
3	Basic Science (Math)	2	8	8.33
4	Professional Elective Course	4	12	12.5
5	Professional Core Course Lab	6	6	6.25
6	Professional Elective Course Lab	4	4	4.17
7	Project	3	20	20.83
8	Seminar	1	2	2.08
9	MOOC	1	2	2.08
10	Audit Course	2	0	0
	Total	**36**	**96**	**100**

Course Distribution: Semester wise

Sr. No.	Type of Course	Number of Courses Per Semester				Total
		I	II	III	IV	
1	Professional Core Course	5	2	4	0	11
2	Management	0	1	1	0	2
3	Basic Science (Math)	1	1	0	0	2
4	Professional Elective Course	0	2	2	0	4
5	Professional Core Course Lab	3	2	1	0	6
6	Professional Elective Course Lab	0	2	2	0	4
7	Project	0	1	1	1	3
8	Seminar	0	0	0	1	1
9	MOOC	0	0	0	1	1
10	Audit Course	1	1	0	0	2
	Total	10	12	11	3	36

Credit Distribution: Semester wise

Sr. No.	Type of Course	Number of Credit Per Semester				Total
		I	II	III	IV	
1	Professional Core Course	17	6	13	0	36
2	Management	0	4	2	0	6
3	Basic Science (Math)	4	4	0	0	8
4	Professional Elective Course	0	6	6	0	12
5	Professional Core Course Lab	3	2	1	0	6
6	Professional Elective Course Lab	0	2	2	0	4
7	Project	0	2	2	0	4
8	Seminar	0	0	0	16	16
9	MOOC	0	0	0	2	2
10	Audit Course	0	0	0	2	2
	Total	24	26	26	20	96

Semester-wise Credit, Hours/Week and Marks:

Semester	Credits	Hours/Week	Marks
I	24	28	675
II	26	33	750
III	26	31	725
IV	20	36	500
Total	**96**	**128**	**2650**

STRUCTURE FOR 1ST YEAR MCA (MASTER OF COMPUTER APPLICATION)

SEMESTER – I

MCA Structure Semester-I													
Course Code	Course Type	Course Name	Teaching Scheme					Examination Scheme					Total
			L	P	T/A	H	CR	IE-1	IE-2	ETE	TW	OR	
MCA21401	PCC	Java Programming	3	-	-	3	3	20	30	50	-	-	100
MCA21402	PCC	Database Management System	3	-	-	3	3	20	30	50	-	-	100
MCA21403	PCC	Web Technologies	3	-	-	3	3	20	30	50	-	-	100
MCA21404	PCC	Software Engineering	3	-	1	4	4	20	30	50	-	-	100
MCA21201	BSC	Mathematical Foundation for Computer Application -1	3	-	1	4	4	20	30	50	-	-	100
MCA21405	PCC	Computer Networks	3	-	1	4	4	20	30	50	-	-	100
MCA21406	PCC	Java Programming Lab	-	2	-	2	1	-	-	-	25	-	25
MCA21407	PCC	Database Management System Lab	-	2	-	2	1	-	-	-	25	-	25
MCA21408	PCC	Web Technologies Lab	-	2	-	2	1	-	-	-	25	-	25
M_21961A to M_21961C	AC	Audit Course-1		-	1	1	-	-	-	-	-	-	
		Total	18	6	4	28	24	120	180	300	75		675

Abbreviations: Course Abbreviation;
L- Lecture; **P**- Practical; **T/A**-Tutorial/Activity;
H- Hours; **CR**- Credits; **IE-1** –Internal Evaluation-1;
IE-2 –Internal Evaluation-2; **ETE** – End Term Examination;
TW – Term Work; **OR** – Oral Exam

SEMESTER – II

MCA Structure Semester-II													
Course Code	Course Type	Course Name	Teaching Scheme					Examination Scheme					Total
			L	P	T/A	H	CR	IE-1	IE-2	ETE	TW	OR	
MCA22409	PCC	Data Structures	3	-	-	3	3	20	30	50	-	-	100
MCA22410	PCC	Python Programming	3	-	-	3	3	20	30	50	-	-	100
MCA22501 to MCA22504	PEC	Professional Elective Course-1	3	-	-	3	3	20	30	50	-	-	100
MCA22509 to MCA22512	PEC	Professional Elective Course-2	3	-	-	3	3	20	30	50	-	-	100
MCA22202	BSC	Mathematical Foundation for Computer Application -2	3	-	1	4	4	20	30	50	-	-	100
MCA22301	MGT	Project Management	3	-	1	4	4	20	30	50	-	-	100
MCA22411	PCC	Data Structures Lab	-	2	-	2	1	-	-	-	25	-	25
MCA22412	PCC	Python Programming Lab	-	2	-	2	1	-	-	-	25	-	25
MCA22505 to MCA22508	PEC	Professional Elective Course-1 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA22513 to MCA22516	PEC	Professional Elective Course-2 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA22701	PROJ	Mini Project-1	-	4	-	4	2	-	-	-	50	-	50
M_22962A to M_22962C	AC	Audit Course-2	-	-	1	1	-	-	-	-	-	-	
		Total	18	12	3	33	26	120	180	300	150	-	750

PROFESSIONAL ELECTIVE COURSES (SEMESTER II)

List of Electives			
FYMCA (Sem II)			
Course Code	**Elective 1**	**Course Code**	**Elective 2**
MCA22501	Advanced Web Technologies	MCA22509	Advanced Java
MCA22502	Data Warehouse & Data Mining	MCA22510	Data Science
MCA22503	Network Security	MCA22511	Blockchain
MCA22504	Software Testing and Quality Assurance	MCA22512	Digital Marketing
MCA22505	Advanced Web Technologies Lab	MCA22513	Advanced Java Lab
MCA22506	Data Warehouse & Data Mining Lab	MCA22514	Data Science Lab
MCA22507	Network Security Lab	MCA22515	Blockchain Lab
MCA22508	Software Testing and Quality Assurance Lab	MCA22516	Digital Marketing Lab

** Student will have to select **ONLY THEORY ELECTIVE COURSE** from the List of Professional Elective Courses. The **corresponding lab course** of 1 credit and 25 marks will be mandatory. List of Professional Elective Courses and their corresponding lab course is given below:

Course Code of Professional Elective Course	Name of Professional Elective Course	Course Code of Corresponding Practical Lab Course	Name of Corresponding Practical Lab Course
MCA22501	Advanced Web Technologies	MCA22505	Advanced Web Technologies Lab
MCA22502	Data Warehouse & Data Mining	MCA22506	Data Warehouse & Data Mining Lab
MCA22503	Network Security	MCA22507	Network Security Lab
MCA22504	Software Testing and Quality Assurance	MCA22508	Software Testing and Quality Assurance Lab
MCA22509	Advanced Java	MCA22513	Advanced Java Lab
MCA22510	Data Science	MCA22514	Data Science Lab
MCA22511	Blockchain	MCA22515	Blockchain Lab
MCA22512	Digital Marketing	MCA22516	Digital Marketing Lab

LIST OF AUDIT COURSES FYMCA SEMESTER I & II

FYMCA Sem I		FYMCA Sem II	
Course Code	**Audit Course**	**Course Code**	**Audit Course**
M_21961A	Constitution of India	M_22962A	Team Building & Leadership
M_21961B	Value Education	M_22962B	English for Research Writing
M_21961C	Stress Management	M_22962C	Disaster Management

FYMCA Syllabus Content
with
Teaching and Evaluation Scheme

Course Syllabus
Semester I

Java Programming

Program: MCA (First Year)				Semester: I			
Course: Java Programming				Code : MCA21401			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Computer Fundamentals
- Basics Concepts of Programming

Objectives

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs and identify Java language components and how they work together in applications.
- To learn about the concepts and principles of Java programming.
- To develop applications using object-oriented programming concepts of Java.
- To develop GUI applications using Swing and Applet programming

Outcomes

At the end of the course, students will be able to:

- Describe different concepts such as Programming Constructs, Multithreading, OOPs, File Handling, Collections, GUI using Java Programming.
- Implement different concepts of object-oriented programming.
- Implement Annotations, Lambda Expression using Java Programming.
- Perform different operations related to file handling, multithreading using Java Programming.
- Use different classes and interfaces from Collection Framework.
- Build user interfaces using Swing, Applets.

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Introduction to Java & Programming Concepts** 1.1 History of Java 1.2 Features of Java	5

	1.3 JDK vs JRE vs JVM 1.4 Basic syntax and language constructs 1.4.1 Identifiers, Keywords, Variables, 1.4.2 Control Structure, Decision Making Statements, 1.4.3 Arrays & Strings (String, StringBuffer class)	
2	**Object-Oriented Programming in Java** 2.1 Classes and Objects 2.2 Constructors and Methods 2.3 Access Modifiers 2.4 Inheritance 2.5 Polymorphism 2.6 Encapsulation and Abstraction 2.7 Exception Handling	8
3	**Advanced Java Programming Constructs** 3.1 Interfaces and Abstract Classes 3.2 Packages 3.3 Generics 3.4 Annotations 3.5 Lambda Expressions 3.6 Functional Interfaces	8
4	**Java Input / Output & Multithreading** **Java Input / Output** 4.1 Java I/O package, IO class Hierarchy 4.2 Byte Stream and Character Stream classes 4.3 Buffered Reader and writer classes 4.4 PrintWriter class4.5 **Multithreading in Java** 4.5 Introduction to multithreading 4.6 Thread Life Cycle 4.7 Creating Thread using Thread class or Runnable Interface 4.8 Main Thread and Thread Properties 4.9 Creating multithreaded application 4.10 Thread Synchronization and Communication	8
5	**Java Collection Framework** 5.1 Overview of Collections 5.2 List Interface and its Implementations 5.3 Set Interface and its Implementations 5.4 Map Interface and its Implementations	8

	5.5 Queue Interface and its Implementations 5.6 Sorting and Searching Algorithms 5.7 Iterator and ListIterator Interfaces	
6	**Java Swing and Applet Programming** 6.1 Introduction to GUI Programming 6.2 Swing Framework 6.3 Event Handling 6.4 Layout Managers 6.5 Applet Programming 6.6 Applet Life Cycle 6.7 Adding component in applet 6.8 HTML applet Tag, Applet Viewer 6.9 Event Handling in Applet	8
	TOTAL	**45**

Text Books

- Java Complete Reference, Herbert Schildt, TMH

Reference Books

- Programming with Java A Primer, E. Balagurusamy, TMH
- Java 6 Programming Black Book , Kogent Solution Inc, dreamTech Pub
- Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

Online References / Resources

- https://docs.oracle.com/javase/tutorial/
- https://www.geeksforgeeks.org/java/
- https://www.javatpoint.com/java-tutorial

Database Management System

Program: MCA (First Year)				Semester: I			
Course: Database Management System				Code : MCA21402			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Basic knowledge of Set Theory and Relations
- Software Engineering

Objectives

- The course aims at providing the students insight on basic DBMS fundamentals principles and practices. Students will further learn RDBMS concepts and implement its operations for database creation and manipulation through SQL and PL/SQL.

Outcomes

At the end of the course, students will be able to:

- Analyze the problem of a real-life situation and draw the ER Diagram
- Analyse a database specification for designing database schema applying normalization techniques to ensure data integrity
- Create a functional database and use SQL queries to retrieve, modify and analyze data stored in the database
- Use PL/SQL to create stored procedures, functions, triggers and cursor for efficient data processing and retrieval
- Apply transaction and concurrency control techniques to ensure consistency, isolation, and durability of data

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Introduction to Conceptual Data Model** Conceptual Data Modeling, Motivation behind Conceptual Data Modeling, Entity-Relationship (E/R) Diagrams: Components of E/R Diagrams, Basic Symbols and Notations in E/R Diagrams, Entities and Entity Types, Attributes and Various Types of Attributes, Relationships and Relationship Types.	8

	Case Studies based on real-world scenarios to analyse the requirements and Draw ERD.	
2	**Relational Data Model & Normalization** Basic concepts of the Relational Data Model, Codd's rules, Type of keys, Referential Integrity, Mapping ER model to Relational form, Concept of Normalization, First Normal Form, Second Normal Form, Third Normal Form and Functional Dependency. Case Study: Convert ERD of Unit 1 to Relational Database and apply Normalization.	8
3	**Introduction to SQL** Overview of SQL Commands and their usage: DDL, DML and DCL. Basic Data Types, Constraints, Conditional Retrieval of Rows, Working with Null Values, Matching a Pattern from a Table. Ordering the result of a Query, Aggregate Functions, Grouping Data and Filtering Groups. Joins Inner Join, Outer Join: Left, Right, Full, Cross Join. Subqueries, Views: Creating Views, Altering and Dropping Views, Updatable Views. Case Study: Implementation of unit 1 case study using SQL.	8
4	**PL/SQL-I** Introduction to PL/SQL, PL/SQL block structure, PL/SQL Data types, Variables and Constants, Scope and visibility of a variable, Assignments and expressions, Operator precedence, Built-in-functions, Conditional and iterative control, Exception handling in PL/SQL, Predefined exceptions, User defined exceptions. Case Study: Implementation of unit 1 case study using SQL/PLSQL.	8
5	**PL/SQL-II** Creating Procedure and Functions, Using stored function in SQL statements, Introduction to Triggers, Trigger Creation, Types of triggers, Trigger Implementation, Introduction to Cursors Cursor, Cursor Declaration and Initialization, Retrieving Data Using Cursors, Manipulating Data Using Cursors	8

	Case Study: Implementation of unit 1 case study using SQL/PLSQL.	
6	**Transaction and Concurrency Control** Concepts of transaction processing, ACID properties, States of transaction, Concurrency control, Problems in Concurrency Control, Serial Schedule and Serializability, Locking based concurrency control-2PL, advantages and disadvantages of 2PL. Numerical Problems based on serializability and locking. Case Study: Study of transaction Management in Oracle.	5
	TOTAL	**45**

Text Books

- Abraham Silberschatz, Henry Korth, and S. Sudarshan, Database System Concepts, McGraw-Hill.
- Elmasri, Ramez and Navathe, Shamkant, Fundamentals of Database Systems, Pearson Education.
- Thomas Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, Pearson Education.
- Ramakrishnan, Raghu and Johannes Gehrke, Database Management Systems, McGraw-Hill.
- S.K. Singh, Database Systems: Concepts, Design, and Applications , Pearson Education India
- Ivan Bayross, SQL- PL/SQL: The Programming Language of Oracle, BPB Publications.
- Bali Shankar Khurana, Advanced Database Management System, Vision Publication

Reference Books

- Database Design for Mere Mortals" by Michael J. Hernandez
- Oracle PL/SQL Programming" by Steven Feuerstein
- Advanced Oracle PL/SQL Developer's Guide" by Saurabh K. Gupta and Martin Guba
- Oracle PL/SQL Programming" by Steven Feuerstein

Online Resources

- W3Schools DBMS Tutorial: https://www.w3schools.in/dbms/
- Oracle Database Online Documentation: https://docs.oracle.com/en/database/
- SQL-Tutorial: https://www.sql-tutorial.com/
- SQL-Tutorial : https://www.tutorialspoint.com/plsql/index.htm

- Learn PL/SQL Tutorial : https://www.javatpoint.com/pl-sql-tutorial
- Tutorials Point DBMS Tutorial: https://www.tutorialspoint.com/dbms/
- Master PL/SQL Programming Quickly and Easily : https://www.oracletutorial.com/plsql-tutorial/
- Data Base Management System Course: https://nptel.ac.in/courses/106105175
- Data Base Management System Course: https://nptel.ac.in/courses/106106095

Web Technologies

Program: MCA (First Year)				Semester: I			
Course: Web Technologies				Code : MCA21403			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Computer Fundamentals
- Basics of Programming

Objectives

- To make students aware of the applications of different technologies related to website development
- To develop the skill and knowledge of Website Design
- To develop the skill and knowledge of Client Side Programming

Outcomes

At the end of the course, students will be able to:

- Describe various concepts related to web application development
- Write HTML Script to develop the web pages
- Use various properties and selectors of CSS to design the web pages
- Apply Javascript to implement interactivity in web pages
- Select suitable utilities and components of Bootstrap to design the web pages
- Build dynamic web pages using Javascript

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**HTML** 1.1 Introduction, Webpage Structure 1.2 Meta Information, Basic Terminologies, and Tags 1.3 Table, Link, Audio, Video 1.4 Forms	6
2	**CSS** 2.1 Introduction and Types 2.2 Selectors, Class, ID, Pseudo Classes, Box Model 2.3 Different Properties of CSS 2.4 Gradient 2.5 Transition, Transformation, Animation	10

3	**Bootstrap** 3.1 Layouts 3.2 Contents 3.3 Forms 3.4 Components 3.5 Utilities	10
4	**Basics of Javascript** 4.1 Introduction, Code Structure 4.2 Basic Building Blocks 4.3 Functions 4.4 Built-in Objects 4.5 Basics of DOM 4.6 Form Validation	12
5	**Object Oriented Programming using Javascript** 5.1 Class 5.2 Constructor 5.3 Properties and Fields 5.4 Inheritance 5.5 Static, Private, Protected Properties and Methods 5.6 instanceOf	4
6	**Javascript API** 6.1 Geolocation 6.2 Canvas 6.3 Local Storage	3
	TOTAL	**45**

Text Books

- HTML5 Up and Running, Mark Pilgrim, Oreilly | Google Press
- Beginning CSS Web Development, Simon Collison, Apress
- Beginning JavaScript, Russ Ferguson, Apress

Reference Books

- You Dont Know JS - 6 Volume Set, Kyle Simpson, Oreilly

Online References / Resources

- Bootstrap Docs, getbootstrap.com
- w3schools.com
- MDN Web Docs
- javascript.info

Software Engineering

Program :	MCA (First Year)			Semester : I			
Course :	Software Engineering			Code : MCA21404			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE1	IE2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Pre-requisite:

- Knowledge any programming language.
- Excellent communication skills will be an added advantage.
- DBMS

Objectives:

1. To impart concepts of study on the theories, processes, methods, and techniques of software.
2. Students learn & understand the Requirement analysis and system Design.
3. Learn the software design principles to develop software in object oriented approach.
4. To know how to gather requirements for software.
5. To get acquainted with the agile software development methodology.

Outcomes:

After learning the course, the students should be able to:

1. Know the fundamental of software development life cycle with current trends in the area of Software Engineering
2. Describe principles of agile development
3. Design software requirements specification solution for a given problem definitions of a Software system
4. Apply an object-oriented software design and development techniques
5. Determine an appropriate and effective graphical user interface

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Object oriented Software Engineering:** 1.1 The Evolving Role of Software, 1.2 The Linear Sequential Model, Prototyping Model, RAD Model, Spiral Model, Introduction to development approach SSAD and OOAD , 1.4 Software Crisis: Problem and Causes	7

2	**Agile Development Process:** 2.1 Agile Development: Agile manifesto, agility and cost of change, 2.2 Agility principles, myth of planned Development Toolset for the agile process, Extreme Programming, SCRUM ,Crystal, Kanban, Feature Driven Development, Adaptive Software Development	6
3	**Requirement Engineering** 3.1 Concepts of Business Requirement Document (BRD) 3.2 Functional Requirement Document (FRD 3.3 Types of Requirements –Functional and Non functional 3.4 Four Phases of Requirement Engineering (elicitation, specification, validation, negotiation,) 3.5 Prioritizing requirements (Kano diagram) 3.6 IEEE standard format Structure and contents of SRS Case study solution on SRS	9
4	**Unified Modeling Language (UML)** 4.1 Structural Modeling : Class Diagram and Object diagram 4.2 Associations and links Aggregation , 4.3 Composition and containment Inheritance, 4.4 Deployment Diagram 4.5 Behavioral Modeling: Use case Diagram Develop use-case Model, 4.6 Description of Use case Diagram 4.7 Activity Diagram 4.8 Sequence diagram, 4.9 State Transition Diagram Case study on all above diagrams	10
5.	**Software Design:** 5.1 System design principles: 5.2 levels of abstraction (architectural and detailed design) 5.3 Design patterns. 5.4 User Interface Design 5.5 Elements of good design 5.6 Eight golden rules for design 5.7 Features of modern GUI, Menus, 5.8 Scroll bars, windows, buttons, icons, panels, error messages etc. Case study on User Interface Design	8

6.	**Current trends in Software Engineering** 6.1 Collaborative development, Global software development challenges, 6.2 Reengineering and Reverse Engineering Computer-Aided Software Engineering	5
	TOTAL	**45**

List of Text Books:

1. Software Engineering by Roger Pressman
2. Object-Oriented Software Engineering: A Use Case Driven Approach by Ivan Jacobson

Reference Books:

1. Object-Oriented Software Engineering: A Use Case Driven Approach by Ivan Jacobson
2. Software Engineering by Sommerville,Pearson,8th Ed
3. Object Oriented System Development - Ali Bahrami McGRAW-HILL International Edition
4. Object Oriented Modeling and Design with UML by James Rumbaugh, Michael Blaha
5. Object Oriented systems Analysis and Design using UML by Simon Bennett
6. The Unified Modeling Language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson
7. Object-Oriented Software Engineering: A Use Case Driven Approach, 2004, 1st Edition, Addison Wesley Longman Publishing
8. Craig Larman, Agile and Iterative Development: A Manager's Guide, 1st Edition, Addison Wesley, 2003

Online References:

1.https://www.computer.org/education/bodies-of-knowledge/software-engineering

2. The NATO Software Engineering Conferences (interesting historic material)

3. Software Engineering Code of Ethics and Professional Practice established in a joint effort by IEEE-CS and ACM [copy at ACM]

List of Tutorials / Activities:

1.Camparison of all software process
2. Case study on Requirement Engineering (BRD)
3. Case study on Requirement Engineering (FRD)
4.Case study on Requirement Engineering (SRS
5.Case study on Object orientation and Structural modeling
6. Case study on Object orientation and Structural modeling
7.Case study on Object orientation and Behavioral modeling
8.Case study on Object orientation and Behavioral modeling

9.Case study on Object orientation and Behavioral modeling 10.Case study on User Interface Design 11.Case study on User Interface Design 12. Computer-Aided Software Engineering tools

Mathematical Foundation for Computer Application –1

Program:	MCA (First Year)			Semester : I			
Course :	Mathematical Foundation for Computer Application -1			Code : MCA21201			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE1	IE2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Pre-requisite:

- Basic Mathematics

Objectives:

- To recognize the mathematical underpinnings of probability.
- To study decisions about likelihood of events, based on a pattern of collected data.
- To recognize and understand probability distribution functions.

Outcomes:

After learning the course, the students should be able to:

- Use probability theory to solve permutation and combination problems.
- Apply the Addition Rule and the Principle of Inclusion and Exclusion and Dearrangements.
- Implement the concept of Conditional Probability and probability.
- Recognize the discrete probability distribution and apply it appropriately.
- Recognize the continuous and normal probability distribution and apply it appropriately.

Detailed Syllabus:

Unit	Description	Duration
1.	**Counting Principle** 1.1 Addition and Multiplication Principles 1.2 Permutations of n Objects, Circular Permutation 1.3 Permutation with repetitions.	7
2.	**Principle of Inclusion and Exclusion:** 2.1 Principle of Inclusion and Exclusion theorem and applications. 2.2 Dearrangement theorem and its applications 2.3 Non negative integer value solution 2.4 Multinomial Theorem and application.	7
3	**Probability** 3.1 Trail,Events,Sample spaces, probability axioms 3.2 Independent and Dependent Events	6

	3.3 Conditional probability and its applications. 3.4 Bayes's Theorem and its applications.	
4.	**Random variables and Mathematical Expectation** 4.1 Random Variable (Discrete and continuous), 4.2 Probability Distribution of a Random Variable, Probability Mass Function, Probability Density Function, Distribution Function. 4.3 Mathematical Expectation of Probability Distribution, Theorems, Calculation of Mean and Variance using Mathematical Expectation 4.4 Concepts of Bivariate Random Variable, Discrete and Continuous Bivariate Random Variable.	**9**
5.	**Discrete Probability Distribution** 5.1 Binomial Distribution 5.2 Finding Mean and variance of Binomial Distribution 5.3 Poisson Distribution 5.4 Finding Mean and variance of Poisson Distribution 5.5 Numerical base on Binomial Distribution and Poisson Distribution	**8**
6.	**Continuous Probability Distribution** 6.1 Uniform Distribution 6.2 Finding Mean and variance of uniform Distribution 6.3 Normal Distribution 6.4 Numerical base on Uniform Distribution and Normal Distribution	**8**
	TOTAL	**45**

Text Books:

1. Probability and Combinatorics by D.P Apte.
2. Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor

Reference Books:

1.Anderson, Sweeney and Williams - Statistics for Business and Economics
2. Discrete Mathematics by Rosen
3. Basic. Econometrics. Fifth Edition. Damodar N. Gujarati. Professor Emeritus of Economics,. United States Military Academy, West Point
4. The Theory and Practice of Econometrics, George G. Judge, William E. Griffiths, R. Carter Hill, Helmut Lütkepohl, Tsoung-Chao Lee
Wiley.
5. Statistical Methods by S. P. Gupta.
6. Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor

Web References:

https://atozmath.com/
https://www.analyticsvidhya.com/

https://www.tutorialspoint.com/discrete_mathematics/index.htm
List of Tutorials / Activities 1. Tutorial on Counting Principle 2. Tutorial on Inclusion and Exclusion 3. Tutorial on Probability 4. Tutorial on Mathematical Expectation 5. Tutorial on Discrete Probability distribution 6.Tutorial on Continuous Probability Distribution

Computer Networks

Program: MCA (First Year)				Semester: I		
Course: Computer Networks				Code : MCA21405		
Teaching Scheme				Evaluation Scheme		
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE
3	-	1	4	20	30	50
				Evaluation Scheme		
				TW	OR	PR
				-	-	-

Prerequisites

- Computer Fundamentals

Objectives

- To understand fundamentals of computer network, network architectures, and internet.
- To understand the features and operations of computer networking protocols.
- To demonstrate the IP addressing scheme.
- To understand the computer network security and cryptography.

Outcomes

At the end of the course, students will be able to:

- Explain the basic computer network technology.
- Identify the features and operations of various application layer protocols.
- Analyse connection-oriented and connection-less computer network services.
- Evaluate IP addressing scheme and implement sub-netting mechanisms.
- Evaluate computer network error detection and correction techniques.
- Analyse security in computer networks with respect to cryptographic services.

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Computer Networks and the Internet** 1.1 What Is the Internet? A Services Description, Protocol. 1.2 The Network Core, Packet Switching and Circuit Switching, 1.3 Protocol Layers and Their Service Models 1.4 Layered Architecture – OSI Reference Model 1.5 TCP/IP Protocol Suite	6
2	**Application Layer** 2.1 Network Application Architectures, 2.2 Application-Layer Protocols, 2.3 The Web and HTTP, Non-Persistent and Persistent Connections, HTTP Message Format 2.4 Electronic Mail in the Internet, SMTP, Comparison with HTTP, Mail Access Protocols 2.5 DNS: Services Provided by DNS, How DNS Works?	8

3	**Transport Layer** 3.1 Transport-Layer Services, Transport Layer in the Internet 3.2 Multiplexing and Demultiplexing at Transport Layer 3.3 Connectionless Transport: UDP, UDP Segment Structure 3.4 Connection-Oriented Transport: TCP, TCP Segment Structure	8
4	**The Network Layer** 4.1 Network Service Models 4.2 Virtual Circuit and Datagram Networks 4.3 The Internet Protocol (IP): IPv4 Format, Addressing, Sub-netting and Numerical Exercises 4.4. IPv6: Next Generation IP. 4.5 Routing Algorithms 4.5.1 The Link-State (LS) Routing Algorithm 4.5.2 The Distance-Vector (DV) Routing Algorithm 4.5.3 Intra-AS Routing in the Internet: RIP 4.5.4 Intra-AS Routing in the Internet: OSPF 4.5.5 Inter-AS Routing: BGP	12
5	**The Link Layer: Links, Access Networks, and LANs** 5.1 Introduction to the Link Layer 5.1.1 The Services Provided by the Link Layer 5.2 Error-Detection and-Correction Techniques, Numerical Exercises 5.2.1 Parity Checks 5.2.2 Checksumming Methods 5.2.3 Cyclic Redundancy Check (CRC) 5.2.4. Backward Error Correction: ARQ 5.2.5. Forward Error Correction: Hamming Code 5.3 Link Layer Protocol: HDLC and PPP	7
6	**Security in Computer Networks** 6.1 What Is Network Security? 6.2 Principles of Cryptography 6.3.Symmetric Key Cryptography 6.4. Asymmetric Key Cryptography 6.5. Encryption Algorithms and examples.	4
	TOTAL	**45**

Text Books

- Computer Networking, A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Pearson Edu., 8th Edition.
- Network Security Essentials – William Stallings, 4th Edition, Pearson Education, Asia

Reference Books

- Data Communications and Networking, Behrouz A. Forouzan, TMH, 6th Edition.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education, 6th Edition.
- Cryptography and Network Security, Atul Kahate, TMH, 3rd Edition.

Online References / Resources

- https://www.coursera.org/learn/computer-networking
- https://nptel.ac.in/courses/106105183

List of Tutorials / Activities:

- Study of basic network commands and network configuration commands
- Study of basic network topologies
- Setup of two or more computers via LAN for sharing resources
- Demonstration of IP addressing scheme and sub-netting
- Demonstration of Cisco Packet Tracer Simulation Tool with Examples
- Demonstration of VMware Virtualization Tool

Java Programming Lab

Program: MCA (First Year)				**Semester : I**			
Course : Java Programming Lab				**Code : MCA21406**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	**OR**	**PR**	**Total**
				25	**-**	**-**	**25**

Pre-requisite:

1. Computer Fundamentals
2. Basics Concepts of Programming

Objectives:

1. To learn why Java is useful for the design of desktop and web applications.
2. To learn how to implement object-oriented designs and identify Java language components and how they work together in applications.
3. To learn about the concepts and principles of Java programming.
4. To develop applications using object-oriented programming concepts of Java.
5. To develop GUI applications using Swing and Applet programming

Outcomes:

- Describe different concepts such as Programming Constructs, Multithreading, OOPs, File Handling, Collections, GUI using Java Programming.
- Implement different concepts of object-oriented programming.
- Implement Annotations, Lambda Expression using Java Programming.
- Perform different operations related to file handling, multithreading using Java Programming.
- Use different classes and interfaces from Collection Framework.
- Build user interfaces using Swing, Applets.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Java & Programming Concepts** ● Assignments based on Control Structres, Arrays, Strings and String Buffers.	4
2.	**Object-Oriented Programming in Java** ● Assignments based on Constructors, Inheritance, Polymorphism, Encapsulations, Abstraction and Exception Handling.	6

3.	**Advanced Java Programming Constructs** ● Assignments based on Interface, Packages, Generics, Lambda Expressions.	**6**
4.	**Java Input / Output & Multithreading** ● Assignments based on File Handling and Multithreading.	**6**
5.	**Java Collection Framework** ● Assignments based on Collection Framework.	**4**
6.	**Java Swing and Applet Programming** ● Assignments based on Swing and applets	**4**
	TOTAL	**30**

Text Books

- Java Complete Reference, Herbert Schildt, TMH

Reference Books

- Programming with Java A Primer, E. Balagurusamy, TMH
- Java 6 Programming Black Book , Kogent Solution Inc, dreamTech Pub
- Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

Online References / Resources

- https://docs.oracle.com/javase/tutorial/
- https://www.geeksforgeeks.org/java/
- https://www.javatpoint.com/java-tutorial

Database Management System Lab

Program:	MCA (First Year)	Semester : I
Course :	Database Management System Lab	Code: MCA21407

Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
-		-		25	-	-	25

Pre-requisite:
Knowledge of Set Theory and Relations.

Objectives:
To develop database handling, data manipulation and data processing skills through SQL and PL/SQL which will help students to develop data centric computer applications.

Outcomes:
After learning the course, the students should be able to:

1. Use SQL commands related to database creation and manipulation.
2. Use SQL operators, Built-in functions, Subqueries on database to access data as per need of user's requirement.
3. Handle database using PL/SQL and issues related to data access

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction of SQL**- DDL and DML and Basic Data Types, Operators: Arithmetic Operators, Logical Operators, Set Operators, Like Clause, between…And, In, Concatenation, Select Query with Distinct Keyword, NULL Values, Order by Clause, Where Clause, AND & OR Clauses	6
2.	**Aggregate functions**-MIN, MAX, AVERAGE, SUM, COUNT and Group By…Having Clause.	4
3.	**Joins**, Types of Joins and Nested Subquery.	6
4.	**Introduction to PL/SQL**, Creating PL/SQL Blocks, Using Variables in PL/SQL Writing PL/SQL Executable Statements, Nested Blocks and Variable Scope.	6

5.	**Conditional Control:** IF Statements, CASE Statements. Basic Loops, Iterative Control: WHILE and FOR Loops, Nested Loops Function, Procedure , Cursor and and	6
6.	Transactions Lock and its Type, Data Access Privileges : Grant ,Revoke, Roles	2
	TOTAL	**30**

Text Books

- Understanding SQL by Martin Gruber, BPB
- SQL- PL/SQL by Ivan Bayross.
- Oracle PL/SQL Best Practices" by Steven Feuerstein
- Oracle – The complete reference – TMH /oracle press

Online References / Resources

- https://www.w3schools.com/sql/
- https://www.tutorialspoint.com/sql/index.htm
- https://www.javatpoint.com/sql-tutorial
- https://www.sqltutorial.org/

List of Assignments:

1. Assignment based on Select Query and use of Operators: Arithmetic Operators, Logical Operators and Set Operators, Like Clause, between…And, In, Concatenation, Distinct Keyword, NULL Values, Order by Clause Where Clause, AND & OR Clauses.
2. Assignment based on Aggregate Functions, Group By…Having Clause
3. Assignment based on Joins and Nested Sub-Query
4. Assignment based on PL/SQL block
5. Assignment based on Function, Procedure and Cursor
6. Transactions Lock and its Type, Data Access Privileges: Grant, Revoke, Roles

Web Technologies Lab

Program:	MCA (First Year)			**Semester : I**			
Course :	Web Technologies Lab			**Code : MCA21408**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	**OR**	**PR**	**Total**
				25	-	-	25

Pre-requisite:

1. Computer Fundamentals
2. Basics of Programming

Objectives:

1. To develop the skill and knowledge of Website Design
2. To develop the skill and knowledge of Client Side Programming

Outcomes:

- Write HTML Script to develop the web pages
- Use various properties and selectors of CSS to design the web pages
- Apply Javascript to implement interactivity in web pages
- Select suitable utilities and components of Bootstrap to design the web pages
- Build dynamic web pages using Javascript

Detailed Syllabus:

Unit	Description	Duration
1.	**HTML5** ● Assignments based on Table, Link, Images, Form, Audio and Video	4
2.	**CSS** ● Assignments based on Border, Font, Text, Color, Position, Transition, Transformation, Animation, Gradient	6
3.	**Bootstrap** ● Assignments based on typography, tables, images, utilities, components	6
4.	**Basics of JavaScript** ● Assignments based on array, string, date, document, form validation	6
5.	**Object Oriented Programming using Javascript** ● Assignments based on Object Oriented Programming	4
6.	**Javascript API** ● Assignments based on Canvas, Geolocation, Local Storage	4
	TOTAL	30

Text Books • HTML5 Up and Running, Mark Pilgrim, Oreilly | Google Press • Beginning CSS Web Development, Simon Collison, Apress • Beginning JavaScript, Russ Ferguson, Apress
Reference Books • You Dont Know JS - 6 Volume Set, Kyle Simpson, Oreilly
Online References / Resources • Bootstrap Docs, getbootstrap.com • w3schools.com • MDN Web Docs • javascript.info

Course Syllabus
Semester II

Data Structures

Program: MCA (First Year)				**Semester : II**			
Course : Data Structures				**Code : MCA22409**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

1. Programming Fundamentals

Objectives:

1. To impart the basic concepts of data structure and algorithms
2. To understand concepts about searching and sorting techniques
3. To solve problems using data structures such as stacks, queues, lists, trees and graphs.

Outcomes: After learning the course, the students should be able to:

1. Understand different data structures, their types and operations on data structures
2. Demonstrate searching and sorting algorithms
3. Apply linear data structures for the given problem
4. Implement non-linear data structures for the given problem

Detailed Syllabus

Unit	Description	Duration
1.	**Introduction to Data Structure** 1.1 Fundamentals of Data Structure 1.2 Arrays as Data Structure 1.3 Searching 1.4 Sorting 1.5 Sparse Matrix 1.6 Time Complexity, Space Complexity, Big-O Notation, Omega Notation, Theta Notation	**8**
2.	**Stacks** 2.1 Introduction and Definition, Representation 2.2 Operations on Stacks 2.3 Applications of Stacks, Representation of Arithmetic Expressions: Infix, Postfix, Prefix.	7

3.	**Queues** 3.1 Introduction and Definition, Representation 3.2 Operation on Queues 3.3 Types of Queues, Dequeue, Circular Queue, Priority Queue 3.4 Applications of Queue.	**4**
4.	**Linked List** 4.1 Introduction to Linked List 4.2 Dynamic Memory Management 4.3 Representation of Linked List 4.4 Operations on Linked List, Inserting, Removing, Searching, Sorting, Merging Nodes 4.5 Double Linked List	**10**
5.	**Trees** 5.1 Introduction to Tree 5.2 Binary Tree and their types, Representation of Binary Tree 5.3 Operations on Binary Tree 5.4 Binary Search Tree (BST) 5.5 Traversal of Binary Tree, Preorder Traversal, In-order Traversal, Post-order Traversal 5.6 Introduction of Threaded Binary Tree 5.7 AVL Tree and B-Tree.	**10**
6.	**Graphs** 6.1 Introduction to Graph 6.2 Representation of Graph, Adjacency Matrix, Adjacency List 6.3 Spanning Tree 6.4 Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS)	**6**
	TOTAL	**45**

Text Books

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson,
2. Classic Data Structures, Debasis Samanta, PHI

Reference Books

1. Data Structures through C in Depth, S. K. Srivastava
2. Schaum's Outlines Data Structures with C

Python Programming

Program: MCA (First Year)				Semester: II			
Course: Python Programming				Code : MCA22410			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Computer Fundamentals
- Basics Concepts of Programming

Objectives

- To solve real-world problems by applying programming concepts.
- To develop and use functions and modules in Python for better code organization and reusability.
- Develop desktop and command-line applications with Python for various purposes.
- Present and demonstrate proficiency in Python programming through projects that apply concepts learned in the course

Outcomes

At the end of the course, students will be able to:

- Describe different concepts associated to Python programming.
- Demonstrate the use of functions, modules.
- Apply the concepts of exception handling.
- Perform different operations related to file handling using Python.
- Implement different concepts of object oriented programming.
- Perform CRUD Operations on MySQL database using Python.

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Introduction to Python and Data Structures in Python** 1.1 Introduction to Python programming 1.2 Environment Setup 1.3 Variables and data types in Python 1.4 Control structures (if, elif, else, for, while) in Python 1.5 Basic input/output in Python **Data Structures in Python** 1.6 List	5

	1.7 Tuples 1.8 Set 1.9 Dictionaries	
2	**Functions and Modules** 2.1 Functions in Python 2.2 Parameters and return values in functions 2.3 Local and global variables in Python 2.4 Modules in Python 2.5 Importing modules in Python 2.6 Creating your own modules 2.7 Using built-in Python modules	8
3	**Exception Handling using Python** 3.1 Introduction to exceptions in Python 3.2 Handling exceptions in Python (try-except blocks) 3.3 Custom exception handling 3.4 Raising exceptions in Python	8
4	**I/O and File Handling using Python** 4.1 Reading and writing text files in Python 4.2 Reading and writing binary files in Python 4.3 File modes and permissions in Python 4.4 Parsing CSV files in Python 4.5 JSON file handling in Python	8
5	**Introduction to Object Oriented Concepts** 5.1 Introduction to object-oriented programming in Python 5.2 Classes and objects in Python 5.3 Constructors and destructors in Python 5.4 Inheritance and polymorphism in Python 5.5 Abstract classes and interfaces in Python	8
6	**MySQL with Python** 6.1 Introduction to relational databases 6.2 Introduction to SQL 6.3 Creating databases and tables using SQL 6.4 SQL queries in Python	8
	TOTAL	**45**

Text Books

- Learning Python By Mark Lutz,O'Reilly Publication
- Programming with Python, A users Book, Michael Dawson, Cengage Learning
- Python Essential Reference, David Beazley, Third Edition

Reference Books
• Python: The Complete Reference.
Online References / Resources
• https://www.python.org/about/gettingstarted/ • www.w3schools.com • https://www.geeksforgeeks.org/python-programming-language/

Advanced Web Technologies

Program: MCA (First Year)				Semester: II			
Course: Advanced Web Technologies				Code : MCA22501			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- HTML
- CSS
- Javascript

Objectives

- To build a solid foundation for a full-stack development
- To inculcate the skill and knowledge of building client-side interfaces using DOM and React

Outcomes

At the end of the course, students will be able to:

- Describe various concepts related to javascript and react
- Use various functions, classes, properties, and methods of javascript to develop interactive webpages
- Develop client-side interfaces using react building blocks such as JSX, Components, Props, Forms
- Demonstrate React hooks, flux, redux, routing to build dynamic web pages

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Javascript** 1.1 Iterables 1.2 Map and Set 1.3 WeakMap and WeakSet 1.4 JSON 1.5 Function object, NFE 1.6 The "new Function" syntax 1.7 Decorators and forwarding, call/apply 1.8 Function binding	8
2	**Asynchronous JavaScript** 2.1 Arraow Function	8

	2.2 Callback 2.3 Promise 2.4 Async/Await 2.5 Generator 2.6 try…catch, custom errors 2.7 Getters and Setters 2.8 Modules : Introduction, Export and Import	
3	**Introduction to React.js** 3.1 History and Overview 3.2 React Features and Benefits 3.3 Installation 3.4 Creating and Running the First Project 3.5 Understanding Directories and Files in React Project	5
4	**React Building Blocks** 4.1 Components 4.2 JSX 4.3 Props 4.4 State 4.5 Event Handling	8
5	**React Forms and UI** 5.1 Lists of Form Components 5.2 Lists of Form Components 5.3 Setup Controlled and Uncontrolled form components. 5.4 Control Input Elements 5.5 How to set default values on all formats of Input elements. 5.6 React JS Form validations. 5.7 How to write Styles?	8
6	**Advanced React** 6.1 Hooks 6.2 Routing 6.3 Flux 6.4 Redux	8
	TOTAL	**45**

Text Books

- React Key Concepts, Maximilian Schwarzmüller, Packt

Reference Books

- You Dont Know JS - 6 Volume Set, Kyle Simpson, Oreilly

• The React Workshop, Brandon Richey, Ryan Yu, Endre Vegh, Theofanis Despoudis, Anton Punith, Florian Sloot, Packt
Online References / Resources • javascript.info • The Complete ReactJs Course - Basics to Advanced, Udemy • https://react.dev/reference/react • https://legacy.reactjs.org/tutorial/tutorial.html

Data Warehouse & Data Mining

Program:	MCA (First Year)					Semester: II	
Course :	Data Warehouse & Data Mining					Code: MCA22502	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IET-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite: DBMS, Data Structure

Objectives:

1. To understand fundamental concepts, techniques and design principles of data warehousing and data mining
2. To enable students to understand, implement and evaluate various algorithms in data mining

Outcomes: After completion of this course, the students would be able to

1. Apply different preprocessing methods to prepare data in the desired format
2. Use multidimensional schema modeling techniques to organize and structure complex data for efficient analysis
3. Evaluate frequent patterns using Association Mining Techniques on large dataset
4. Evaluate various Classification Techniques on large dataset
5. Evaluate various Clustering Techniques on large dataset

Detailed Syllabus:

Unit	Description	Duration
1	**Data Pre-processing:** Data Objects, attribute types, descriptions of data, Measuring Data Similarity and Dissimilarity on binary, numerical and mixed dataset. Data	6

	Pre-processing- Data cleaning, Data Integration, data reduction and Data Transformation. Practice with weka./Tanagra /Orange tool for data preprocessing	
2	**Data Warehouse Fundamentals:** Define Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse, Architecture of Data warehouse, Characteristics of Data Warehouse, Top-Down and Bottom-Up Development Methodology. Applications of Data Warehouse.	**6**
3	**Dimensional Modeling:** Dimensional Modeling: E-R Modeling Vs Dimensional Modeling, Data Warehouse Schemas: Star Schema, Snowflake Schema, and Fact Constellation Schema. OLAP and operations on Multidimensional Database: Rollup, Roll down, Dice, Slice and Pivot.	**8**
4	**Introduction to Data Mining and Association Rules** Concept of Data Mining, Predictive & Descriptive Mining, KDD, Architecture for Data Mining. Applications of Data Mining. Define Association Rule, Representations of Items for Association Mining, Metrics to Evaluate the Strength of Association Rules: Support, Confidence Apriori Algorithm and Frequent-pattern Tree Algorithm to find frequent item set and strong association rules.	**7**
5	**Classification :** Introductions to classification and Prediction, Types of Classification, Input and Output Attributes, Guidelines for Size and Quality of the Training Dataset. Building Decision Tree using Gini Index Method, Naïve Bayes Classification, k-Nearest-Neighbor Classifiers (Lazy Learners), A **case study to classify a sample data set.**	**8**

6	**Clustering:** Introduction to Cluster Analysis, Applications of Cluster Analysis, Desired Features of Clustering, and Distance Metrics: Euclidean distance, Manhattan distance and Chebyshev distance. Major Clustering Methods/Algorithms-**Partition Clustering:** k-means clustering, Issues with the k-means algorithm, **Hierarchical clustering:** Agglomerative clustering and Divisive clustering, **Density-Based Methods**: DBSCAN Algorithm, Strengths and Weakness of DBSCAN Algorithm, Outlier Analysis **A case study on finding efficient Clusters on sample data set.**	**10**
	TOTAL	**45**

Text Books

1. Data Mining Concepts and Techniques By J. Han, M. Kamber , Morgan Kaufmann
2. Data Warehousing Fundamentals by Paulraj Ponnian, John Willey.
3. Data Mining Techniques By Arun K pujari, Universities Press
4. Introduction to Data Mining with Case Studies By G.K.Gupta, PHI
5. Data Mining: Concepts and Techniques By Han, Elsevier
6. Data Mining and Data Warehousing: Principles and Practical Techniques by Parteek Bhatia
7. Data warehouse and Data Mining by Bali Shankar Khurana

Reference Books

- "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling" by Ralph Kimball and Margy Ross
- Data Warehousing in the Age of Big Data" by Krish Krishnan

Online References / Resources

- Tutorialspoint: https://www.tutorialspoint.com/data_warehousing/index.htm
- GeeksforGeeks: https://www.geeksforgeeks.org/data-warehousing-and-data-mining/
- Oracle: https://www.oracle.com/big-data/data-warehouse-architecture/data-warehousing-and-data-mining.html
- Data Warehousing: https://www.dwbi.org/
- KDnuggets: https://www.kdnuggets.com/data_mining_course/
- https://www.digimat.in/nptel/courses/video/106105174/L01.html
- https://nptel.ac.in/courses/106106095

Network Security

Program: MCA (First Year)				Semester: II			
Course: Network Security				Code : MCA22503			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Basics of Computer Network

Objectives

- To study the concepts of network security and various cryptographic algorithms.
- To understand hardware and software security, IDS, wireless and web security
- To understand the security laws with Internet Governance and Email policy.

Outcomes

At the end of the course, students will be able to:

- Explain the basic concepts of network security
- Identify network security with respect to cryptographic services
- Compare various hardware and software securities for information
- Identify intrusion detection system to provide security using firewalls
- Identify wireless and web security provided to information
- Analyse security and law along with Internet Governance and Email policy

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Introduction to Network Security** 1.1 Computer security concepts, 1.2 The OSI security architecture, 1.3 Security threats and attacks, 1.4 Security services, Security mechanisms, 1.5 A model for network security and Standards	6
2	**Cryptography** 2.1 Symmetric Encryption Principles, 2.2 Symmetric Block Encryption Algorithms	7

	2.3 Stream Ciphers, Cipher Block Modes of Operation, 2.4 Approaches to Message Authentication, Secure Hash Function, 2.5 Public-Key Cryptography Algorithms 2.6 Digital Signatures	
3	**Hardware and Software Security** 3.1 Hardware Security, Smart Cards, Biometrics, 3.2 Virtual Private Networks (VPN), Types of VPN, 3.3 Trusted Operating Systems 3.4 Pretty Good Privacy (PGP), Security Protocols, 3.4 Security Socket Layer (SSL), Transport Layer Security (TSL), 3.5 IPSec, S/MIME	9
4	**Intrusion Detection System and Firewalls** 4.1 What is Intrusion Detection System (IDS)? 4.2 Classification of IDS, Host-based IDS, Network based IDS, 4.3 Malicious Software, Safeguards 4.4 Firewalls, Packet-Filtering Firewalls, Proxy firewalls 4.5 Limitations of Firewalls	10
5	**Wireless and Web Security** 5.1 Wireless Application Protocol, WAP/WEP Security 5.2 Secure Hypertext Transport Protocol (S-HTTP), 5.3 Secure Electronic Transaction (SET), 5.4 Business Requirements, SET Participants, SET Transaction Flow	6
6	**Security and Law, Internet Governance and Email Policy** 6.1 Security and Law: Regulations in India 6.2 Information Technology Act 2000, Cyber Crime and the IT Act 2000, Indian Copyright Act 6.3 Internet Governance, Network Security Aspects in E-Governance 6.4 Electronic mail policy	7
	TOTAL	**45**

Text Books

- –

Reference Books

- Network Security Essentials: Applications and Standards, 4/e, William Stallings, Pearson Education
- Network Security and Management, 2nd Edition, Brijendra Sing, PHI,

• Network Security Bible, 2nd Edition, Eric Cole, Wiley Publisher
Online References / Resources • https://nptel.ac.in/courses/106106129 • https://nptel.ac.in/courses/106105031

Software Testing and Quality Assurance

Program:	MCA (First Year)			Semester : II			
Course :	Software Testing and Quality Assurance			Code : MCA22504			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	CE	MTE	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

1. Basic concepts of programming language and database concepts.
2. Basic knowledge of software engineering and project life cycle.

Objectives:

3. To understand the principles of software quality assurance.
4. To learn fundamental concepts in software testing & testing levels.
5. To understand test design techniques based on software functionality & its structure.
6. To understand test planning, monitoring and controlling process.

Outcomes:

After learning the course, the students should be able to

1. Describe different quality factors in software
2. Explain concept of software testing
3. Explain different software testing levels
4. Demonstrate the test cases based on the testing levels
5. Use the testing design techniques for preparing test cases
6. Appraise test plan based on the requirements

Detailed Syllabus

Unit No	Unit Name and Contents of the Unit	Duration(in Hrs.)

1.	**Software Quality Assurance Fundamentals:** 1.1 Definition of Quality, Quality Assurance, Quality Control, 1.2 Difference between QA and QC, 1.3 Software Quality Assurance, SQA Planning & Standards 1.4 Building Blocks of SQA 1.5 Software Quality Metrics: Process Metrics & Product Metrics	**5**
2.	**Overview of Software Testing** 2.1Review of software development models (W Model, V Model) 2.2 Basic Definition of Software Testing–Evolution - Myths and Facts-Goals 2.3 Importance of Software Testing 2.4 Errors, Defects, and Failures 2.5 Testing and Debugging	**6**
3.	**Fundamentals of software testing** 3.1 Software Testing Principles 3.2 Software Testing Life Cycle (STLC) 3.3 Defect life cycle 3.4 Quality Assurance and Testing 3.5 Manual Testing Vs Automation Testing	**5**
4.	**Test Levels &Testing Types** 4.1 Component Testing 4.2 Integration Testing 4.3 System Testing 4.4 Acceptance Testing. Testing Types 4.5 Regression Testing 4.6 Performance Testing 4.7 Stress Testing 4.8 User Acceptance Testing 4.9 Load Testing	**10**
5.	**Test Design Technique** Black-box Test Techniques 5.1 Equivalence Partitioning 5.2 Boundary Value Analysis 5.3 Decision Table Testing 5.4 State Transition Testing 5.5 Use Case Testing White-box Test Techniques	**10**

	5.6 Statement Testing and Coverage 5.7 Decision Testing and Coverage Experience-based Test Techniques 5.8 Error Guessing 5.9 Exploratory Testing & Checklist-based Testing	
6.	**Test Management** 6.1Test Organization 6.2 Tasks of a Test Manager and Tester 6.3 Test Planning and Estimation 6.4 Purpose and Content of a Test Plan with Test Strategy and Test Approach 6.5Entry Criteria and Exit Criteria 6.6 Test Execution Schedule 6.7 Test plan writing & Test Reports.	**9**
	Total	**45**

Text Books:

1.M G Limaye, "Software Testing Principles, Techniques and Tools", Tata McGraw Hill,
2.Srinivasan Desikan, Gopalswamy Ramesh, "Software Testing Principles and Practices", Pearson
3. Software Testing Techniques by Boris Beizer-DreamTech Pub,2nd Edition

Reference Books:

1. Roger S. Pressman, "Software Engineering-A Practitioner's Approach", McGraw Hill pub.2010Software Testing in Real World Edward Kit- Pearson Pub
2. Software Testing Techniques by Boris Beizer-DreamTech Pub,2nd Edition
3. Software Testing by Ron Patton, TechMedia Pub.
4. Introducing Software by Testing Louise Tamres
5. Allen Gilles "Software quality: Theory and management", International Thomson, Computer press 1997.
6. Software Testing Principles Techniques and Tools by Milind.G. Limaye- Tata Mcgraw Hill Pub.
7. Stephen H. Kan, "Metrics and models in software quality Engineering", Addison –Wesley 2003

Online References / Resources:

1.https://www.coursera.org/specializations/software-testing-automation
2. ttps://www.udemy.com/course/everything-for-software-tester/
3. https://www.udacity.com/course/software-testing--cs258
4.https://www.greatlearning.in/academy/learn-for-free/courses/software-testingfundamentals1
5. https://www.guru99.com/software-testing.html
6.https://onlinecourses.nptel.ac.in/noc19_cs71/preview
7. https://testinginstitute.com/Free-Software-Testing-Training.php

Advanced Java

<table>
<tr><td colspan="4">Program: MCA (First Year)</td><td colspan="4">Semester: II</td></tr>
<tr><td colspan="4">Course: Advanced Java</td><td colspan="4">Code : MCA22509</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Evaluation Scheme</td></tr>
<tr><td>Lecture</td><td>Practical</td><td>Tutorial</td><td>Credit</td><td colspan="4">Evaluation Scheme</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>IE1</td><td>IE2</td><td>ETE</td><td>Total</td></tr>
<tr><td></td><td></td><td></td><td></td><td>20</td><td>30</td><td>50</td><td>100</td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="4">Evaluation Scheme</td></tr>
<tr><td></td><td></td><td></td><td></td><td>TW</td><td>OR</td><td>PR</td><td>Total</td></tr>
<tr><td colspan="8">Prerequisites
Computer Fundamentals
Basics Concepts of Programming
Java Programming
Basics of Web Development</td></tr>
<tr><td colspan="8">Objectives
To Develop a solid understanding of SQL and database design principles
Develop expertise in web application development using Java Servlets and Java Server Pages (JSP), including understanding web servers, HTTP protocol, and managing sessions.
Gain an understanding of Object Relational Mapping (ORM) concepts and their benefits in Java development, including the basics of Hibernate as an ORM tool and its integration with Java.
Develop proficiency in Hibernate framework, including the configuration of Hibernate in a Java application, Object Relational Mapping (ORM) using Hibernate annotations, and Hibernate Query Language (HQL) for efficient database access.</td></tr>
<tr><td colspan="8">Outcomes
At the end of the course, students will be able to:
Understand the concepts of JDBC, Servlet, JSP.
Apply JDBC for database management.
Build Dynamic Web Pages using Servlet.
Build Dynamic Web Pages using JSP.
Understand Hibernate ORM, HQL.
Apply Hibernate for database management.</td></tr>
<tr><td colspan="8">Detailed Syllabus</td></tr>
<tr><td>Unit No.</td><td colspan="5">Unit Name and Contents of the Unit</td><td colspan="2">Duration (in Hrs.)</td></tr>
<tr><td>1</td><td colspan="5">Java Database Connectivity:
1.1 Introduction to JDBC</td><td colspan="2">5</td></tr>
</table>

	1.2 JDBC Architecture 1.3 Types of JDBC Driver 1.4 Connecting to databases 1.5 Executing SQL queries 1.8 Handling transactions	
2	**Java Servlet:** 2.1 Introduction 2.2 Servlet Life Cycle 2.3 HTTP protocols and HTTP methods 2.4 Web Server and Web container 2.5 Types of Servlets: 2.5.1 Generic 2.5.2 HTTP 2.6 Creating dynamic web pages 2.7 Handling web requests using Servlets 2.8 Working with cookies and sessions 2.9 ServletConfig and Servlet context. 2.10 Introduction to Beans 2.11 Database applications using Servlet	8
3	**Java Server Pages (JSP):** 3.1 Introduction 3.2 JSP programming structures 3.3 JSP Directives 3.4 JSP Actions 3.5 Creating dynamic web pages 3.6 Handling web requests using Servlets 3.7 Working with cookies and sessions 3.8 ServletConfig and Servlet context. 3.9 Introduction to Beans 3.10 Database applications using Servlet	8
4	**Introduction to Hibernate:** 4.1 Overview of Hibernate framework 4.2 Advantages of Hibernate over JDBC 4.3 Hibernate architecture and components 4.4 Setting up Hibernate in a project	8
5	**Object Relational Mapping (ORM) with Hibernate:** 5.1 Introduction to ORM 5.2 Mapping between Java objects and relational databases 5.3 Hibernate mapping concepts	8

	5.4 Working with Hibernate annotations	
6	**Hibernate Query Language (HQL):** 6.1 Introduction to HQL 6.2 HQL syntax and features 6.3 Executing HQL queries 6.4 Working with HQL functions and expressions	8
	TOTAL	**45**

Text Books

- Murach's Java Servlets and JSP
- Beginning Hibernate, Apress

Reference Books

- Head First Servlet and JSP
- Servlet & JSP: A Tutorial, by Budi Kurniawan
- Java Persistence with Hibernate
- Hibernate Recipes: a Problem-Solution Approach by Gary Mak, Srinivas Guruzu

Online References / Resources

- https://www.edureka.co/blog/servlet-and-jsp-tutorial/
- https://www.springboottutorial.com/first-java-web-application-with-jsp-and-servlets-in-25-steps
- https://www.digitalocean.com/community/tutorials/hibernate-tutorial-for-beginners#hibernate-tutorial-for-beginners
- https://www.javaguides.net/p/hibernate-tutorial.html
- https://howtodoinjava.com/series/hibernate-tutorials/

Data Science

Program: MCA (First Year)				Semester: II			
Course: Data Science				Code : MCA22510			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Prerequisites

- Basics of Python Programming
- Basics of Business Statistics

Objectives

- To develop relevant Python programming abilities for analysis of data.
- To learn and demonstrate the basic statistical analysis of data.
- To understand the features and applications of machine learning algorithms.
- To use appropriate tools and methods to collect, process, summarize, and visualize data for analysis.

Outcomes

At the end of the course, students will be able to:

- Apply python programming data structures and control structures for data analysis
- Apply basic statistical operations using python programming libraries on datasets.
- Analyse and implement data visualization techniques for data analysis
- Analyse and implement basic data cleaning techniques to prepare data for analysis
- Evaluate appropriate machine learning algorithms for data analysis and visualization

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Python for Data Science** 1.1 Introduction to Python Programming 1.2 Python Interpreters and IDEs: IPython, Google Colab, VS Code. Python Data Structures and Functions: 1.3.1 Lists 1.3.2 Tuple	5

	1.3.3 Set 1.3.4 Dictionary 1.4 Control Structures and Selection 1.4.1 For Loop 1.4.2 While Loop 1.4.3 If-else selection statements	
2	**Statistics for Data Science** 2.1 Introduction to Business Statistics 2.2 Scales of Measurement, Qualitative and Quantitative data 2.3 Types of Statistics: Descriptive and Inferential 2.4 Measures of Central Tendency: Mean, Median, Mode, Percentiles, Quartiles 2.5 Measures of Variations: Range, Interquartile Range, Variance, Standard Deviation 2.6. Measures of shape- Skewness, Kurtosis 2.7 Introduction to Charts and Graphs	5
3	**Python Libraries** 3.1 Introduction to Python Libraries, installing and importing 3.2 NumPy - Numerical Python Library 3.2.1 Arrays – Important Characteristics and Attributes 3.2.2 NumPy Array vs Python List 3.2.3 Creation of NumPy Arrays from List 3.2.4 Intrinsic Creation of an Arrays, Indexing, Slicing and Iterating an Array 3.2.5 Basic Statistical Operations on Arrays, Broadcasting, 3.2.6 Loading and Saving Arrays in Files 3.3 pandas - Python Library 3.3.1 pandas Data Structures: Series, Dataframes 3.3.2 Defining a Series from NumPy Arrays and Other Series 3.3.3 Operations and Mathematical Functions on Series 3.3.4 Defining a Dataframe: DataFrame() constructor 3.3.5 Assigning Values, Indexing, Membership, NaN Values 3.3.6 Operations Between DataFrame and Series 3.3.7 pandas: Reading and Writing Data using files	12
4	**Data Visualization using Python** 4.1 The matplotlib Python Library 4.2 The matplotlib Architecture 4.3 A Simple Interactive Chart	10

	4.4 Working with Multiple Figures, Elements and Axes 4.5 Charts with pandas: Line Charts, Histograms, Bar Charts, Pie Charts, Scatter Plots, etc 4. 6 Advanced Charts: Contour Plots, Polar Charts, Plots in 3D 4. 7 Working with subplots and grids 4. 8 Examples using datasets	
5	**Introduction to Machine Learning** 5.1 Supervised and Unsupervised Machine Learning 5.2 Data Preprocessing operations 5.3 Dealing with Missing Data 5.4 Handling Categorical Data 5.5 Normalizing Data 5.6 Exploratory Data Analysis 5.7 Correlation Matrix	4
6	**Machine Learning Algorithms** 6.1 The scikit-learn Python Library 6.2 Machine learning model preparation and evaluation 6.3 R-Squared for Goodness of Fit 6.4 Root Mean Squared Error (RMSE) 6.5 Mean Absolute Error (MAE) 6.6 Overfitting and Under-fitting 6.7 Regression: Linear and Multiple 6.8 Classification: Logistic and Decision Tree	9
	TOTAL	**45**

Text Books

- –

Reference Books

- Python for Data Analytics with Pandas, Numpy and MatPlotLib, Fabio Nelli, Apress Publication
- Python for Data Analysis, Wes McKinney, O'Reilly publication
- Business Statistics, Naval Bajpai, Pearson Publication

Online References / Resources

- https://nptel.ac.in/courses/106106212
- https://nptel.ac.in/courses/110106072

Blockchain

Program: MCA (First Year)				Semester: II			
Course: Blockchain				Code : MCA22511			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Object Oriented Programming
- Networking Basics

Objectives

- To give an overview of Blockchain technology, cryptocurrency, smart contracts
- To develop skills and knowledge about blockchain-based solutions

Outcomes

At the end of the course, students will be able to:

- Understand blockchain technology.
- Understand Cryptocurrency
- Understand Smart contract
- Develop blockchain-based solutions and write smart contracts using Ethereum Framework
- Deploy Decentralized Application

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Blockchain Introduction** 1. What is a Blockchain 2. Understanding SHA256 - Hash 3. Immutable Ledger 4. Distributed P2P Network 5. How Mining Works: The Nonce 6. Byzantine Fault Tolerance 7. Consensus Protocol: Defense Against Attackers	5
2	**Overview of Cryptocurrency**	8

	1. What is Bitcoin? 2. Bitcoin's Monetary Policy 3. Understanding Mining Difficulty 4. Virtual tour of a Bitcoin Mine 5. Mining Pools 6. Nonce Range 7. Orphaned Blocks 8. The 51% Attack	
3	**Cryptocurrency Transactions** 1. Transactions and UTXO's 2. Where do transaction fees come from? 3. How wallets work 4. Signatures: Private & Public Keys 5. Signatures & Keys Demo 6. What is Segregated Witness (SegWit) 7. Public Key vs Bitcoin Address 8. Hierarchically Deterministic (HD) Wallets	8
4	**Smart Contract** 1. What is Ethereum 2. Decentralized Applications (Dapps) 3. Ethereum Virtual Machine & Gas 4. Decentralized Autonomous Organizations (DAOs) 5. The DAO Attack 6. Soft and Hard Forks 7. Initial Coin Offerings (ICOs) 8. ICO Case Study	8
5	**Understanding Hyperledger Fabric** 1. Overview of Open source Hyperledger project 2. Hyperledger Fabric- Architecture 3. Identities and Policies 4. Membership and Access Control 5. Channels 6. Transaction Validation 7. Writing smart contract using Hyperledger Fabric	8
6	**Blockchain Use Cases** 1. Enterprise application of Block chain: Cross border payments 2. Know Your Customer (KYC)	8

	3. Food Security 4. Block chain enabled Trade 5. We Trade – Trade Finance Network 6. Supply Chain Financing 7. Identity on Block chain 8. Blockchain in energy sector 9. Blockchain in governance	
	TOTAL	**45**

Text Books

- Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
- Blockchain by Melanie Swa, O'Reilly
- Hyperledger Fabric - https://www.hyperledger.org/projects/fabric

Reference Books

- Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits

Online References / Resources

- Blockchain A to Z : Udemy
- Blockchain, Dr.Mayank Aggarwal, Swayam

Digital Marketing

Program: MCA (First Year)				Semester: II			
Course: Digital Marketing				Code : MCA22512			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE1	IE2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Prerequisites

- Computer Fundamentals and Internet

Objectives

- To learn various aspects of digital marketing
- To explore the CMS

Outcomes

At the end of the course, students will be able to:

- Explain the key digital marketing activities
- Develop website using CMS
- Identify and appropriately apply Fundamental Factors that Result in Achieving Top Search Engine Rankings
- Examine the basics of a search engine marketing strategy and how to achieve goals through search engine advertising platforms
- Analyze the role that social marketing plays in the digital landscape and marketing mix

Detailed Syllabus

Unit No.	Unit Name and Contents of the Unit	Duration (in Hrs.)
1	**Basics of Digital Marketing** Introduction To Online Digital Marketing Importance Of Digital Marketing How did Internet Marketing work? Traditional Vs. Digital Marketing Types of Digital Marketing Increasing Visibility Visitors' Engagement	7

	Bringing Targeted Traffic Lead Generation	
2	**Analysis and Keyword Research** Market Research Keyword Research And Analysis Types Of Keywords Tools Used For Keyword Research Localized Keyword Research Competitor Website Keyword Analysis Choosing the Right Keywords to The Project	7
3	**Website Planning and Development** Why CMS? Wordpress Installation Themes Widgets Menu Plug-in Contents Settings	7
4	**Search Engine Optimization** Introduction To Search Engine Optimization How Did Search Engine Work? SEO Fundamentals & Concepts Understanding the SERP Google Processing Indexing Crawling On-Page SEO Off-Page SEO	8
5	**Google Adwords** Introduction To Online Advertising And Adwords Adwords Account And Campaign Basics Adwords Targeting And Placement Adwords Bidding And Budgeting Adwords Tools Opportunities Optimizing Performance Ads Type	8

	Bidding Strategies Search Network Display Network Shopping Ads Video Ads Universal App Ads Tracking Script Remarketing Performance Monitoring Reports	
6	**Social Media Optimization** Introduction To Social Media Networks Types Of Social Media Websites Social Media Optimization Concepts Facebook, Google+, LinkedIn, YouTube, Pinterest, Hashtags Image Optimization	8
	TOTAL	**45**

Text Books

- Digital Marketing, Vandana Ahuja, Oxford University Press
- Digital Marketing For Dummies, Ryan Deiss, Russ Henneberry
- Digital Marketing Strategy An Integrated Approach to Online Marketing, Simon Kingsnorth, Kogan Page

Reference Books

- Epic Content Marketing, Joe Pulizzi, McGarw Hill

Online References / Resources

- https://www.semrush.com/academy/
- https://www.digitalvidya.com/blog/digital-marketing-tutorial/

Mathematical Foundation for Computer Application -2

Program:	MCA (First Year)	**Semester : II**
Course :	Mathematical Foundation for Computer Application -2	**Code : MCA22202**

Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial / Activity**	**Credit**	**IE1**	**IE2**	**ETE**	**Total**
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Pre-requisite:

- Basic Mathematics
- Probability.

Objectives:

1. To learn the basics of business decision-analysis.
2. To summarize business data numerically and graphically.
3. To understand the importance of business sampling methods, and be able to describe different business sampling methods.
4. To understand the process associated with statistical decisions, defining and formulating problems, analyzing the data, and using the results in decision making.

Outcomes:

After learning the course, the students should be able to:

1. Describe the concepts of statistics and data representation.
2. Apply the concept of Measures of Central Tendency
3. Determine Sampling and Sampling Distribution
4. Implement various hypothesis testing techniques.
5. Illustrate correlation between the attributes
6. Articulate concepts of time series moving average.

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introduction to statistics** Importance of statistics in modern business environment Definition of statistics, importance, scope and applications Characteristics of statistics, Functions of Statistics, Limitations Need of Data, Types Of Data	**7**

	Principles of Measurement, Source of Data Data classification, Tabulation And presentation	
2.	**Measures Of Central Tendency** Introduction, Objectives of Statistical average Requisites of a Good Average Statistical Averages- Arithmetic Mean Properties Of AM, Mean of combined group, Median, Mode, Geometric mean and Harmonic Mean.	**7**
3	**Sampling, Sampling Distributions And Testing** Introduction , Population And Sample-Universe of Population Types Of Population- Sample, Advantages of Sampling Sampling Theory- Types Of Sampling.	**6**
4.	**Testing Of Hypothesis** Introduction Testing Hypothesis Classification Of Test statistics Testing of Hypothesis , Z-Test, 't' test, chi square proportion test	**9**
5.	**Simple Correlation And Regression** Introduction Correlation-Types of Correlation-measures of correlation- Properties Of Karl Pearson's correlation coefficient Spearman's Rank Correlation coefficient Regression- Regression analysis	**8**
6.	**Time Series Analysis** Introduction Utility of the time series Components of Time Series Methods of measuring trend Method of least squares Mathematical Models of Time series Forecasting methods using time series	**8**
	TOTAL	**45**

Text Books:

1. Business Statistics, J. K. Sharma, Pearson Education-2nd Edition.
2. Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor.
3.Statistical and Quantitative Methods By Ranjeet Chitale by Nirali Publisher.

Reference Books:

1.Anderson, Sweeney and Williams - Statistics for Business and Economics
2. Discrete Mathematics by Rosen
3. Basic. Econometrics. Fifth Edition. Damodar N. Gujarati. Professor Emeritus of Economics,. United States Military Academy, West Point
4. The Theory and Practice of Econometrics, George G. Judge, William E. Griffiths, R. Carter Hill, Helmut Lütkepohl, Tsoung-Chao Lee
Wiley.
5. Statistical Methods by S. P. Gupta.
6.Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor
7. Business Statistics, Naval Bajpai, Pearson Education-2nd Edition
8.The Art of Computer systems Performance Analysis, Raj Jain, Wiley India Pvt Ltd,
9. Complete Business Statistics, Amir Aczel, Jayavel Sounderpandian, (Seventh Edition),Tata McGraw-Hill Education Pvt. Ltd – 2012
10. Business Statistics Theory and Applications, by Jani P.N , PHI

Reference website :

https://atozmath.com/
https://www.analyticsvidhya.com/

List of Tutorials / Activities: (15 Hrs allocated for Tutorials)

1. Tutorial on Importance of statistics
2. Tutorial on Measures Of Central Tendency
3. Tutorial on Sample Distribution
4. Tutorial on Testing Hypothesis
5. Tutorial on Simple Correlation and Regression
6. Tutorial on Time Series Analysis

Project Management

Program :	MCA (First Year)			Semester : II			
Course :	Project Management			Code: MCA22301			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ESE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

- Concepts of Software Engineering and Software Testing

Objectives:

- To understand the fundamentals of Software Project Management
- To investigate software project planning and management tools
- To learn software project scheduling and tracking
- To discuss about the agile project management
- To know people management in software project

Outcomes:

After learning the course, the students should be able to:
CO1: Comprehend Project Management Concepts
CO2: Choose various techniques of Software Project Estimations
CO3: Apply Agile Project Management
CO4: Gain knowledge of configuration management
CO5: Analyze staffing process for team building and decision making in Software

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Software Project Management** 1.1 Overview of project Management(Processes and Knowledge Areas in Projec Management) Project Definition, Project versus Flow type work 1.2 Project management life cycle 1.3 Build or Buy decision, Work Breakdown Structure (WBS) 1.4 Introduction to PMBOK	7

2	**2 Software Project Planning & cost Estimation** 2.1 Project planning ●2.2.1 Gantt Chart ● 2.2.2 CPM, ● 2.2.3 PERT Chart 2.2 Different methods of Cost estimation 2.2.1 COCOMO-I 2.2.2 II model (Problem Statement) 2.3 Function Point Analysis (Problem Statement) 2.4 Delphi cost estimation 2.5 Microsoft Project(Ms-Project) 2.6 Software Project Metrics	10
3	**Risk Management** Risk Management Process 3.1 Risk Identification 3.2 Risk Analysis 3.3 Risk Mitigation, RMMM	5
4	**Agile Project Management** 4.1 Introduction Agile Project Life Cycle 4.2 Agile Project Management v/s Traditional Project Management 4.3 Predictive versus Empirical Management, 4.4 Three stages of Agile Project, 4.5 Estimation, Scope Management, 4.6 Roles and Responsibilities, 4.7 Scheduling and Tracking.	9
5.	**Configuration Management** 5.1 Configuration management & Maintenance plan 5.2 Change Management 5.3 Version and Release Management Configuration Management Tools	6
6.	**Staffing in Software Projects** 6.1Organizational structures Team Structure & Staff development plan 6.1 Characteristics of Performance management 6.2 High performance Directive and collaborative styles 6.3 Team Communication	8

	6.4 Group Behaviours 6.5 Managing customer expectations.	
	TOTAL	**45**

List of Text Books:

1.Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", Sixth Edition, Tata McGraw Hill, New Delhi, 2017.

2. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, 2011.

Reference Books:

1.Ken Schwaber, "Agile Project Management", Microsoft Press, 2004

2.Walker Royce, "Software Project Management", Addison-Wesley, 1998.

3. Jalote Pankaj, "Software Project Management in Practice", Addison-Wesley Professional, 2002

4. PMBOK Guide

5.Software project management, A Concise Study, S. A. Kelakar.

6 . Software Engineering, Pressman.

Online References / Resources

- https://www.kornev-online.net/ITIL/Mcgraw.Hill.Software_Project_Management_2nd_Edition.pdf
- http://library.lol/main/B96E3B122326F8D2C6FBD35A5E978422

MOOCs Courses Links:

- https://onlinecourses.nptel.ac.in/noc19_cs70/preview Software Project Management By Prof. Rajib Mall & Prof. Durga Prasad Mohapatra | IIT

List of Tutorials / Activities:

1.Discussions on project crises and Project Failure with Case study
2. Understanding of Project Management skill sets
3. Problem Solving on Software Project Planning
4. Problem Solving on Software cost Estimation methods
5. Problem Solving on Software cost Estimation methods
6. Problem Solving on Software Project Planning methods
7. Problem Solving on Software Project Planning methods
8. Risk Management Process with academic manuals
9. Risk Management Process with Risk assessment Table
10. Case study on Agile Project Management
11. Case study on Agile Project Management
12. Case study on Staffing in Software Projects

Data Structures Lab

Program: MCA (First Year)				**Semester : II**			
Course : Data Strucutres Lab				**Code : MCA22411**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Basics of Programming

Objectives:

1. To understand concepts about searching and sorting techniques
2. To solve problems suing data structures such as stacks, queues, lists, trees and graphs

Outcomes:

- Demonstrate searching and sorting algorithms
- Apply linear data structures for the given problem
- Implement non-linear data structures for the given problem

Detailed Syllabus:

Unit	Description	Duration
1.	**Array** ● Assignments based on Array, Matrices	4
2.	**Searching and Sorting** ● Assignments based on different sorting and searching algorithms	4
3.	**Stack and Queue** ● Assignments based on stack and queue implementation and applications	6
4.	**Linked List** ● Assignments based on linked list implementation and applications	6
5.	**Tree** ● Assignments based on tree implementation and applications	6
6.	**Graph** ● Assignments based on graph implementation and applications	4
	TOTAL	30

Text Books

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson,
2. Classic Data Structures, Debasis Samanta, PHI

Reference Books

1. Data Structures through C in Depth, S. K. Srivastava
2. Schaum's Outlines Data Structures with C

Python Programming Lab

Program: MCA (First Year)				**Semester : II**			
Course : Python Programming Lab				**Code : MCA22412**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Computer Fundamentals
2. Basics Concepts of Programming

Objectives:

1. To solve real-world problems by applying programming concepts.
2. To develop and use functions and modules in Python for better code organization and reusability.
3. Develop desktop and command-line applications with Python for various purposes.
4. Present and demonstrate proficiency in Python programming through projects that apply concepts learned in the course

Outcomes:

- Describe different concepts associated to Python programming.
- Demonstrate the use of functions, modules
- Apply the concepts of exception handling.
- Perform different operations related to file handling using Python.
- Implement different concepts of object oriented programming.
- Perform CRUD Operations on MySQL database using Python.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Python and Data Structures in Python** ● Assignments based on control structures, input and outputs, Data Structures in Python	4
2.	**Functions and Modules** ● Assignments based on Functions and modules in Python	6
3.	**Exception Handling using Python** ● Assignments based on Exception Handling in Python	6
4.	**I/O and File Handling using Python**	6

	• Assignments based on Input Output and File Handling using Python	
5.	**Introduction to Object Oriented Concepts** • Assignments based on Object Oriented Programming	**4**
6.	**MySQL With Python** • Assignments based on Database Handling	**4**
	Total	**30**

Text Books

- Learning Python By Mark Lutz,O'Reilly Publication
- Programming with python, A users Book, Michael Dawson, Cengage Learning
- Python Essential Reference, David Beazley, Third Edition

Reference Books

- Python: The Complete Reference.

Online References / Resources

- https://www.python.org/about/gettingstarted/
- www.w3schools.com
- https://www.geeksforgeeks.org/python-programming-language/

Advanced Web Technologies Lab

Program: MCA (First Year)				**Semester : II**			
Course : Advanced Web Technologies Lab				**Code : MCA22505**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. HTML
2. CSS
3. Javascript

Objectives:

1. To build a solid foundation for a full-stack development
2. To inculcate the skill and knowledge of building client-side interfaces using DOM and React

Outcomes:

- Use various functions, classes, properties, and methods of javascript to develop interactive webpages
- Build client-side interfaces using react building blocks such as JSX, Components, Props, Forms
- Demonstrate React hooks, flux, redux, routing to build dynamic web pages

Detailed Syllabus:

Unit	Description	Duration
1.	**Javascript** ● Assignments based on Javascript functions, JSON	6
2.	**Asynchronous Javascript** ● Assignments based on callback, async/await, promise, modules	6
3.	**React Building Blocks** ● Assignments based on components, JSX, props, hooks	6
4.	**React Forms** ● Assignments based on form and validations	4
5.	**Advanced React** ● Assignments based redux, flux, routing	8
	Total	**30**

Text Books • React Key Concepts, Maximilian Schwarzmüller, Packt
Reference Books • You Dont Know JS - 6 Volume Set, Kyle Simpson, Oreilly • The React Workshop, Brandon Richey, Ryan Yu, Endre Vegh, Theofanis Despoudis, Anton Punith, Florian Sloot, Packt
Online References / Resources • javascript.info • The Complete ReactJs Course - Basics to Advanced, Udemy • https://react.dev/reference/react • https://legacy.reactjs.org/tutorial/tutorial.html

Data Warehouse & Data Mining Lab

Program:	MCA (First Year)			**Semester : II**			
Course :	Data Warehouse & Data Mining Lab			**Code**: **MCA22506**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	**2**	**-**	**1**	**-**	**-**	**-**	**-**
				Evaluation Scheme			
				TW	OR	PR	Total
				25	**-**	**-**	**25**

Pre-requisite:
DBMS, Basic SQL Queries and

Objectives:

1. Develop proficiency in using Tableau, Weka, Oracle and MS Excel as tools for working with datasets.
2. To enable students to understand and implement various Data Mining algorithms on large dataset and evaluate the result.

Outcomes:
After learning the course, the students should be able to:

1. Use multidimensional schema modeling techniques to organize and structure complex data for efficient analysis
2. Evaluate frequent patterns using Association Mining Techniques on large dataset
3. Evaluate various Classification Techniques on large dataset
4. Evaluate various Clustering Techniques on large dataset

Detailed Syllabus:

Unit	Description	Duration
1	Working with a Dataset using Data warehouse and Data Mining Tools: Tableau / R / Weka / Oracle/ MS Excel	**4**
2	**Multidimensional Database :** Create multi-dimensional database for a mini data warehouse problem using Star Schema Model or Snowflake Schema Model.	**6**

3	**OLAP and Operations On OLAP** Perform various operations on Multidimensional Database: Roll-up, Roll-Down, Dicing, Slicing, Pivot, Ad-hoc Queries.	**6**
4	**Association Rule Mining:** Implementing Association Mining with Weka, Applying the Apriori Algorithm in Weka on a Real-World Dataset, Rules Generation, Applying the Apriori Algorithm on a Numeric Dataset/ Categorical Dataset. Setting Support Count and Confidence to find strong Association Rules	**4**
5	**Clustering** Implementing Clustering with Weka, Clustering Fisher's Iris Dataset with the Simple k-Means Algorithm, Hierarchical Clustering Algorithm. Interpret the result after applying Clustering algorithms, change setting for no of clusters	**6**
6	**Classification** Implementing Classification using Weka, J48 decision tree, interpreting results, using rules for prediction, Applying Naïve Bayes algorithm to a sample dataset.	**4**
	TOTAL	**30**

Reference Books:

- Data Mining: Practical Machine Learning Tools and Techniques, Second Edition
- Bulding the Data Warehouse 4 Edition By W. H. Inmon
- Data Mining and Data Warehousing : Principles and Practical Techniques By Parteek Bhatia
- Data Mining Practical Machine Learning Tools and Techniques By Ian H. Witten
- Data Mining Practical Machine Learning Tools and Techniques By Morgan Kaufmann

Online References / Resources

- Weka Data Mining : https://www.javatpoint.com/weka-data-mining
- Weka Tutorial : https://www.tutorialspoint.com/weka/index.htm
- Introduction to Weka : https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf

Network Security Lab

Program:	MCA (First Year)			**Semester :** II			
Course :	Network Security Lab			**Code : MCA22507**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Basic of Python Programming.
2. Basic of Statistics

Objectives:

- To study the concepts of network security and various cryptographic algorithms.
- To understand hardware and software security, IDS, wireless and web security
- To understand the security laws with Internet Governance and Email policy.

Outcomes:

After learning the course, the students should be able to:

- Explain the basic concepts of network security
- Identify network security with respect to cryptographic services
- Compare various hardware and software securities for information
- Identify intrusion detection system to provide security using firewalls
- Identify wireless and web security provided to information
- Analyze security and law along with Internet Governance and Email policy

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Network Security** IP address, Sub-netting, MAC Address, Static IP, Dynamic IP Assignment based on basic network commands and network configuration commands	5
2.	**Cryptography** Symmetric and Asymmetric algorithms. Assignments based on simplified DES, AES implementation , Encryption and Decryption by RSA algorithm	5
3.	**Hardware and Software Security** Demonstration of Cisco Packet Tracer Simulation Tool with Examples	5

	Assignments based on PGP, S/MIME, SSL and TSL	
4.	**Intrusion Detection System and Firewalls** Functions and limitation of Firewalls Assignments based on Windows Firewall configuration	5
5.	**Wireless and Web Security** WLAN configuration. Web Security Protocols Assignments based on Wireless LAN configurations and Web Security protocols.	5
6.	**Security and Law, Internet Governance and Email Policy** Security and Law: Regulations in India, Information Technology Act 2000, Cyber Crime and the IT Act 2000, Indian Copyright Act, Internet Governance, Electronic mail policy Assignment based on Security and Law, Internet Governance and Email Policy	5
	TOTAL	**30**

Text Books: –

Reference Books:

1. Network Security Essentials: Applications and Standards, 4/e, William Stallings, Pearson Education
2. Network Security and Management, 2nd Edition, Brijendra Sing, PHI,
3. Network Security Bible, 2nd Edition, Eric Cole, Wiley Publisher

List of Experiments:

1. Assignment based on basic network commands and network configuration commands
2. Assignments based on simplified DES, AES implementation , Encryption and Decryption by RSA algorithm
3. Assignments based on PGP, S/MIME, SSL and TSL
4. Assignments based on Windows Firewall configuration
5. Assignments based on Wireless LAN configurations and Web Security protocols.
6. Assignment based on Security and Law, Internet Governance and Email Policy

Software Testing and Quality Assurance Lab							
Program: MCA (First Year)				**Semester : I**			
Course : STQA Lab				**Code : MCA22508**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	**2**	**-**	**1**	**-**	**-**	**-**	**-**
				Evaluation Scheme			
				TW	**OR**	**PR**	**Total**
				25	**-**	**-**	**25**

Pre-requisite:

1. Basic concepts of programming language and database concepts.
1. Basic knowledge of software engineering and project life cycle.

Objectives:

1. To learn fundamental concepts in software testing & testing levels.
2. To understand test design techniques based on software functionality & its structure.
3. To understand test planning, monitoring and controlling process

Outcomes:

1. Illustrate the test cases designing based on the use cases
2. Use the testing design techniques for a given system under test based on requirements.
3. Appraise test plan based on the requirements.

Detailed Syllabus:

Unit	Description	Duration
1.	1. Design test cases using Use case Diagrams	4
	2. Design test cases using WBT technique	6
	3. Design test cases using Cyclomatic complexity	6
	4. Design test cases using Equivalence Partitioning	6
	5. Design test cases using Boundary value analysis	4
	6. Design test plan using IEEE format	4
	Total	30

Text Books

1. M G Limaye, “Software Testing Principles, Techniques and Tools”, Tata McGraw Hill,
2.Srinivasan Desikan, Gopalswamy Ramesh, “Software Testing Principles and Practices”, Pearson
3. Software Testing Techniques by Boris Beizer-DreamTech Pub,2nd Edition

Advanced Java Lab

Program: MCA (First Year)				**Semester : II**			
Course : Advanced Java Lab				**Code : MCA22513**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Computer Fundamentals
2. Basics Concepts of Programming
3. Java Programming
4. Basics of Web Development

Objectives:

1. To Develop a solid understanding of SQL and database design principles
2. Develop expertise in web application development using Java Servlets and Java Server Pages (JSP), including understanding web servers, HTTP protocol, and managing sessions.
3. Gain an understanding of Object Relational Mapping (ORM) concepts and their benefits in Java development, including the basics of Hibernate as an ORM tool and its integration with Java.
4. Develop proficiency in Hibernate framework, including the configuration of Hibernate in a Java application, Object Relational Mapping (ORM) using Hibernate annotations, and Hibernate Query Language (HQL) for efficient database access.

Outcomes:

- Apply JDBC for database management.
- Build Dynamic Web Pages using Servlet.
- Build Dynamic Web Pages using JSP.
- Apply Hibernate for database management.

Detailed Syllabus:

Unit	Description	Duration
1.	**Java Database Connectivity** ● Assignments based on Java DataBase Connectivity.	4
2.	**Java Servlet** ● Assignments based on Servlets	6

3.	**Java Server Pages (JSP)** ● Assignments based on Java Server Pages	**6**
4.	**Introduction to Hibernate** ● Assignments based on basics of Hibernate	**6**
5.	**Object Relational Mapping (ORM) with Hibernate** ● Assignments based on Object Relational Mapping	**4**
6.	**Hibernate Query Language (HQL)** ● Assignments based on Hibernate Query Language	**4**
	TOTAL	**30**

Text Books

- Murach's Java Servlets and JSP
- Beginning Hibernate, Apress

Reference Books

- Head First Servlet and JSP
- Servlet & JSP: A Tutorial, by Budi Kurniawan
- Java Persistence with Hibernate
- Hibernate Recipes: a Problem-Solution Approach by Gary Mak, Srinivas Guruzu

Online References / Resources

- https://www.edureka.co/blog/servlet-and-jsp-tutorial/
- https://www.springboottutorial.com/first-java-web-application-with-jsp-and-servlets-in-25-steps
- https://www.digitalocean.com/community/tutorials/hibernate-tutorial-for-beginners#hibernate-tutorial-for-beginners
- https://www.javaguides.net/p/hibernate-tutorial.html
- https://howtodoinjava.com/series/hibernate-tutorials/

Data Science Lab

Program:	MCA (First Year)			**Semester :** II			
Course :	Data Science Lab			**Code : MCA22514**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Basic of Python Programming.
2. Basic of Statistics

Objectives:

- To develop relevant Python programming abilities for analysis of data.
- To learn and demonstrate the basic statistical analysis of data using python programming.
- To understand the features and applications of machine learning algorithms.
- To use appropriate tools and methods to collect, process, summarize, and visualize data for analysis.

Outcomes:

After learning the course, the students should be able to:

- Apply python programming data structures and control structures for data analysis.
- Apply basic statistical operations using python programming libraries on datasets.
- Analyze and implement data visualization techniques for data analysis.
- Analyze and implement basic data cleaning techniques to prepare data for analysis.
- Evaluate appropriate machine learning algorithms for data analysis and visualization.

Detailed Syllabus:

Unit	Description	Duration
1.	**Unit-1: Python for Data Science** Demonstration of Python programming, Demonstration of Python Data Structures: List, Tuple, Set, Dictionary Python Control structures: If-else, while and for statements. Assignment based on Python Programming.	4
2.	**Unit-2: Statistics for Data Science** Demonstration of Qualitative & Quantitative Analysis methods. Assignment based on Mean, Mode, Median, Probability, Distribution, Variance, Correlation and Standard Deviation.	4

3.	**Unit-3: Python Libraries** Demonstration of NumPy and Pandas Libraries Assignment based on Numpy and Pandas Library	**4**
4.	**Unit-4: Data Visualization in Python** Demonstration of data visualization using MatPlotLib and Seaborn libraries. Assignment based on data visualization.	**6**
5.	**Unit-5: Introduction to Machine Learning** Demonstration of Machine Learning Algorithms (Supervised & Unsupervised) Assignment based on Machine Learning Concepts for data preprocessing..	**6**
6.	**Unit-6: Machine Learning Algorithms** Demonstration of Regression and Classification Algorithms. Assignment based on Machine Learning Algorithms.	**6**
	Total	**30**

Text Books: –

Reference Books:

1. Python for Data Analytics with Pandas, Numpy and MatPlotLib, Fabio Nelli, Apress Publication
2. Python for Data Analysis, Wes McKinney, O'Reilly publication
3. Business Statistics, Naval Bajpai, Pearson Publication

List of Experiments:

1. Programs based on Data Structure and Control structure using Python.
2. Programs based on the basics of Statistics and its methods.
3. Programs based on Python libraries NumPy and Pandas
4. Programs based on data visualization using Python libraries
5. Programs based on Data Preprocessing.
6. Programs based on Machine Learning algorithms (Regression and Classification)

Blockchain Lab

Program: MCA (First Year)				**Semester : I**			
Course : Blockchain Lab				**Code : MCA22515**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Object Oriented Programming
2. Networking Basics

Objectives:

1. To develop skills and knowledge about blockchain-based solutions

Outcomes:

- Develop blockchain-based solutions and write smart contracts using Ethereum Framework
- Deploy Decentralized Application

Detailed Syllabus:

Unit	Description	Duration
1.	**Mining** ● Assignments based on virtual mining of BitCoin	6
2.	**Cryptocurrency** ● Assignments based on Cryptocurrency Transactions	10
3.	**Smart Contracts** ● Assignments based on Smart Contracts	8
4.	**Hyperledger** ● Assignments based on Hyperledger	6
	TOTAL	30

Text Books

- Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
- Blockchain by Melanie Swa, O'Reilly

Reference Books

- Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits

Online References / Resources

- Blockchain A to Z : Udemy
- Blockchain, Dr.Mayank Aggarwal, Swayam

Digital Marketing Lab

Program: MCA (First Year)				**Semester : II**			
Course : Digital Marketing Lab				**Code : MCA22516**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Pre-requisite:

1. Computer Fundamentals and Internet

Objectives:

1. To make students aware about "WHAT-WHY-HOW" of digital marketing aspects

Outcomes:

- Analyse the keywords for website building and SEO
- Build webpages using CMS
- Perform on-page and off-page SEO
- Select a suitable Ad and channel for digital advertisement
- Select social media platform, target audience, geographic area to post the ads

Detailed Syllabus:

Unit	Description	Duration
1.	**Keyword Research** ● Assignments based on Keyword Analysis on Google Keyword Planner Tool	4
2.	**Website Planning and Development** ● Website development using CMS	8
3.	**SEO** ● Search Engine Results Page (SERP) Report Generation ● Google Crawling and Indexing Status Checking ● On-Page SEO ● Off-Page SEO	8
4.	**Google Ads** ● Assignments based Google AdWords, PPC	4
5.	**Social Media Optimization** ● Assignments based on SMO	6
	TOTAL	30

Text Books ● Digital Marketing, Vandana Ahuja, Oxford University Press ● Digital Marketing For Dummies, Ryan Deiss, Russ Henneberry ● Digital Marketing Strategy An Integrated Approach to Online Marketing, Simon Kingsnorth, Kogan Page
Reference Books ● Epic Content Marketing, Joe Pulizzi, McGarw Hill
Online References / Resources ● https://www.semrush.com/academy/ ● https://www.digitalvidya.com/blog/digital-marketing-tutorial/

Mini Project-1

Program:	MCA (First Year)			Semester : II			
Course :	Mini Project-I			Code : MCA22701			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	CE	MTE	ETE	Total
-	4	-	2	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				50	-	-	50

Guidelines for Mini Project-I

- About Course : The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research.
- The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. This course will also develop investigative, research and report writing skills and will provide an opportunity to investigate a chosen topic in considerable depth.
- Mini Project provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to computing problems.

Objectives

- To acquire practical skills and knowledge pertaining to tools and techniques with the aim of effectively addressing real-world issues.
- To familiarize students with the utilization of software engineering methodologies to analyze and devise solutions for real-world problems.
- To gain deeper understanding in specific functional areas
- To inculcate the team work skills
- To enhance communication skill

Course Outcome: After learning the course, the students should be able to:

- Demonstrate the theoretical concepts applied to a software development project
- Enhance critical thinking and problem-solving skills by identifying and addressing challenges that arise during the course of the project
- Evaluate the project outcomes based on established criteria and make informed decisions to improve the project outcomes
- To create innovative solutions by synthesizing and integrating knowledge from diverse sources to address complex challenges

Guidelines

Students are not restricted for software development only. They have the flexibility to Carry-out/perform/opt/achieve either of the following work during the semester to fulfill the requirements of the mini project:

- Industry Internship: Students can opt for an internship in an industry-related field to gain practical experience and apply their skills in a professional setting.
- Interdisciplinary Project: Students have the opportunity to collaborate with peers from different disciplines to work on a project that integrates knowledge and techniques from multiple areas.
- Startup Idea with Proof of Concept (POC): Students can develop their own startup idea and provide a proof of concept, demonstrating the feasibility and potential of their innovative concept.
- Paper Publication: Students can choose to conduct research and write a research paper on a relevant topic within the scope of their course, aiming for publication in a respected journal or conference.
- Achievement in National/International Project Competitions/Hackathons/Business Plan Competitions: Students can participate in various competitions or hackathons at national or international levels, showcasing their skills and innovations.
- Any other activity fulfilling the needs and objectives of the Mini Project: Students may propose and pursue alternative activities that align with the goals and objectives of the mini project, subject to the prior permission of the internal academic panel.
- Students are required to present the progress of the Mini Project work during the semester as per the schedule provided by the Project Coordinator.
- Evaluation of mini project shall be done for 50 marks. This evaluation shall be based on

at least two reviews required as per the nature of mini project work, with the necessary guidelines prepared time to time.

- Students may also start the mini project work as soon as previous semester concludes.
- At the end of semester, student shall submit necessary records of the project work as applicable.