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 2022)

Department of Master of Computer Application

(Updated with minor changes from 2021-2022)

Institute Vision

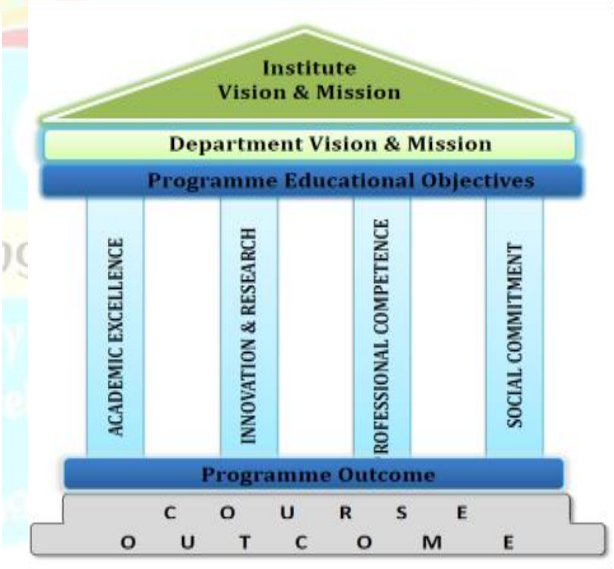
To Serve the Society, Industry and all the Stakeholders through the **Value-Added Quality Education.**

Institute Mission

To serve the needs of society at large by establishing State-of-the-Art Engineering, Management and Research Institute and impart attitude, knowledge and skills with quality education to develop individuals and teams with ability to think and analyze right values and self-reliance.

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
PDT *	Professional Development Course
LS #	Life Skill Course
AC #	Audit Course
MO	MOOC Course

Note:

* - Indicates courses are conducted in 1-2 weeks, after Semester Examination (During Vacation).

- 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	ABBREVATION
1.	Professional Core Course	PCC
2.	Basic Science Course	BSC
3.	Management	MGT
4.	Professional Elective Course	PEC
5.	Open Elective Course	OEC
6.	Project / Seminar	PROJ/SEM
7.	MOOC's Course	MOOC
8.	Professional Development Training	PDT
9.	Life Skill	LS
10.	Audit Course	Audit

- **The Course and Credit Distribution is as under**

Sr. No.	Type of Course	Number of Courses	Total Credit	Credit Per (%)
1	Professional Core Course (PCC)	15	36	38.71
2	Basic Science Course (BSC)	2	8	8.6
3	Management Course (MGT)	2	8	8.6
4	Professional Elective Course (PEC)	9	19	20.43
5	Seminar (SEM)	1	3	3.23
6	Project /Mini Project (PROJ)	3	18	19.35
7	MOOC's Course (MO)	1	1	1.08
8	Professional Development Training (PDT)	1	-	-
9	Life Skill (LS)	1	-	-
10	Audit Course (Audit)	2	-	-
	Total	**37**	**93**	**100**

Course Distribution: Semester wise

Sr. No.	Type of Course	Number of Courses Per Semester				Total
		I	II	III	IV	
1	Professional Core Course (PCC)	7	4	4	0	**15**
2	Basic Science Course (BSC)	1	1	0	0	**02**
3	Management Course (MGT)	1	1	0	0	**02**
4	Professional Elective Course (PEC)	0	4	4	1	**09**
5	Seminar (SEM)	0	0	1	0	**01**
6	Project /Mini Project (PROJ)	0	1	1	1	**03**
7	MOOC's Course (MO)	0	0	0	1	**01**
8	Professional Development Training (PDT)	0	0	1	0	**01**
9	Life Skill (LS)	1	0	0	0	**01**
10	Audit Course (AC)	1	1	0	0	**02**
	Total	**11**	**12**	**11**	**03**	**37**

Credit Distribution: Semester wise

Sr. No.	Type of Course	Number of Credit Per Semester				Total
		I	II	III	IV	
1	Professional Core Course (PCC)	16	8	12	0	**36**
2	Basic Science Course (BSC)	4	4	0	0	**8**
3	Management Course (MGT)	4	4	0	0	**8**
4	Professional Elective Course (PEC)	0	8	8	3	**19**
5	Seminar (SEM)	0	0	3	0	**3**
6	Project /Mini Project (PROJ)	0	1	1	16	**18**
7	MOOC's Course (MO)	0	0	0	1	**1**
8	Professional Development Training (PDT)	-	-	-	-	-
9	Life Skill (LS)	-	-	-	-	-
10	Audit Course (AC)	-	-	-	-	-
	Total	**24**	**25**	**24**	**20**	**93**

Semester wise Credit, Hours/Week and Marks:

Semester	Credits	Hours/Week	Marks
I	24	30	**675**
II	25	31	**725**
III	24	28	**700**
IV	20	35	**550**
Total	**93**	**124**	**2650**

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

SEMESTER – I

MCA Structure		Semester-I	Teaching Scheme					Examination Scheme					
Course Code	Course Type	Course Name	L	P	T/A	H	CR	IE-1	IE-2	ETE	TW	OR	Total
MCA1401	PCC	Java Programming	3	-	-	3	3	20	30	50	-	-	100
MCA1403	PCC	Data base Management System	3	-	-	3	3	20	30	50	-	-	100
MCA1405	PCC	Data Structure	3	-	-	3	3	20	30	50	-	-	100
MCA1407	PCC	Object Oriented Software Engineering	3	-	1	4	4	20	30	50	-	-	100
MCA1201	BSC	Probability and Probability distribution	3	-	1	4	4	20	30	50	-	-	100
MCA1301	MGT	Principles & Practices of Management and Organizational Behavior	3	-	1	4	4	20	30	50	-	-	100
MCA1402	PCC	Java Programming Lab	-	2	-	2	1	-	-	-	25	-	25
MCA1404	PCC	Database Management System Lab	-	2	-	2	1	-	-	-	25	-	25
MCA1406	PCC	Data Structure Lab	-	2	-	2	1	-	-	-	25	-	25
M_1961A To M_1961C	Audit	Audit Course-1	1	-	-	1	-	-	-	-	-	-	-
BHM1937	LS	Life Skill	-	-	2	2	-	-	-	-	-	-	-
		Total	**19**	**6**	**5**	**30**	**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	Teaching Scheme					Examination Scheme					
Course Code	**Course Type**	**Course Name**	**L**	**P**	**T/A**	**H**	**CR**	**IE-1**	**IE-2**	**ETE**	**TW**	**OR**	**Total**
MCA2408	PCC	Web Technology	3	-	-	3	3	20	30	50	-	-	100
MCA2410	PCC	Python Programming	3	-	-	3	3	20	30	50	-	-	100
MCA2501 TO MCA2504	PEC	Professional Elective Course-1	3	-	-	3	3	20	30	50	-	-	100
MCA2511 TO MCA2514	PEC	Professional Elective Course-2	3	-	-	3	3	20	30	50	-	-	100
MCA2202	BSC	Business Statistics	3	-	1	4	4	20	30	50	-	-	100
MCA2302	MGT	Entrepreneurship Development	3	-	1	4	4	20	30	50	-	-	100
MCA2409	PCC	Web Technology Lab	-	2	-	2	1	-	-	-	25	-	25
MCA2411	PCC	Python Programming Lab	-	2	-	2	1	-	-	-	25	-	25
MCA2505 TO MCA2508	PEC	Professional Elective Course-1 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA2515 TO MCA2518	PEC	Professional Elective Course-2 Lab	-	2	-	2	1	-	-	-	25	-	25
MCA2701	PROJ	Mini Project-1*	-	2	-	2	1	-	-	-	25	-	25
M_2962A TO M_2962C	Audit	Audit Course-2	-	-	1	1	-	-	-	-	-	-	-
		Total	**18**	**10**	**3**	**31**	**25**	**120**	**180**	**300**	**125**	-	**725**

Mini Project*- Software Development / Internship / Sponsored / Start up / Interdisciplinary / Achievement in recognized Project Competition / Societal

PROFESSIONAL ELECTIVE COURSES (Semester-II)

Course Code	Professional Elective Course-1	Course Code	Professional Elective Course-2
MCA2501	Design and Analysis of Algorithm	MCA2511	Introduction to Data Science
MCA2502	Web development with Java	MCA2512	Information and Security Audit
MCA2503	Data Warehouse and Mining	MCA2513	ASP.Net using C#
MCA2504	Design Thinking and Problem Solving	MCA2514	Business Process Domain
MCA2505	Design and Analysis of Algorithm Lab	MCA2515	Introduction to Data Science Lab
MCA2506	Web development with Java Lab	MCA2516	Information & Security Audit Lab
MCA2507	Data Warehouse and Mining Lab	MCA2517	ASP.Net using C# Lab
MCA2508	Design Thinking & Problem Solving Lab	MCA2518	Business Process Domain Lab

LIST OF AUDIT COURSES

	SEM-I		SEM-II
M_1961A	Constitution of India	M_2962A	Team Building & Leadership
M_1961B	Value Education	M_2962B	English for Research writing
M_1961C	Stress Management	M_2962C	Disaster Management

FYMCA Syllabus
Content with
Teaching and Evaluation Scheme

Course Syllabus
Semester I

Program:		MCA (First Year)		**Semester :** I			
Course :		Java Programming		**Code :** MCA1401			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:

Fundamental Programming Concepts.
Logical thinking

Objectives:

1. To learn about the concepts and principles of Java programming.
2. To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To develop applications using object oriented programming concepts of Java.
4. To develop GUI application using Swing and Applet programming

Outcomes:

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

1. Describe Programming Constructs and features of Java like Interface, Package, and Exception Handling.
2. Use the programming constructs and features like Interface, Package and Exception Handling to write a Java Program.
3. Develop the Java application by applying the programming constructs and features like Interface, Package and Exception Handling.
4. Describe the features of Multithreading, Java I/O, Swing, Applet, and Collection Framework.
5. Write console based applications using Java I/O, Multithreading, Swing/Applet, and Collection Framework.
6. Develop the Java console base application based on Java I/O, Multithreading, Swing/Applet, and Collection Framework.

Detailed Syllabus

Unit	Description	Duration
1.	**Unit-1: Introduction to Java** History of java, Features of Java, Programming Concepts Identifiers, Keywords, Variables, Control Structure, Decision Making Statements, Arrays & Strings (String, StringBuffer class) Object Oriented Concepts of Java Class & Objects, Encapsulation & Abstraction,	**5**

	Inheritance & Polymorphism, Java Input / Output Operations.	
2.	**Unit-2: Java Programming Constructs:** Defining Class with data members and methods, Creating objects & accessing members of class, Access specifiers Public, Private and Protected. Modifiers Static, Final and Abstract Object Initialization using Constructor, Types of constructors. Inner class Inheritance Types of Inheritance Single, Multilevel and Hierarchical Inheritance Polymorphism Types of Polymorphism Method overloading Method overriding	**5**
3.	**Unit-3: Interface, Packages and Exception Handling** Interface Definition of Interface Implementing an Interface Abstract class Package Introduction Creating Package Importing Package / Class from package Package scope Exception Handling Introduction to Exception and Exception Handling Types of Exception, Exception class hierarchy Exception handling using try, catch and finally block Use of throw and throws statements User defined exception	**6**
4.	**Unit-4: Java Input / Output & Multithreading** Java Input / Output Java I/O package, IO class Hierarchy Byte Stream and Character Stream classes Buffered Reader and writer classes Classes for file IO operations PrintWriter class Multithreading in Java Introduction to multithreading Thread Life Cycle	**6**

	Creating Thread using Thread class or Runnable Interface Main Thread and Thread Properties Creating multithreaded application Thread Synchronization and Communication	
5.	**Unit-5: Java Collection Framework** Introduction to collection framework Collection Interface, Classes and Iterator Collection, Set, SortedSet and List interface ArayList, LinkedList, HashSet, TreeSet classes Map and SortedMap interface HashMap and TreeMap classes	**6**
6.	**Unit-6: Java Swing and Applet Programming** Introduction to Swing class and Features of Swing class Swing Component Classes JButton, JLabel, JTextFiled, JComboBox, etc Creating Menu using Swing Graphics, Font, Color Class Layout Manager Classes Event Delegation Model Event Source, Event Class, Listener Interface Event class Hierarchy Anonymous and Adapter class Applet Class Applet Life Cycle Creating and displaying applet Adding component in applet HTML applet Tag, Applet Viewer Event Handling in Applet	**8**
	Total	**36**

Reference Books:

1. Java Complete Reference, Herbert Schildt, TMH
2. Programming with Java A Primer, E. Balagurusamy, TMH
3. Java 6 Programming Black Book , Kogent Solution Inc, dreamTech Pub
4. Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

Program:	MCA (First Year)					Semester: I	
Course :	Database Management System					Code: MCA1403	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:
Basic knowledge of Set Theory and Relations, Software Engineering

Objectives:
The concepts related to database, database models, SQL, Concurrency Control, Data Recovery and issues of Database security are covered in this subject. This creates a strong foundation for application database design.

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

1. Analyse the problem of a real-life situation and draw the ER Diagram
2. Create a Database and write Comprehensive SQL Queries.
3. Analyse the database design and improve performance by using rules of Normalization.
4. Resolve transaction concurrency problem by using serializability and locking protocol
5. Recover database from transaction failures using deferred and immediate techniques.
6. Apply data access control for multiple users of database.

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Data Models** Conceptual data modelling-motivation, Entities, Entity types, various types of attributes, Relationships, Relationship types, E/R diagram notation, converting the database specification in E/R notation to the relational schema. Examples. Case studies.	6
2	**Relational Data Model:** Concept of relations, Codd's rules, Type of keys, Referential Integrity, **Introduction to SQL:** DDL, DML and Basic Data Types, Operators: Arithmetic Operators, Logical Operators, Set Operators, Like Clause, Between…And, In, Concatenation, Select Query with Distinct Keyword,	8

	NULL Values, Order by Clause, Where Clause, AND & OR Clauses, Expressions Examples on queries.	
3	**Data Normalization:** Concept of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Functional Dependency, Solving Case Study based problems (Design ERD, Database Schema and Normalization up to 3NF).	**6**
4	**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. Numerical Problems based on serializability and locking.	**6**
5	**Crash Recovery and Backup** Database Recovery Concept, Types of failures, and Types of database recovery: REDO & UNDO, Database Recovery Techniques: Deferred Update, Immediate Update, Numerical Problems based on Deferred and Immediate Update	**6**
6	**Database Security** Database security issues, Discretionary access control based on grant & revoking privilege, Mandatory access control and role-based access control for multilevel security.	**4**
	Total	**36**

Recommended Books:

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, Database System Concepts, McGraw-Hill.
2. Raghu Ramakrishnan, Database Management Systems, WCB/McGraw-Hill.
3. Bipin Desai, An Introduction to Database Systems, Galgotia.
4. R. Elmasri and S. Navathe, Fundamentals of Database Systems8, Addison-Wesley.
5. S.K. Singh, Foundations of Databases. Addison-Wesley.
6. SQL- PL/SQL by Ivan Bayross.

Program:	MCA (First Year)			Semester : I			
Course :	Data Structure			Code : MCA1405			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:

1. C Programming

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. Implement searching and sorting algorithms
3. Implement linear data structures for the given problem
4. Demonstrate non-linear data structures for the given problem

Detailed Syllabus

Unit	Description	Duration
1	**Introduction to Data Structure:** Fundamentals of Data Structure, Operations of Data Structure: Traversing, Inserting and Deleting, Arrays as Data Structure, Searching, Sorting Bubble, Insertion, Selection), Storage Representation of Arrays, Applications of an Arrays as Polynomial and Sparse Matrix.	5
2	**Stacks:** Introduction and Definition, Representation, Operations on Stacks, Applications of Stacks, Representation of Arithmetic Expressions: Infix, Postfix, Prefix.	5
3	**Queues:** Introduction and Definition, Representation, Operation on Queues, Types of Queues, Dequeue, Circular Queue, Priority Queue, Applications of Queue.	4
4	**Linked List:** Definition of Linked List, Dynamic Memory Management, Representation of Linked List, Operations on Linked List, Inserting, Removing, Searching, Sorting, Merging Nodes , Double Linked List	8
5	**Trees :** Definition of Tree, Binary Tree and their types, Representation of Binary Tree, Operations on Binary Tree, Binary Search Tree (BST), Traversal of Binary Tree, Preorder Traversal, In-order Traversal, Post-order Traversal, Introduction of Threaded Binary Tree, AVL Tree and B-Tree.	8
6	**Graphs:** Definition of Graph, Basic Concepts of Graph, Representation of	6

	Graph, Adjacency Matrix, Adjacency List, Spanning Tree, Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS)	
	Total	**36**

Reference Books:

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson,
2. Classic Data Structures, Debasis Samanta, PHI
3. Data Structures through C in Depth, S. K. Srivastava
4. Schaum's Outlines Data Structures with C

Program:	MCA (First Year)			**Semester : I**			
Course :	**Object Oriented Software Engineering**			**Code :** MCA1407			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial / Activity**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

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

Objectives:

1. To study phases of SDLC and different process models.
2. Students learn & understand the Requirement analysis and system Design.
3. Learn the 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. Comprehend software development life cycle. (Understanding)
2. Design software requirements specification solution for a given problem definitions of a Software system. (Application)
3. Apply an object-oriented software design and development techniques. (Apply)
4. Determine an appropriate and effective graphical user interface. (Analyzing)
5. Recognize current trends in the area of Software Engineering. (Understanding)

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introduction to Software and Software Engineering** The Evolving Role of Software, The Linear Sequential Model, Prototyping Model, RAD Model, Spiral Model, Agile Process Introduction to development approach SSAD and OOAD	**5**

2.	**Requirement Engineering** Types of Requirements –Functional and Non functional Four Phases of Requirement Engineering IEEE standard format Structure and contents of SRS Case study solution on SRS	**9**
3.	**Object orientation and Structural modeling** Introduction to OOAD: Class and object, Abstraction and encapsulation Method and messages ,Interface, Inheritance and polymorphism Structural Modeling : Class Diagram and Object diagram Associations and links Aggregation , Composition and containment Inheritance, Sub Types and IS-A hierarchy Case study of Structural Modeling Case study of Structural Modeling	**7**
4.	**Behavioral Modeling :** Use case Diagram Develop use-case Model ,Description of Use case Diagram Activity Diagram Sequence diagram Collaboration Diagram State Transition Diagram Case study on all above diagrams	**9**
5.	**User Interface Design** Elements of good design Eight golden rules for design Features of modern GUI, Menus, Scroll bars, windows, buttons, icons, panels, error messages etc. Case study on User Interface Design	**4**
6.	**Current trends in Software Engineering** Collaborative development, Global software development challenges, Reengineering and Reverse Engineering Computer-Aided Software Engineering	**2**
	Total	**36**

Reference Books:

1. Software Engineering by Roger Pressman
2. Object-Oriented Software Engineering: A Use Case Driven Approach by Ivan Jacobson
3. Software Engineering by Sommerville,Pearson,8th Ed

4. Object Oriented System Development - Ali BahramiMcGRAW-HILL International Edition
5. Object Oriented Modeling and Design with UML by James Rumbaugh, Michael Blaha
6. Object Oriented systems Analysis and Design using UML by Simon Bennett
7. The Unified Modeling Language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson
8. Ivar Jacobson, Object-Oriented Software Engineering: A Use Case Driven Approach, 2004, 1st Edition, Addison Wesley Longman Publishing

List of Tutorials / Activities:

1.Camparison of all software process

2. Case study on Requirement Engineering (SRS)

3. Case study on Requirement Engineering (SRS)

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

Program:	MCA (First Year)			Semester : I			
Course :	Probability and Probability distribution			Code : MCA1201			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE-1	IE-2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				-	-	-	-

Pre-requisite:

Basic Mathematics

Objectives:

1. To count similar things in sophisticated ways.
2. To understand the mathematical underpinnings of probability.
3. To learn to make informed decisions about likelihood of events based on a pattern of collected data.
4. To recognize and understand discrete probability distribution functions, in general.

Outcomes:

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

1. Use probability theory to solve interesting problems.
2. Apply the Addition Rule and the Principle of Inclusion and Exclusion and Dearrangement.
3. Use the concepts of sample space, events and compute the probability and conditional probability of events, and use Bayes' Rule.
4. Solve problems based on the concepts of discrete random variables, probability distributions and joint probability distributions.
5. Apply the discrete probability distribution in the given problem appropriately.
6. Apply normal probability distribution in the given problem appropriately

Detailed Syllabus:

Unit	Description	Duration
	Counting Principle 1.1 Addition and Multiplication Principles 1.2 Permutations of n Objects, Circular Permutation 1.3 Permutation with repetitions.	5
2.	Principle of Inclusion and Exclusion: 2.1 Principle of Inclusion and Exclusion theorem and applications. 2.2 Dearrangement theorem and its applications	5

	2.3 Non negative integer value solution 2.4 Multinomial Theorem and application.	
3	Probability 3.1 Trail,Events,Sample spaces, probability axioms 3.2 Independent and Dependent Events 3.3 Conditional probability and its applications. 3.4 Bayes's Theorem and its applications.	6
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.	7
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	6
6.	Continuous Probability Distribution 6.1 Uniform Distribution 6.2 Finding Mean and variance of uniform Distribution 6.3 Normal Distribution 6.4 Finding Mean and variance of uniform Distribution 6.4 Numerical base on Uniform Distribution and Normal Distribution	7
	Total	**36**

Reference Books:

1. Probability and Combinatorics by D.P Apte.
2. Discrete Mathematics by Rosen
3. Probability & Random Process by T. Veerarajan
4. Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor
5. Statistical Methods by S. P. Gupta

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

Program:	MCA (First Year)			Semester : I			
Course :	**Principles and Practices of management and Organizational Behavior**			Code : MCA1301			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial / Activity**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:
No any prerequisite

Objectives:

1. To develop skills to become administrations, managers and executives, a better insight and appreciation of human problems in both industrial and non-industrial organizations
2. To understand the processes of organizational growth and development, and the role of an individual and group behavior therein.
3. To provide a deeper knowledge of organizational behavior with specific emphasis on Indian situations.
4. To understand of the behavior of individuals and groups inside organizations should further enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations

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

1.Apply the key concepts of management

2.Make use of functionalities related to Organizing and staffing

3. Analyze motivation function, leadership skills essential for managerial success.

4.Outline the Organizational Behaviour shaping in the organizational work life

5. Develop group, team dynamics leading to organizational effectiveness.

6.Outline personality structure with individual behaviour

Detailed Syllabus:

Unit	Description	Duration

1.	**Management:** Meaning, Definition Evolution of Management: Need and Process of Management Managerial levels/Hierarchy Five Functions of Management: Planning, Organizing, Staffing, Directing, Controlling Managerial Skills: Technical Skill, Human Skill, Conceptual Skill Introduction to Scientific Management by Taylor, Administrative Management by Fayol, Contribution of Peter Drucker.	**6**
2.	**Organizing and Staffing:** Importance and Process of Organizing, Types of Organizations and span of control, Organizational structure: Functional organization, Product Organization, Territorial Organization Staffing and its importance in the organization, Concept of Personnel Management	**6**
3.	**Motivation and Leadership:** Concept of Motivation, Benefits to organization and Manager Maslow's need Hierarchy theory Theory X and Y, Theory Z Definition, Nature, Qualities of Leader, Leader V/s Manager Leadership Styles (Autocratic, Participative, Laissez faire or subordinate-centered ,Bureaucratic leadership, Transformational leadership, Transactional leadership)	**6**
4.	**Organizational Behaviour:** Definition, scope and importance of OB, Application of Organizational Behavior in Business. Limitations of OB, Globalization and OB ORGANISATIONAL CULTURE: Meaning, Definition, Culture, Organizational Effectiveness ORGANISATIONAL CHANGE: Importance of Change, Planned Change ,OB Techniques	**6**
5.	**Group ,Group Dynamics and Team Building:** Concept of Group, Effect; Characteristics of group, Types of groups The Five-Stage Model of Group Development Concept of Team, Nature, Benefits from team, Types of Teams and Creating Effective Teams.	**6**
6.	**Personality and Understanding Individual Behavior**:	**6**

	Definition and Concept of Emotions, Emotional Intelligence Definition Personality, importance of personality in Performance Personality Structure -Personality and Behavior Perception: Meaning and concept of perception, Factors influencing perception. Ego State, Johari window- Transactional Analysis	
	Total	**36**

Reference Books:

1. Principles and Practices of Management- Shejwalkar
2. Essential of management- 7th edition Koontz H;Weitrich H TMH
3. Organizational behavior Keith Davis
4. Organizational Behaviour - Stephen Robbins
5. Organizational Behaviour - K. Aswathappa (8th revised edition)
6. Organizational Behaviour - John Newstrom
7. Principles and Practice of Management-L.M. Prasad- Sultan Chands and Publication
8. Organizational Behaviour - Kavita Singh-Vikas Publication-3rd Edition

List of Activities:

1. Activity based on Management
2. Activity Based on Organizing and Staffing
3. Activity for effective Motivation and Leadership
4. Activity for Organizational Behaviour
5. Activity Based on Group ,Group Dynamics and Team Building
6. Activity Based on Personality and Understanding Individual Behavior

Program:	MCA (First Year)			Semester : I			
Course :	Java Programming Lab			Code : MCA1402			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prerequisite:

1. Fundamental Programming Concepts
2. Logical thinking

Objectives:

1. To learn about the concepts and principles of java programming.
2. To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To develop applications using object oriented programming concepts of java.
4. To develop GUI application using Swing and Applet programming

Outcomes:

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

1. Write a Java Program using OOP constructs and features like Interface, Package and Exception Handling.
2. Develop the Java application by applying the programming constructs and features like Interface, Package and Exception Handling.
3. Write console based applications using Java I/O, Multithreading, Swing/Applet, and Collection Framework.
4. Develop the Java console base application based on Java I/O, Multithreading, Swing/Applet, and Collection Framework.

Detailed Syllabus:

Unit	Description	Duration
1.	**Unit-1: Introduction to Java** Demonstration of Java Program compilation and Execution Assignment based on Java Programming constructs Assignment based on Java Array and Strings	4
2.	**Unit-2: Java Programming Constructs:** Demonstration of a program using Java Programming Construct. Assignment based on Java Class, Objects, and Constructors. Assignment based on Inheritance & Polymorphism.	4

3.	**Unit-3: Interface, Packages and Exception Handling** Demonstration of program using Interface, Package and Exception Handling. Assignment based on Interface, Packages, and Exception Handling.	4
4.	**Unit-4: Java Input / Output & Multithreading** Demonstration of Program using Java I/O classes and Multithreading. Assignment based on Java IO Classes and File Handling. Assignment based on Multithreading.	4
5.	**Unit-5: Java Collection Framework** Demonstration of java program using collection classes and interfaces. Assignment based on Collection Classes and Interfaces.	4
6.	**Unit-6: Java Swing and Applet Programming** Demonstration of java program using Swing component and Applet with event handling. Assignment based on Java Swing Component with event handling. Assignment based on Applet Programming with event handling.	4
	Total	**24**

Reference Books:

1. Java Complete Reference, Herbert Schildt, TMH
2. Programming with Java A Primer, E. Balagurusamy, TMH
3. Java 6 Programming Black Book , Kogent Solution Inc, dreamTech Pub
4. Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

List of Experiments:

1. Programs based on basic Java programming constructs.
2. Programs based on Java Array and String.
3. Programs based on Java Class and Objects.
4. Programs based on Inheritance and Polymorphism in Java.
5. Programs based on Interface of Java.
6. Programs based on Packages of Java.
7. Programs based on Exception Handling in Java.
8. Programs based on Java IO packages and File Handling.
9. Programs based on Multithreading.
10. Programs based on Java Collection Framework.
11. Programs based on the Swing component of Java with event handling.
12. Programs based on Applet Programming of Java with event handling.

Program:	MCA (First Year)			**Semester:** I			
Course :	DBMS Lab			**Code: MCA1404**			
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 SQLand 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	4
2.	**Aggregate functions**-MIN, MAX, AVERAGE, SUM, COUNT and Group By…Having Clause.	4
3.	**Joins**, Types of Joins and Nested Subquery.	4
4.	**Introduction to PL/SQL**, Creating PL/SQL Blocks, Using Variables in PL/SQL Writing PL/SQL Executable Statements, Nested Blocks and Variable Scope.	4
5.	**Conditional Control:** IF Statements, CASE Statements. Basic Loops, Iterative Control: WHILE and FOR Loops, Nested Loops Function, Procedure and Cursor	6
6.	Transactions Lock and its Type, Data Access Privileges : Grant ,Revoke, Roles	2
	Total	**24**

Reference Books:

1. Understanding SQL by Martin Gruber, BPB
2. SQL- PL/SQL by Ivan Bayross.

3. Oracle – The complete reference – TMH /oracle press
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

Program:	MCA (First Year)	**Semester : I**	
Course :	Data Structure Lab	**Code : MCA1406**	

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:

1. C Programming

Objectives:

1. To build efficient programming skills in students.
2. To impart the basic concepts of data structure and algorithms.
3. To implement concepts about searching and sorting techniques
4. To build efficient programming skills in students.

Outcomes

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

1. Implement searching and sorting algorithms
2. Implement linear data structures for the given problem
3. Demonstrate non-linear data structures for the given problem

Sr.No.	**Experiments**	**Duration**
1	Assignment based on Array Data Structure	**2**
2	Assignment based on operations of Array Data Structure	**2**
3	Assignment based on Searching and Sorting	**2**
4	Assignment based on Application of Array	**2**
5	Assignment based on operations on Stack	**2**
6	Assignment based on Application of Stack	**2**
7	Assignment based on operations of Queue	**2**
8	Assignment based on Singly Linked List	**2**
9	Assignment based on Doubly Linked List	**2**
10	Assignment based on Dynamic implementation of Stack and Queue	**2**
11	Assignment-10 based on basic Binary Tree	**2**
12	Assignment-11 based on implementation of Graph Data Structure	**2**
	Total	**24**

Reference Books:

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson,
2. Classic Data Structures, Debasis Samanta, PHI
3. Data Structures through C in Depth, S. K. Srivastava
4. Schaum's Outlines Data Structures with

Guidelines of Audit Courses

Program:	**MCA**		**Semester:**	**I and II**		
Course :	**Audit Courses (Semester I and II)**		**Code:**	M_1961A To M_2962C		
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE1**	**IE2**	**ETE**	**Total**
1	1	--	--	--	--	--

Guidelines:

1. The audit courses are common to MCA programs
2. Students can select any audit course from list of audit courses for Semester I and II
3. These are non-credit courses but mandatory to comply with for the completion of the semester.

Audit Course-1

Course :	Constitution of India				Code :M_1961A	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	IE1	IE2	ETE	Total
1	1	-	--	--	--	--

Objectives:

1. To understand the constitution and the centre-state relations and functioning
2. To understand the rules and regulations under which public and private sector work
3. To understand E-governance through computers and knowledge of cyber laws

Outcomes:

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

1. Understand the functions of the Indian government and identify and explore the basic features, modalities about Indian constitution and assessment of the Parliamentary System in India.

2. Differentiate the functioning of Indian Political system at Central and State level and comprehend the fundamental rights and abide the rules of the Indian constitution.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Constitution & System of Government** Meaning of the constitution law and constitutionalism, making of constitution, Salient features and characteristics of the Constitution of India, Preamble, Fundamental Rights, Directive Principles of State Policy, Fundamental Duties and it's legal status, Citizenship. Structure and Function of Central Government, President, Vice President, Prime Minister, Cabinet, Parliament, Supreme Court of India, Judicial Review, Federal structure and distribution of legislative and financial powers between the Union and the States, local self-government	6
2.	**Judiciary and Constitution Functions:** Governor, Chief Minister, Cabinet, State Legislature Judicial System in States, High Courts and other Subordinate Courts, Parliamentary Form of Government in India.	6

	Constitution Functions: Indian Federal System and it's characteristics, Center& State Relations, President's Rule, Constitutional Amendments and powers, Constitutional Functionaries, Emergency Provisions, Assessment of working of the Parliamentary System in India.	

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi,24th edition, 2020, ISBN-109388548868

2. Clarendon Press, Subhash C, Kashyap, "Our Constitution: An Introduction to India's Constitution and constitutional Law", NBT, 5th edition, 2014, ISBN-9781107034624

Reference Books:

1.Dr J N Pandey : Constitutional Law of India
2. https://www.meity.gov.in/divisions/national-e-governance-plan
2. https://www.meity.gov.in/DeitY_e-book/e-gov_policy/download/Policy%20Document.pdf
3. http://www.iibf.org.in/documents/cyber-laws-chapter-in-legal-aspects-book.pdf
4. Maciver and Page, "Society: An Introduction Analysis ", Laxmi Publications, 4th edition, 2007, ISBN-100333916166
5. PM Bhakshi, "The constitution of India", Universal Law Publishing - An imprint of Lexis Nexis, 14th edition, 2017, ISBN-108131262375

Course :	Value Education				Code :M_1961B	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	IE1	IE2	ETE	Total
1	1	-	--	--	--	--

Objectives:

1. To identify and develop Attitude and Core Faith values
2. To expose students to Family Relations
3. To enable student to understand Creative Thinking and Problem solving
4. To enable students to understand Humanistic Education.

Outcomes:

After learning the course the students should be able to:

1. Change in awareness levels, knowledge and understanding of student
2. Change in attitudes / behaviour of students with regards to their education improved teamwork,
   institutional leadership and other life skills
3. Improvement in social health and attitude.

Detailed Syllabus:

Unit	Description	Duration
1	Why Human Relations are so important? Understanding Behaviour, Human Relations, and Performance, Personality, Stress, Learning, and Perception, Attitudes, Self-Concept, Natural acceptance of human values, and Ethics, Dealing with Conflict, Leading and Trust	6
2	Justice in Humankind, Nurturing and Exploitation, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics	6
	Total	**12**

Text Books:

1. A Foundation Course in Human Values and Professional Ethics" R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi and Teacher's Manual, R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi

Reference Books:

1. Human Relations in Organizations Applications and Skill Building" Robart Lussier, eighth edition, McGraw-Hill (2014).
2. Atkinson and Hilgard's, "Introduction to psychology" Nolen-Hoeksema, S., Fredrickson, B. L., Loftus, G. R., & Lutz, C., Cengage Learning EME.

Course :	Stress Management				Code : M_1961C	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	IE 1	IE 2	ETE	Total
1	1	-	--	--	--	--

Objectives:

1. To overcome stress
2. To achieve overall health of body and mind
3. To learn to achieve the highest goal happily
4. To become a person with stable mind, pleasing personality and determination

Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve working efficiency

Detailed Syllabus:

Unit	Description	Duration
1.	Definitions of Eight parts of Yog. (Ashtanga) Yam and Niyam. Do`s and Don't's in life.	6
2.	Pranayam Regularization of breathing techniques and its effects- Types of pranayama Approach to day to day work and duties, wisdom	6
	Total	12

Text Books:

1. Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur

Reference Books:

1. Swami Vivekananda, Rajayoga or conquering the Internal Nature, Advaita Ashrama (Publication Department), Kolkata
2. Wendelin Küpers, David J. Pauleen, A Handbook of Practical Wisdom Leadership, Organization and Integral Business Practice, 2016
3. A Foundation Course in Human Values and Professional Ethics Presenting a Universal Approach to Value Education - Through Self-exploration

Life Skill

Program:	MCA			Semester: I						
Course :	Life Skill			Code: BHM 1937						
Teaching Scheme				Evaluation Scheme						
Lecture	Practical	Tutorial / Activity	Credit	CE	MTE	ETE	TW	PR	OR	Total
-	-	2	-	-	-	-	-	-	-	-

Pre-requisite: None

Objectives:

1. To propagate information and knowledge of Yoga, its various techniques and practice them.
2. To attain mental, emotional balance and spiritually to achieve Self-realization and enlightenment to help better understanding of the Inner Personality & its establishment of Harmony with the External Demands
3. To learn to build team spirit and adapt to the various skills required in various sports activities.
4. To provide a platform to express their mind, body, and emotions through performing arts.

Outcomes:

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

1. Practice Yoga themselves to prevent the effects of stress in real life and to develop healthy strategies for dealing with the daily work demand.
2. To achieve a balanced state and enjoy improved mental, physical, emotional, and spiritual wellbeing.
3. To apply sportsman skills in the context of leadership, sports management etc.
4. Demonstrate the ability to think critically about a variety of visual arts and will verify creativity and productivity in the visual arts.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
1.	**Practicing Yoga** Yoga: Its Origin, History, and Development Introduction to Major schools of Yoga: Janan, Yoga Bhakti, Yoga Karma, Patanjali, Hatha. Introduction to yogic practices: Sukshama Vyayama, Surya Namaskar and Asanas. Pranayama and Breathing exercises **Practicing Meditation** Meditation Technique, Thoughtless Awareness : Through Patanjali/Sahajayoga/ Vipassana/ Madhyastha Darshan/ Art of	**12**

	Living etc., Or **Sports:** Indoor Games / Outdoor Games	
2.	**Performing arts** Music, Singing, Poetry, Indian Conventional Dancing, Photography, Short Movie Making, Painting/ Sketching/ Drawing, Theatre Arts, Anchoring, Calligraphy etc.	**12**
	Total	**24**

Reference Books:

1. B. K. S. Iyengar , "Light on Yoga", 20 March 2006
2. Swami Ramdevji , "Yog Sadhana Evam Yog Chikitsa Rahasya", 2002.
3. Vishnu Devananda, "Meditation and Mantras" ,1978.
4. Swami Vivekananda, "Patanjali's Yoga Sutras", 1 Jan 2012.
5. Shri Mataji Nirmala Devi, "Sahajayoga an Introduction"
6. William Hart , S. N. Goenka, "The Art of Living", 4 August 2009.
7. Dennis Hill, "Meditation Deep Peace", Trafford Publishing, 7 August 2014.
8. Boria Majumdar, Sachin Tendulakar, "Sachin Tendulkar – Playing It My Way", Hodder & Stoughton, Hachette Livre publishing, 6 November 2014.
9. Milkha Singh, "The Race of My Life", 2013.
10. Sfurti Sahare, "Think and Win like Dhoni", 3 July 2016.
11. Dina Serto and Mary Kom, "Unbreakable", 19 November 2013.
12. Ronojoy Sen, "Nation at Play: A History of Sport in India", 2015.
13. Andre Agassi, "Open", 2009.
14. Dr. Monica Hiten Shah, "Sangeet Aradhana", Aradhana Sangeet Academy Ahmedabad, Edition 2018.
15. Kishori Amonkar , "Recreating A Dream", Standard Edition .
16. Veejay Sai & foreward by Girish Karnad, "Drama Queens – Women who created history on Stage", Roli Books publication.
17. Jiwan Pani, "Back to the roots – Essays on Performing Arts of India", 1 January 2004.

Course Syllabus
Semester II

Program:	MCA (First Year)			**Semester : II**			
Course :	**Web Technology**			**Code :** MCA2408			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

1. Object Oriented Concepts
2. C++ Programming
3. Basics of Networking
4. SQL

Objectives:

1. To give the basic overview of the different technologies related to website development
2. To develop the skill and knowledge of Client Side Programming
3. To make the students aware about web publishing

Outcomes:

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

1. Explain the concepts related to HTML, CSS, JavaScript,Bootstrap, Angular technologies.
2. Use HTML tags to create the structure of web pages.
3. Apply CSS properties to design the web page.
4. Build UI using Bootstrap
5. Use JavaScript to build interactive web pages.
6. Demonstrate Angular concepts

Detailed Syllabus

Unit	**Description**	**Duration**
1	**HTML 5** 1.1 Basic Terminologies and Tags 1.2 Table, Link, Audio, Video 1.3 Forms 1.4 Canvas 1.5 Geolocation	**06**
2	**CSS** 2.1 Introduction and Types 2.2 Selectors, Class, ID, Pseudo Classes, Box Model 2.3 Color, Background, Opacity 2.4 Border, Margin, Padding 2.5 Display, Position, Float 2.6 Font, Text, Overflow 2.7 Tables, Lists, Size	**05**
3	**Bootstrap 5**	**07**

	3.1 Layouts 3.2 Contents 3.3 Forms 3.4 Components 3.5 Utilities	
4	**JavaScript** 4.1 Need of Javascript, Basic Syntax and Building Blocks 4.2 Array, String, Date, Math, Global Objects 4.3 DOM and DOM Manipulation 4.4 Window, Location, History, Navigator, Screen Objects 4.5 Event Handling 4.6 Form Validations (using Regular Expressions)	**07**
5	**Angular** 5.1 Introduction 5.2 Setup and Install 5.3 Files and Folder Structure 5.4 Hello World 5.5 Interpolation 5.6 Angular CLI 5.7 Introduction to TypeScript and ES6	**05**
6	**Advanced Angular** 6.1 Components 6.2 Data and event Binding 6.3 Directives 6.4 Forms 6.5 Modules	**06**
	Total	**36**

Reference Books:

- Pro HTML 5 Programming, Apress Publication
- Pro CSS3 Layout Techniques, Apress Publication
- Professional JavaScript for Web Developers, Wiley Publication
- Pro Angular 9, Adam Freeman, Apress

Web Reference:

- Bootstrap Docs, www.getbootstrap.com

Program:	MCA (First Year)			**Semester :II**			
Course :	**Python Programming**			**Code :**MCA2410			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	–	--	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

1. Basic Programming Concepts
2. C Programming
3. Object Oriented Programming Using CPP
4. Logical Thinking

Objectives:

1. To learn about the concepts and principles of Python Programming.
2. To Understand fundamentals of Data Structures in python programming
3. To learn object-oriented programming , including defining classes, invoking methods, using class libraries, etc. using python
4. To develop skills of finding solutions and building applications using python programming..

Outcomes:

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

1. Demonstrate the use of the built-in data structures like List, Tuples, Set and Dictionaries, Strings
2. Implement different predefined functions, user defined functions and modules
3. Identify and implement exception handling
4. Implement Object Oriented Concepts
5. Implement different operations on different types of Files
6. Implement database operations

Detailed Syllabus:

Unit	**Description**	**Duration**
1.	**Introduction to Python and Data Structures in Python** • Introduction to Python. • Variables • Data Types • Decision Making • Loops **Data Structures in Python** • List • Tuples • Set • Dictionaries	**8**

2.	**Functions and Modules** • Built-in Functions • User Defined Functions • Importing modules • DateTime Module • Math Module • String Module • Random Module	**5**
3.	**Exception Handling using Python** • Introduction to Syntax, Errors, Exceptions • Handling Exceptions • User defined exceptions • Clean up actions (Try … Catch…Finally)	**5**
4.	**I/O and File Handling using Python** • Input functions • Output Formatting • Reading and Writing Files • Reading and Writing to Binary Files • Reading and Writing to CSV Files	**5**
5.	**Introduction to Object Oriented Concepts** • Object Oriented concepts • Python Scopes and Namespaces • Classes and Objects • Inheritance • Polymorphism	**5**
6	**MySQL with Python** • Installation of MySQLdb • Database Connections • Creating Database and Tables • CRUD Operations • Transactions	**8**
	Total	**36**

Reference Books:

1. Learning Python By Mark Lutz,O'Reilly Publication
2. Programming with python, A users Book, Michael Dawson, Cengage Learning
3. Python Essential Reference, David Beazley, Third Edition
4. Python Bible

Program Elective Course - 1

Program:	MCA (First Year)			**Semester : II**			
Course :	Design and Analysis of Algorithm			**Code :** MCA2501			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

1. Programming fundamentals.
2. Basic data structures.

Objectives:

1. To learn algorithms and methods used to create strong logic and problem solving approaches in students.
2. To understand basic design concepts of algorithms and design strategies.
3. To analyze time and space complexity of an algorithm.
4. To understand the applications of various design strategies of algorithms.

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

1. Describe concepts of algorithm and algorithm design principles.
2. Use algorithm design techniques to write algorithms
3. Apply algorithm design principles and concepts to implement algorithms
4. Understand different algorithmic design strategies.
5. Use different algorithm design strategies to solve problem statements.

Detailed Syllabus

Unit	**Description**	**Duration**
1	**Foundations:** Algorithm Definition, Algorithm writing conventions, Principles of Algorithm Design, Algorithm designing techniques, Analysis of an algorithm, Time and Space Complexity, Introduction to Asymptotic complexity, Heap and Heap Sort Algorithm	**6**
2	**Divide and Conquer:** Control Abstraction of Divide and Conquer Strategy, Algorithm of Binary Search Techniques, Algorithm of Quick Sort and Merge Sort.	**6**
3	**Greedy Method:** Control Abstraction of Greedy Method, Knapsack problem using Greedy Method, Minimal Spanning Trees-Prim's and Kruskal's Algorithm, Single Source shortest path algorithm-Dijkstra's algorithm.	**8**
4	**Dynamic Programming :**Control Abstraction of Dynamic Programming, Applications of Dynamic Programming in Traveling Salesperson Problem, 0/1 Knapsack, Multistage Graph Problem.	**8**
5	**Backtracking:** Strategy of Backtracking**,** 0/1 Knapsack, N- Queen's problem, Graph Coloring Problem.	**5**
6	**Introduction to complexity theory**: Tractable and intractable problems,	**3**

	classes P and NP, NP-completeness, standard NP-complete problems.	
	Total	**36**

Reference Books:

1. Bressard, “Fundamental of Algorithm.” PHI
2. Horowitz/Sahani, “Fundamentals of computer Algorithms”, Galgotia.
3. Magnifying Data Structures, Arpita Gopal : PHI Publications
4. Thomas H Cormen and Charles E.L Leiserson, “Introduction to Algorithm” PHI
5. A. V. Aho and J.D. Ullman, “Design and Analysis of Algorithms”, Addison Wesley
6. Herbert Edelsbrunner Design and Analysis of Algorithms.
7. Parag H. Dave Design and Analysis of Algorithms, Pearson Education India

Program:	MCA (First Year)			**Semester :** II			
Course :	Web Development with Java			**Code :** MCA2502			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

1. Java Programming
2. Database Management System
3. Basic of HTML

Objectives:

1. To apply concepts of Java Programming to write and develop web application
2. To apply java programming constructs like Networking and RMI to write and develop applications.
3. To develop web applications using Servlet and JSP.

Outcomes:

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

1. Describe Programming Constructs and features of Java like Networking and RMI.
2. Use the programming constructs and features like Networking, RMI and JDBC to write a Java Program.
3. Develop the Java application by applying the programming constructs and features like Networking, RMI and JDBC.
4. Describe the features of Servlet and JSP using Java.
5. Use the features of JSP and Servlet to develop the web application.
6. Develop a web application based on JSP, Servlet

Detailed Syllabus

Unit	**Description**	**Duration**
1	**Networking with Java & Remote Method Invocation:** Networking basics, Java.net package with classes and interfaces, Client Server Applications. Connection Oriented and Connection less communication. Creating TCP/IP based Client Server Application using Java. Creating UDP based Client Server Application Using Java. Remote Method Invocation: Architecture of RMI, RMI classes and Interfaces, Creating Java RMI applications, Parameter passing through Remote method call.	**6**
2	**Java Database Connectivity:** Introduction, JDBC Architecture, Types of JDBC Drivers,	**6**

	Steps to create JDBC application, Types of Statements: Statement, PreparedStatement, CallableStatement. Types of ResultSet: Scrollable & Updateable. Inserting, Updating, Selecting, Deleting data from database. Creating JDBC applications.	
3	**Java Servlet:** Introduction, Servlet Life Cycle, HTTP protocols and HTTP methods, Web Server and Web container, Types of Servlets: Generic and HTTP, Writing and Execution Simple Servlets. Session Tracking using Servlet. ServletConfig and Servlet context. Introduction to Beans, using beans component with Servlet.	**6**
4	**Database application using Servlet:** Handling Request and Response of Servlet, Handling Get(), Post() methods through Servlet. Creating Servlet Application which handles Client Requests. Creating database applications using Servlet. HTTP Sessions, Cookies	**6**
5	**Java Server Pages (JSP):** Introduction, JSP programming structures, JSP Directives, JSP Actions, Writing Simple JSP Applications with HTML. Default objects of JSP. Handling Default objects through JSP applications.	**6**
6	**Database application using JSP:** Session Tracking in JSP, Handling request and response objects of JSP, Creating JSP application with database operations, Creating JSP-Servlet Applications.	**6**
	Total	**36**

Reference Books:

1. Complete Reference- J2EE Jim Keogh, TMH
2. Inside Servlets Dustine R. Callway, Pearson pub.
3. Complete reference JSP, TMH.
4. Inside Servlets Dustine R. Callway, Pearson pub.
5. JDBC, Servlet and JSP, Black Book, Santosh Kumar K. Dremtech publication

Program:	MCA (First Year)					Semester: II	
Course :	Data warehouse and Data Mining					Code: MCA2503	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:
DBMS, Data Structure

Objectives:

1. To Study data warehouse architectures, OLAP and the project planning aspects in building a data warehouse
2. To introduce the concepts, techniques, design and applications of data warehousing and data mining.
3. To enable students to understand and implement classical algorithms in data mining
4. To understand how to analyze the data, identify the problems, and choose the relevant algorithms to apply

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

1. Measure data similarity and use data preprocessing techniques on different dataset.
2. Design multidimensional data and perform OLAP operations
3. Apply Association Mining Techniques on large dataset
4. Apply various classification Techniques on large dataset
5. Apply various Clustering Techniques on large dataset

Detailed Syllabus:

Unit	Description	Duration
1	**Data Pre-processing:** Data Objects, attribute types, Measuring Data similarity and dissimilarity. Data Pre-processing- **Data cleaning:** Missing values, Noisy Data. **Data Integration:** Entity identification problem, Redundancy – correlation analysis, Tuple duplications, **Data reduction and Data Transformation.**	6
2	**Data Warehouse Fundamentals:** Define Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse, Architecture of Data warehouse, Characteristics of Data Warehouse, Applications of Data Warehouse.	6

3	**Dimensional Modeling:** Dimensional Modeling: Star Schema, Snowflake Schema, and Fact Constellation Schema. OLAP and operations on Multidimensional Database: Roll-Up, Roll-Down, Dice, Slice and Pivot	**6**
4	**Introduction to Data Mining and Association Rules:** Concept of Data Mining, Predictive & Descriptive Mining, 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 and Lift. Apriori Algorithm and Frequent-pattern Tree Algorithm to find frequent item set and strong association rules.	**6**
5	**Classification:** Introductions to classification, Types of Classification, Building Decision Tree using Gini Index Method, Naïve Bayes Classification, k-Nearest-Neighbor Classifiers (Lazy Learners), Metrics to Assess the Quality of Classifiersin terms of True Positive, False Positive, True Negative and False Negative, Precision, Recall. A case study to classify a sample data set.	**6**
6	**Clustering:** Introduction to Cluster Analysis, Applications of Cluster Analysis, **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.	**6**
	Total	**36**

Recommended Books:

1. Data Mining Concepts and Techniques By J. Han, M. Kamber , Morgan Kaufmann
2. Data Warehousing Fundamentals ByPaulrajPonnian,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

Program:	MCA (First Year)			**Semester : II**			
Course :	Design Thinking and Problem Solving			**Code :** MCA2504			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:

- Problem solving skill
- New idea generation skill

Objectives:

1. To understand the notions of Design Thinking and People Centered Design.
2. To initiate a new working culture based on a user-centric approach, empathy, ideation, prototyping, and playful testing.
3. Understand the terminology and conceptual models used in design disciplines
4. Expand students' thinking about design and innovation beyond the design and development of new products
5. Strengthen students' individual and collaborative capabilities to identify customer needs,

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

1. Understand how the design thinking process is.
2. Apply design thinking to the problems in order to generate innovative and user-centric solutions.
3. Make use of practical design thinking methods in every stage of the problem,
4. Generate and develop design ideas through different techniques
5. Generate and develop design ideas through different technique
6. Participate in and lead innovation in creative and collaborative settings

Detailed Syllabus

Unit	Description	Duration
1	**Introduction :** Introduction to design thinking and creativity, Team project framing	**6**
2	**Overview of design thinking framework**: Rapid collaboration and rapid prototyping, Reframing problems and creating human centered design challenges.	**6**
3	**Wicked Problems in Design :**The Ethics of Design Interventions ,Design Needs in Education, Health & Society	**8**
4	**Interpretation:** Point of View & Problem Reframing , Developing Grounded Theory	**8**
5	**Ideation:** Generating and Developing Ideas, Creativity as Teaching and Learning	**5**
6	**Evolution and Documenting Design:** Express, Test, Cycle: Iterate Without Starting Over **Cycles of Design**	**3**

	Learning, **Representing design knowledge**	
	Total	**36**

Reference Books:

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
3. Cross, Nigel. Design Thinking: Understanding How Designers Think and Work. Oxford: Berg, 2011. On reserve at the Bio-Med Library.
4. Bennett, Kevin. "Design Thinking: Creating a Better Understanding of Today to Get to a Better Tomorrow."
5. Martin, Roger L. "The innovation catalysts." *Harvard Business Review* 89(6) (2011): 82-87. Available online through the U of M libraries.

Program Elective Course - 2

Program:	MCA (First Year)			**Semester :** I			
Course :	Introduction to Data Science			**Code :** MCA2511			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:

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

Objectives:

1. Student should able to learn basic of statics, python data structures.
2. Student should able to learn python libraries and data visualization techniques.
3. Student should able to learn Machine learning algorithms of regression and classification and its implementation in python

Outcomes:

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

1. Use python data structures and control structures.
2. Use basic statistics operations and python libraries with python programming.
3. Implement data visualization techniques with python programming.
4. Use data visualization techniques and python libraries for data analysis
5. Implement machine learning algorithms regression and classification using python programming.

Detailed Syllabus

Unit	**Description**	**Duration**
2.	**Unit-1: Python for Data Science** Introduction to Python, Data Structures: List, Tuple, Set & Dictionary Control structures: If-else, while and for statements	**4**
2.	**Unit-2: Statistics for Data Science** Types of Analysis: Qualitative & Quantitative. Descriptive and Inferential Statistics. Mean, Mode, Median, Probability, Distribution, Variance, Correlation, Standard Deviation	**6**
3.	**Unit-3: Python Libraries** Numpy: Numerical Python functions	**6**

	Pandas: python for data analysis	
4.	**Unit-4: Data Visualization in Python** Basic of data visualization, MatPlotLib and Seaborn libraries. Plot, SubPlot, Ploting graphs for given data.	**8**
5.	**Unit-5: Introduction to Machine Learning** Machine Learning, Supervised & Unsupervised Learning, Data Preprocessing operations	**4**
6.	**Unit-6: Machine Learning Algorithms** Regression: Linear and Multiple Classification: Logistic and Decision Tree	**8**
	Total	**36**

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

Program:	MCA (First Year)			**Semester : II**			
Course :	Information and Security Audit			**Code :** MCA2512			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total

Pre-requisite:

1. Internet concepts and Applications.
2. Fundamentals of computers and Networking.

Objectives:

1. To understand the fundamental concepts of information security and value of information.
2. To gain basic understanding of Information security framework.
3. To understand need and importance of security Models required in IT companies worldwide.
4. To gain a basic understanding of security controls.
5. To gain the understanding of information security audit and IT governance frameworks for information security.

Outcomes:

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

CO1. Describe different threats to information assets in the organization. (BL2: Understand)
CO2. Explain concept of ISMS framework. (BL2: Understand)
CO3. Design security policy using security control concepts (BL3: Apply)
CO4. Explain different Information security Controls in the organization. (BL2: Understand)
CO5. Describe information security audit and understand information security IT governance framework. (BL2: Understand)

Detailed Syllabus

Unit	Description	Duration
1.	**Overview of Information Security System** 1.1 Basic concept & Need of Information Security 1.2 Components of IS 1.3 Threats to information security & cyber crime 1.4 Classification of threats & Attacks	**5**
2.	**Information Security Management System** 2.1 Information Security Life Cycle 2.2 Risks to Information System 2.3 The 3 pillar concepts of Information Security (Confidentiality, Integrity, Availability) 2.4 Components of ISMS & ISMS Conceptual Framework 2.5 Steps for developing ISMS 2.6 Information Classification, Risk Analysis & Management	**5**

3.	**Information Security Policy and Standards** 3.1 Information Security Policy, Standards and Procedures 3.2 PDCA Cycle 3.3 Policy design life cycle 3.4 Types of Information security policies 3.5 Security policy standards and practices - BS7799, ISO/IEC 17799, ISO 27001. 3.6 Examples of Policy writing (Based on Types)	**7**
4.	**Information Security Controls** 4.1 Control : An Introduction, Need of Control 4.2 Types of IS controls – Based on security incident 4.3 Types of Controls- Based on Nature 4.4 Other types of Control- database, network, Internet access, digital signature 4.5 BCP and DRP	**6**
5.	**Information Security Audit** 5.1 Security Audits what are they? 5.2 Need for Security audits in organizations & The Audit Process 5.3 Responsibilities & functions of IS Auditor 5.4 Types of Audits & approaches to Audits Technology based Audits – vulnerability scanning and penetration testing , Key success factors for Security Audits 5.6 Case study on IS Audit	**7**
6.	**Information Security Governance and Issues** 6.1 What is IT Governance, Benefits 6.2 IT Governance Best Practices 6.3 IT governance framework- COBIT- key differences between COBIT 5 and COBIT 2019, ITIL-ITIL V1 to V4 Foundation • Concept • Model • Definitions 6.4 IT governance maturity model.	**6**
	Total	**36**

Reference Books:

1. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices (With Cd) : Nina Gobole
2. The complete reference Information Security by Mark Rhodes
3. Information security Theory and practices By Dhiren R Patel
4. Information Security Management Principles. By Taylor, Andy Alexander, David, Finch, Amanda Sutton, David

5. M. Stamp, “Information Security: Principles and Practice,” Wiley
6. Information security policies, procedures and standards by Thomas Pettier.
7. Information security Management Hand book- 5th Edition-HAROLD F. TIPTON
8. Information systems control and Audit by Ron Weber, Pearson Pub.
9. Implementing Effective IT Governance And IT Management By Gad J. Selig, Published by Van Haren
10. Executive's Guide to IT Governance: Improving Systems Processes with Service Management, COBIT, and ITIL by Robert R. Moeller, Wiley Publication

Program:	MCA (First Year)			Semester : II			
Course :	ASP.NET using C#			Code : MCA2513			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requsite:

1. Object Oriented Programming (C++ / Core Java)
2. HTML
3. CSS
4. JavaScript
5. SQL
6. Basics of Computer Network

Objectives:

1. To understand the ASP.NET web application execution model
2. To introduce visual studio IDE
3. To enable students to create and modify multi-page Web Form applications that involve and demonstrate features such as flow control, the use of style sheets, state management, data access, data binding, security, and data verification and validation.
4. To introduce ASP.NET MVC model

Outcomes:

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

1. Acquire the knowledge of different terminologies and concepts associated with C#, ASP.Net and MVC
2. Use server controls to design user interface, perform form validations
3. Perform Add-Update-Delete-View operations on database using Connected or Disconnected Architecture of ADO.Net
4. Use data controls to manage the data in the database.

Detailed Syllabus

Unit	Description	Duration
1.	**ASP.NET Introduction** How to create and run the first ASP.NET application Understanding the code generated by VS.NET Types of Server Controls Page Life Cycle Understanding AutoPostBack Understanding ViewState Navigation / Redirection Methods	**03**
2.	**ASP.Net Controls** Common Controls	**10**

	Validation Controls Navigation Controls Login Controls Common AJAX Controls Creating User Control Introduction to Master Pages Web.config	
3.	**State Management in ASP.NET** Need of State Management Viewstate Control State QueryString Cookies Session Application	**05**
4.	**Introduction to ADO.NET** Introduction ADO.NET Architecture Data Providers ADO.NET Objects (Connection, Command, DataReader, DataAdapter, DataSet, DataTable, DataView etc)	**04**
5.	**Databound Controls** Rendering Table using SqlDataAdapter and SqlCommandReader SqlDataSource GridView DetailsView	**10**
6.	**Introduction to ASP.NET MVC** Overview Architectural Elements Controllers Views Models	**04**
	Total	**36**

Reference Books:

- Beginning ASP.Net 4.5 in C#, Apress, Mathew McDonald
- ASP.Net 4.5 Unleashed, Sams, Stephen Walther
- Pro ASP.Net MVC 4, Apress, Adam Freeman

Program:	MCA (First Year)			Semester :			II
Course :	Business Process Domain			Code :			MCA2514
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE-1	IE-2	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

PPMOB

Objectives:

1. To learn & understand the processes and practices in business and their applications
2. To make students understand the necessity and importance of Marketing in a business Environment.
3. To Develop understanding about business management concepts for applying these to application development

Outcomes:

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

1. Outline the concepts of marketing
2. Analyze the marketing mix for product or service
3. Make use of various Human Resource functions and processes
4. Develop the Customer Relationship Management strategy
5. Demonstrate effective understanding of relevant functional areas of Banking , Insurance
6. Outline the key concepts of Supply Chain Management

Detailed Syllabus

Unit	Description	Duration
1.	**Introduction to Marketing:** Definition & Functions of Marketing- Scope of Marketing, Company orientation towards market place, Core concepts of marketing: -Need, Want, Demand, Customer Value, Exchange, Customer Satisfaction, Customer Delight, Customer loyalty Segmentation, Target Marketing & Positioning	**6**
2.	**Marketing Mix:** Origin & Concept of Marketing Mix, 7P's - Product, Price, Place, Promotion, People, Process, Physical evidence. Product Life Cycle: Concept & characteristics of Product Life Cycle (PLC)	**6**

3.	**Human Resource** Recruitment and selection Processes, Employee Appraisal, Leave Types, Salary calculation, PF, Gratuity, Bonus.	**6**
4.	**Customer Relationship Management (CRM)** Consumer Behavior: Meaning & importance of consumer behavior, Buying roles, Five steps consumer buyer decision process – Problem Recognition, Information Search, Evaluation of Alternatives, Purchase Decision, Post Purchase behavior. What is CRM? , Why we need CRM?, Customer Life Cycle, Use of CRM in Business, CRM Applications in various industries.	**6**
5.	**Banking and Insurance :** Accounts and Deposits, Types of accounts Concept of payments- NEFT, RTGS, IMPS Loans and various types of loans Loan Sanction Process Insurance, types of insurance Insurance processes	**6**
6.	**Supply Chain Management (SCM)** what is supply chain, Major drivers of Supply chain, Value in Supply Chain- quality, delivery, flexibility, Make Vs Buy, Managing Inventory in Supply chain- definition of inventories, Role of Inventory, Inventory control techniques Transportation– Modes of transportation, Transportation Management system (TMS)	**6**
		36

Reference Books:

1. Marketing Management: A South Asian Perspective, 14th Edition, Philip Kotler, K. Keller, Abraham Koshy and Mithileshwar Jha

2.Supply Chain Management - by Donald J Bowersox; David J Closs; M Bixby Cooper; John C Bowersox, McGraw-Hill Education

3. Personnel Management by C.B.Mamoria, V.S.P Rao, Himayalaya Publication House

4. Customer Relationship Management by Kristin Anderson and Carol Kerr, TMGH

5. Management of banking and Financial Services, by Padmalatha Suresh & Justin Paul, Pearson India Ltd, New Delhi

Program:	MCA (First Year)			Semester : II			
Course :	Business Statistics			Code : MCA2202			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE-1	IE-2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Prerequisite:

- Basic Mathematics
- Basic of Probability and Probability Distribution.

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 Analysis.
2. Apply the concept of Measures of Central Tendency
3. Determine Sampling and Sampling Distribution
4. Implement various hypothesis testing techniques.
5. Interpret correlation between the attributes
6. Demonstrate 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 Principles of Measurement, Source of Data Data classification, Tabulation And presentation	**5**
2.		**5**

	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.	
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	**7**
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 .	**6**
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	**7**
	Total	**36**

Reference Books:

1.Business Statistics, J. K. Sharma, Pearson Education-2nd Edition
2. Business Statistics, Naval Bajpai, Pearson Education-2nd Edition

3. The Art of Computer systems Performance Analysis, Raj Jain, Wiley India Pvt Ltd,
4. Complete Business Statistics, Amir Aczel, Jayavel Sounderpandian, (Seventh Edition), Tata McGraw-Hill Education Pvt. Ltd - 2012
5. Business Statistics Theory and Applications, by Jani P.N , PHI
6. Probability and Statistics, J.L.Devore, 8th Edition, Brooks/Cole, Cengage Learning (2012)

Reference website :

https://atozmath.com/

https://www.analyticsvidhya.com/

List of Tutorials / Activities:

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

Program:	MCA (First Year)			Semester : II			
Course :	Entrepreneurship Development			Code : MCA2302			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial / Activity	Credit	IE-1	IE-2	ETE	Total
3	-	1	4	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	-	-	-	-	-	-

Pre-requisite:
PPMOB

Objectives:

1. To develop entrepreneurship awareness
2. To inculcate entrepreneurial mindset into the minds of young professionals
3. To identify entrepreneurial opportunities
4. To leverage managerial & leadership skills for founding, leading & managing startups

Outcomes:
After learning the course, the students should be able to:
1.Make use of relevance of entrepreneurship

2.Outline the nature of entrepreneurship

3.Summarize the role of Government, various support organizations in promoting Entrepreneurship

4.Develop the financial support system for entrepreneurship

5.Identify Elements of enterprise promotion

6.Discover skill sets required for successful Entrepreneurship

Detailed Syllabus:

Unit	Description	Duration
1	**Unit – 1: Introduction to Entrepreneurship** - Meaning, Definition and concept of Enterprise, Entrepreneurship Development, Evolution of Entrepreneurship, McClelland's Need Achievement Theory, Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship Case Study of Indian Entrepreneurs in Pre-Independence Era and Post Independence Era	**6**
2	**Unit – 2: The Entrepreneur:**	**6**

	Why to become entrepreneur ,Types of Entrepreneur , Concept of Social Enterprise and Social Entrepreneurship**,** Social Entrepreneurs, Rural Entrepreneurship, Family Business Entrepreneurship**,** The entrepreneurial decision process, Women Entrepreneurs: Challenges to Women Entrepreneurs, Achievements of Women Entrepreneurs, Role Models of Woman Entrepreneurs. Case Study of Entrepreneurship in different Sectors	
3	**Unit – 3 Role of government and Institutional Support** Role of Government in promoting Entrepreneurship, MSME policy in India, Start up India, Make in India schemes Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD) Role of Government in ED, various schemes - PMEGP, CGTMSE, PMKVY, Mudra loan Incubation, Role of Incubation Centres, Support from Incubation centres Role of Mentors , Role of consultancy organizations in promoting Entrepreneurs	**6**
4	**Unit – 4 The Financial Road Map:** Financial Support System: Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institution Planning/Budgeting, Developing a financial roadmap, How to budget for startup success, sources of funding, Informal capital– Friends & Family, MPDA, SFURTI. Crowd funding, Venture capital, Private Equity, Financing Mix The Pitch, Preparing for your investor presentation, Elements of the perfect investment pitch Role of Commercial Banks - SIDBI, NABARD, EXIM Bank and Other Agencies; Institutional Assistance for Small Enterprises	**6**

5	**Unit – 5 Enterprise Promotion:** Creating Entrepreneurial Venture, Business Planning Process, The business plan as an entrepreneurial tool, Elements of Business Plan, Objectives, Market Analysis, Development of product / idea - Resources, Capabilities, and strategies, Opportunity Analysis, SWOT analysis, Internal and External Environment Analysis, Industry Analysis, Marketing management	**6**
6	**Unit – 6 Skills For Successful Entrepreneurs:** Communication Skills, Creativity and Problem solving, Innovation, Negotiation Skills, Risk management Case Study of Successful Entrepreneurs Cases of Tata, Birlas, Kirloskar and new generation entrepreneurs in India	**6**
	Total	**36**

Reference Books:

1. Dynamics of Entrepreneurship Development – Vasant Desai.
2. Entrepreneurship: New Venture Creation – David H. Holt
3. Entrepreneurship Development New Venture Creation – Satish Taneja, S.L.Gupta
4. Entrepreneurship Development and small business management – Poornima M. Charantimath

List of Activities:

1. Activity Based on Introduction to Entrepreneurship
2. Activity on Entrepreneur
3. Activity on Role of government and Institutional Support
4. Activity based on The Financial Road Map
5. Activity based on Enterprise Promotion
6. Activity based on Skills For Successful Entrepreneurs

Program:	MCA (First Year)	**Semester : II**	
Course :	Web Technology Lab	**Code :** MCA2409	

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

Pre-requisite:

1. Object Oriented Concepts
2. C++ Programming
3. Basics of Networking
4. SQL

Objectives:

1. To develop static web pages using HTML 5 and CSS 3
2. To perform form validations using JavaScript and Regular Expressions
3. To use Bootstrap Framework to build UI
4. To demonstrate Angular concepts

Outcomes:

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

1. Use HTML tags to create the structure of web pages.
2. Apply CSS properties to design the web page.
3. Build UI using Bootstrap
4. Use JavaScript to build interactive web pages
5. Demonstrate Angular Concepts

Detailed Syllabus:

Unit	**Description**	**Duration**
1	**HTML5** • Assignments based on Table, Form, Audio and Video, Geolocation, Canvas	**4**
2	**CSS** • Assignments based on Border, Font, Text, Color, Position, Transition, Transformation	**4**
3	**Bootstrap** • Assignments based on typography, tables, images, utilities, components	**4**
4	**JavaScript** • Assignments based on array, string, date, document, form validation	**6**
5	**Angular**	**2**

	• Assignments based on basics of Angular	
6	**Advanced Angular** • Assignments based on Advanced Angular	**4**
	Total	**24**

Reference Books:

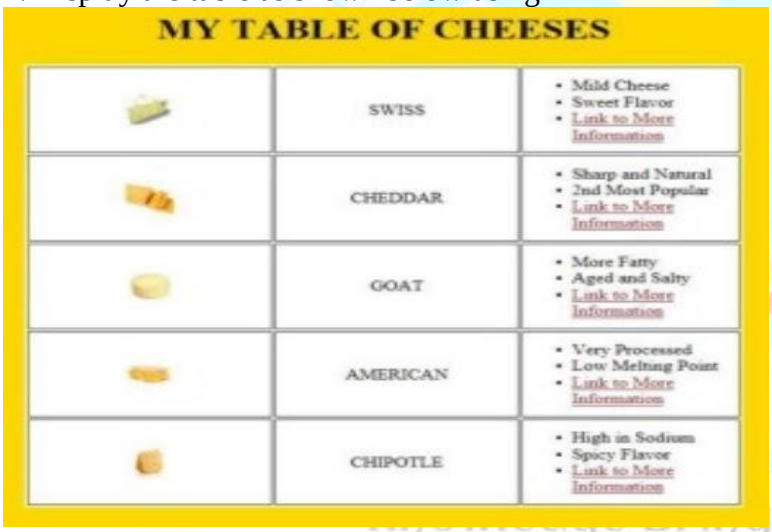
- Pro HTML 5 Programming, Apress Publication
- Pro CSS3 Layout Techniques, Apress Publication
- Professional JavaScript for Web Developers, Wiley Publication
- Pro Angular 9, Adam Freeman, Apress

Web Reference:

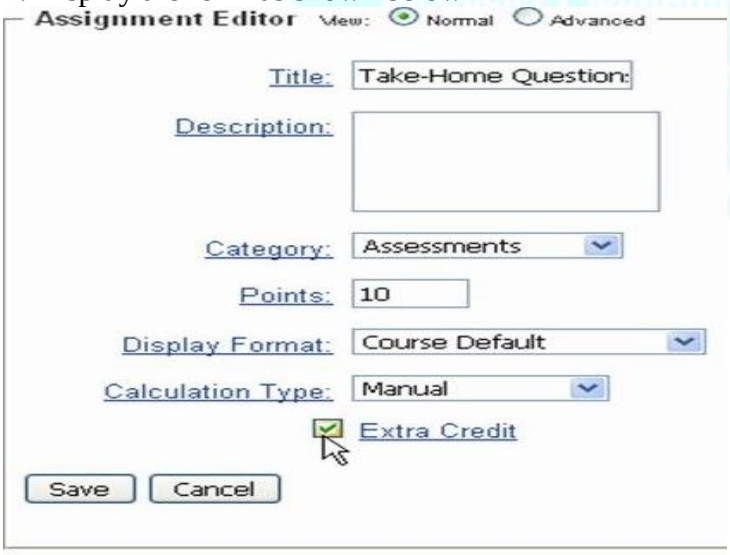
- Bootstrap Docs, www.getbootstrap.com

List of Experiments:

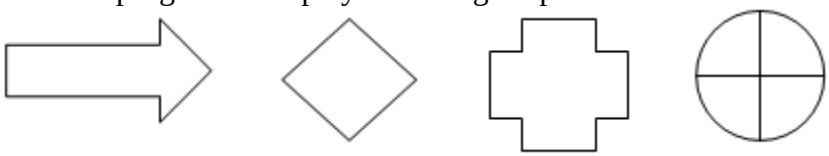
1. Display the table as shown below using HTML



2. Display the form as shown below

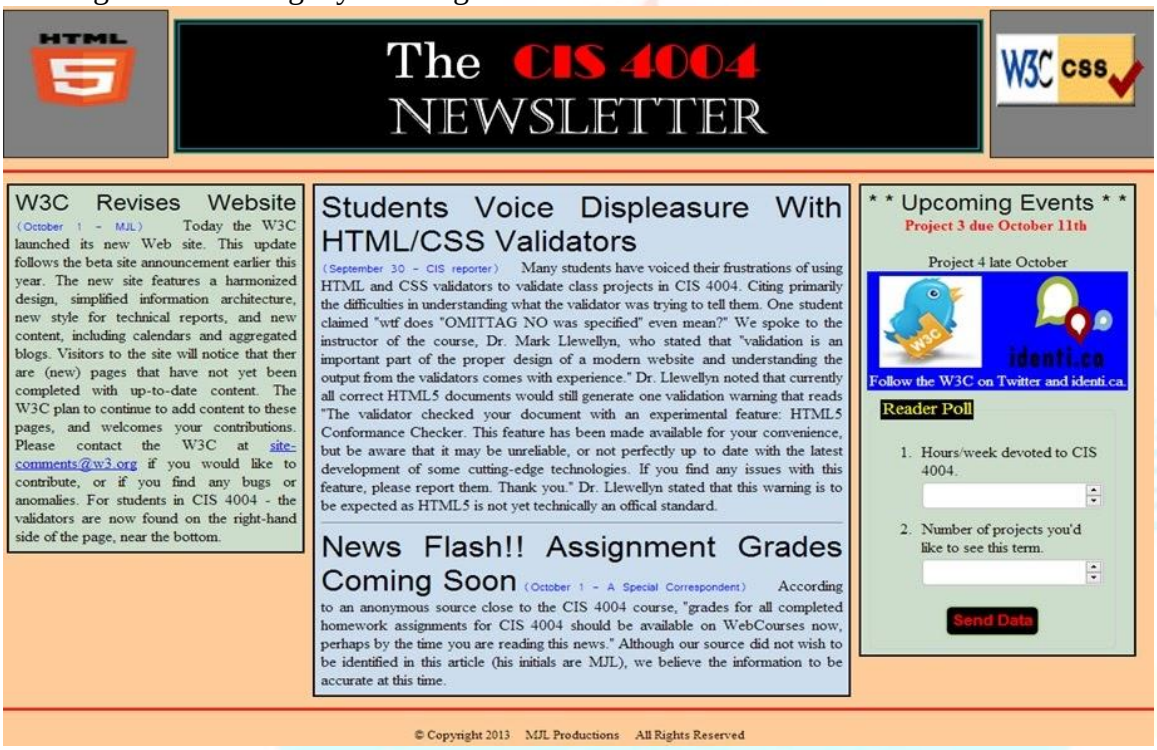


3. Write program to display following shapes on Canvas



4. Write program to display user location on map.

5. Design the following layout using HTML and CSS



6. Demonstrate table and list properties of CSS.

7. Write a program in JS to count the number of images in a document.

8. Write JS program to change background color of element of your choice.

9. Write a JavaScript code for accepting name and mobile number from user. (use validations). Required Validations are : Name text field should not accept numbers, special characters, alphanumeric characters, length should be 20 characters. Mobile number text field should not accept characters, special characters, alphanumeric characters, length should be 10 digits.

10. Write a program do design registration form and validate the details using regular expression (Assume at-least five different validation criteria for the entire form).

11. Design web pages with following layouts using Bootstrap

12. Design a webpage to display tables, images and text using Bootstrap.

13. Design a webpage to demonstrate different components of Bootstrap.

14. Create a web application that demonstrates different concepts of Angular.

Program:	MCA	Semester :	II
Course :	Python Programming Lab	Code :	MCA2411

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:

1. Basic Programming Concepts
2. C Programming
3. Object Oriented Programming Using CPP
4. Logical Thinking

Objectives:

1. To learn about the concepts and principles of Python Programming.
2. To Understand fundamentals of Data Structures in python programming
3. To learn object-oriented programming , including defining classes, invoking methods, using class libraries, etc. using python
4. To develop skills of finding solutions and building applications using python programming.

Outcomes:

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

1. Demonstrate the use of the built-in data structures like List, Tuples, Set and Dictionaries, Strings
2. Implement different predefined functions, user defined functions and modules
3. Identify and implement exception handling
4. Implement Object Oriented Concepts
5. Implement different operations on different types of Files
6. Implement database operations

Detailed Syllabus:

Unit	Description	Duration
1.	**Unit 1 : Introduction to Python and Data Structures in Python** Assignment Based on Basic Python Programming Assignment Based on Data Structures	4
2.	**Unit 2 : Functions and Modules** Assignment based on Functions Assignment based on Modules	4
3.	**Unit 3 : Exception Handling using Python** Assignment based on Exception Handling	4
4.	**Unit 4 : I/O and File Handling using Python** Assignment based on IO and File Handling	4
5.	**Unit 5 : Introduction to Object Oriented Concepts** Assignment based on Object Oriented Concepts	4
6.	**Unit 6 : MySQL with Python** Assignment based on MySQL	4
	Total	**24**

Reference Books:

1. Learning Python By Mark Lutz,O'Reilly Publication
2. Programming with python, A users Book, Michael Dawson, Cengage Learning
3. Python Essential Reference, David Beazley, Third Edition
4. Python Bible

List of Experiments :

1. Write a python program to find the square root of the entered number.
2. Write a Python Program to find Armstrong number
3. Python Program To Display Powers of 2 Using Anonymous Function
4. Python Program to Convert Decimal to Binary Using Recursion
5. Write a Python Program which will Generate a randomly selected element from range(start, stop, step)
6. Write a program which will find all such numbers which are divisible by 7 but are not a multiple of 5, between 2000 and 3200 (both included). The numbers obtained should be printed in a comma-separated sequence on a single line.
7. Write a Python program to count the number of characters (character frequency) in a string.
8. Write a Python program to get a string made of the first 2 and last 2 chars from a given string. If the string length is less than 2, return instead of the empty string.
9. Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
10. Write a Python program to add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
11. Write a Python program to sum all the items in a list.
12. Write a Python program to get the largest and smallest number from a list.
13. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are the same from a given list of strings.
14. Write a Python program to get a list, sorted in increasing order by the last element in each tuple from a given list of non-empty tuples.
15. Write a Python program to convert a tuple to a string.
16. Write a Python program to get the 4th element and 4th element from last of a tuple.
17. Write a Python program to reverse a tuple.
18. Write a Python program to find maximum and the minimum value in a set.
19. Write a Python program to use of frozensets.
20. Write a Python program to create a shallow copy of sets.
21. Write a Python program to create a union of sets
22. Write a Python program to convert a dictionary to OrderedDict.
23. Write a Python program to replace dictionary values with their sum.
24. Write a Python program to sort Counter by value.
25. Write a Python program to get the top three items in a shop.
26. Write a Python program to perform CRUD operations on data in a file.
27. Write a Python program to copy the contents of a file to another file .
28. Write a Python class to reverse a string word by word.
29. Write a Python class named Rectangle constructed by a length and width and a method which will compute the area of a rectangle.
30. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

Program Elective Course – 1 Labs

Program:	MCA (First Year)			**Semester : II**			
Course :	Design and Analysis of Algorithm Lab			**Code :** MCA2505			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prerequisite:

1. Programming fundamentals.
2. Basic data structures

Objectives:

1. To learn algorithms and methods used to create strong logic and problem solving approaches in students.
2. To understand basic design concepts of algorithms and design strategies.
3. To analyze time and space complexity of an algorithm.
4. To understand the applications of various design strategies of algorithms

Outcomes

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

1. Use algorithm design techniques to write algorithms.
2. Apply algorithm design principles and concepts to implement algorithms.
3. Use different algorithm design strategies to solve problem statements.

Sr.No.	**Experiments**	**Duration**
1	**Foundations:** Demonstration of algorithm writing techniques Assignment based on linear sorting techniques.	**4**
2	Assignment based on Heap sort algorithm	**4**
3	**Divide & Conqure:** Demonstration of Divide & Conquer algorithm design technique. Assignment based on Divide & Conquer technique.	**4**
4	Greedy Method: 4. Demonstration of Greedy method design technique. Assignment based on Greedy method	**4**
5	**Dynamic programming:** Demonstration of Dynamic programming design technique. Assignment based on Dynamic programming technique.	**4**

6	**Backtracking:** Demonstration of Backtracking algorithm design technique. Assignment based on Backtracking design technique.	**4**
	Total	**24**

Reference Books:

1. Bressard, “Fundamentals of Algorithms.” PHI
2. Horowitz/Sahani, “Fundamentals of computer Algorithms”, Galgotia.
3. Magnifying Data Structures, Arpita Gopal : PHI Publications
4. Thomas H Cormen and Charles E.L Leiserson, “Introduction to Algorithm” PHI
5. A. V. Aho and J.D. Ullman, “Design and Analysis of Algorithms”, Addison Wesley
6. Herbert Edelsbrunner Design and Analysis of Algorithms.
7. Parag H. Dave Design and Analysis of Algorithms, Pearson Education India

Program:	MCA (First Year)	Semester : I	
Course :	Web Development with Java Lab	Code : MCA2506	

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

Prerequisite:

1. Java Programming
2. Database Management System
3. Basic of HTML

Objectives:

1. To apply concepts of Java Programming to write and develop web application
2. To apply java programming constructs like Networking and RMI to write and develop application.
3. To develop web application using Servlet and JSP.

Outcomes:

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

1. Use the programming constructs and features like Networking and RMI to write a Java Program.
2. Develop the Java application by applying the programming constructs and features like Networking and RMI.
3. Use features of JSP and Servlet to write web applications
4. Develop a web application based on JSP, Servlet.

Detailed Syllabus:

Unit	Description	Duration
1	**Networking with Java & Remote Method Invocation** Demonstration of network programming and RMI Assignment based on network programming. Assignment based on Remote Method Invocation.	4
2	**Java Database Connectivity** Demonstration of Java database connectivity. Assignment based on Java database connectivity.	4
3	**Java Servlet** Demonstration of creating Servlet application. Assignment based on Servlet and HTML	4
4	**Database application using Servlet** Demonstration of creating Servlet application with JDBC Assignment based on Servlet application with JDBC	4

5	**Java Server Pages (JSP)** Demonstration of creating JSP. Assignment based on JSP	4
6	**Database application using JSP** Demonstration of JSP application with JDBC Assignment based on JSP application with JDBC	4
	Total	**24**

Reference Books:

1. Complete Reference- J2EE Jim Keogh, TMH
2. Inside Servlets Dustine R. Callway, Pearson pub.
3. Complete reference JSP, TMH.
4. Inside Servlets Dustine R. Callway, Pearson pub.
5. JDBC, Servlet and JSP, Black Book, Santosh Kumar K. Dremtech publication

List of Experiments:

1. Programs based on Java Networking
2. Programs based on RMI
3. Programs based on Java Database Connectivity
4. Programs based on creating simple Servlet.
5. Programs based on creating Servlet with data base connectivity
6. Programs based on creating Servlet with Session handling
7. Programs based on creating beans component with Servlet
8. Programs based on creating simple JSP applications.
9. Programs based on creating JSP application with Default Objects
10. Programs based on Request and Response objects of JSP
11. Programs based on database application with JSP
12. Programs based on session handling with JSP.

Program:	MCA (First Year)			Semester : II			
Course :	Data Warehouse and Data Mining Lab			Code: MCA2507			
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 and Basic SQL Queries

Objectives:

1. To design database for a mini warehouse system
2. To learn various data mining techniques to analyze the data for decision making.

Outcomes:

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

1. Use Data warehouse and Data Mining Tools- Tableau, MS Excel, Oracle and Weka for data Analysis
2. Design Multidimensional database and perform various OLAP Operations
3. Apply Association Mining, Clustering and Classification Algorithms to a given 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.	4
3	**OLAP and Operations On OLAP** Perform various operations on Multidimensional Database: Roll-up, Roll-Down, Dicing, Slicing, Pivot, Ad-hoc Queries.	4
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	3
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	5
6	**Classification** Implementing Classification using Weka, J48 decision tree, interpreting	4

	results, using rules for prediction, Applying Naïve Bayes algorithm to a sample dataset.	
	Total	**24**

Reference Books:

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

Program: MCA (First Year)						**Semester : II**	
Course : Design Thinking and Problem Solving Lab						Code: MCA2508	
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:

- Problem solving skill
- New idea generation skill

Objectives:

1. To recognize situations where a need is not being met and where something suboptimal can be made better by a design intervention
2. To point directly to the problem
3. To conduct a deep analysis to get a better understanding of the problem.

Outcomes:

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

1. Develop a design theory from observations.
2. Participate in and lead innovation in creative and collaborative settings
3. Undertake complex and unstructured problem-solving challenges in unfamiliar domains

Detailed Syllabus:

Unit	Description	Duration
1	What are you trying to solve? How you define the challenge will shape what you do next. Be precise with your words, and continue to reframe your questions.	4
2	How might you discover the needs of those for whom you are innovating? Gain understanding and empathy by observing, listening, and studying the world around you.	4
3	How do you come up with new ideas? Collaborative creativity is at the heart of innovation. You need a clear and visual process, expert facilitation, and the permission to fail on the way to success.	4
4	How might you best evaluate your ideas? Prototype often, and embrace both failure and success as unique learning opportunities. "Thinking by doing" is a great way to accelerate the development of new ideas.	3
5	How might you best communicate your ideas and concepts? A good story is essential to engage colleagues and customers, and to elicit valuable feedback for the road ahead.	5
6	How might you learn and improve? Pausing for reflection creates opportunities for insight, and for making new connections between ideas. Take time to reflect: it will be the best investment you make.	4
	Total	**24**

Reference Books:

1.Basics of Design Thinking, Gavin Ambrose Design Paul HarrisPublished by AVA Publishing SA

2. “Designing for growth: A design thinking tool kit for managers”, by Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1

3.“The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems”, by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1-119-46747-2

Program Elective Course – 2 Labs

Program:	MCA (First Year)	**Semester :** II	
Course :	Introduction to Data Science Lab	**Code :** MCA2515	

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

Prerequisite:

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

Objectives:

1. Student should able to learn basic of statics, python data structures.
2. Student should able to learn python libraries and data visualization techniques.
3. Student should able to learn Machine learning algorithms of regression and classification and its implementation in python

Outcomes:

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

1. Use basic statistics operations and python libraries with python programming.
2. Use data visualization techniques and python libraries for data analysis
3. Implement machine learning algorithms using python programming.

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, Control structures: If-else, while and for statements. Assignment based on Python Programming.	**2**
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.	**2**
3	**Unit-3: Python Libraries** monstration of Numpyand Pandas Libraries signment based on Numpy and Pandas Library	**2**
4	**Unit-4: Data Visualization in Python** Demonstration of data visualization using MatPlotLib and Seaborn libraries.	**6**

	Assignment based on data visualization.	
5	**Unit-5: Introduction to Machine Learning** Demonstration of Machine Learning Algorithms (Supervised & Unsupervised) Assignment based on Algorithms.	**6**
6	**Unit-6: Machine Learning Algorithms** Demonstration of Regression and Classification Algorithm. Assignment based on Algorithm.	**6**
	Total	**24**

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 basic 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).

Program:	MCA (First Year)			**Semester : II**			
Course :	Information & Security Audit Lab			**Code :** MCA2516			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prerequisite:

1. Internet concepts and Applications.
2. Fundamentals of computers and Networking.

Objectives:

1. To understand the various security threats & attacks
2. To gain basic understanding of writing security policy.
4. To gain a basic understanding of security audit.
5. To understand IT governance frameworks for information security.

Outcomes:

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

1. Describe different threats to information assets in the organization. (BL2: Understand)
2. Design security policy using security control concepts (BL3: Apply)
3. Describe information security audit and understand information security IT governance framework. (BL2: Understand)

List of Experiments / Tutorials / Activities:

1. Case study on security threats
2. Case study on security attacks
3. Case study on policy writing
4. Case study on policy writing with Security controls
5. Case study on IS Audit.
6. Presentation on different IT Governance Frameworks.

Reference Books:

1. Information Systems Security: Security Management, Metrics, Frameworks And Best
a. Practices (With Cd) : Nina Gobole
2. The complete reference Information Security by Mark Rhodes
3. Information security Theory and practices By Dhiren R Patel
4. Information Security Management Principles. By Taylor, Andy Alexander, David, Finch, Amanda Sutton, David
5. M. Stamp, “Information Security: Principles and Practice,” Wiley
6. Information security policies, procedures and standards by Thomas Pettier.
7. Information security Management Hand book- 5th Edition-HAROLD F. TIPTON
8. Information systems control and Audit by Ron Weber, Pearson Pub.
9. Implementing Effective IT Governance And IT Management By Gad J. Selig, Published by Van Haren
10. Executive's Guide to IT Governance: Improving Systems Processes with Service Management,
11. COBIT, and ITIL by Robert R. Moeller, Wiley Publication

Program:	MCA (First Year)	Semester : II	
Course :	ASP.NET using C# Lab	Code : MCA2517	

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

Prerequisite:

1. Object Oriented Programming (C++ / Core Java)
2. HTML
3. CSS
4. JavaScript
5. SQL
6. Basics of Computer Network

Objectives:

1. To understand the ASP.NET web application execution model
2. To introduce visual studio IDE
3. To enable students to create dynamic interactive web pages using ASP.NET.
4. To make students understand about implementation of state management

Outcomes:

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

1. Use server controls to design user interface, perform form validations
2. Perform Add-Update-Delete-View operations on database using Connected or Disconnected Architecture of ADO.Net
3. Use data controls to manage data
4. Perform partial page updates using AJAX controls

Detailed Syllabus:

Unit	Description	Duration
1.	**Common Controls** • Assignmetsn based on Buttons, Checkbox, radio Button, List, TextBox etc	**6**
2.	**Validation, Navigation, Login, AJAX** • Assignments based on various validation controls, Navigation Controls, Login controls, AJAX controls	**4**
3.	**Master Pages, User Control** • Assignments based on creation web page layout, creating user controls	**3**
4.	**State Management** • Assignments based on state management in ASP.NET	**3**
5.	**ADO.NET**	**4**

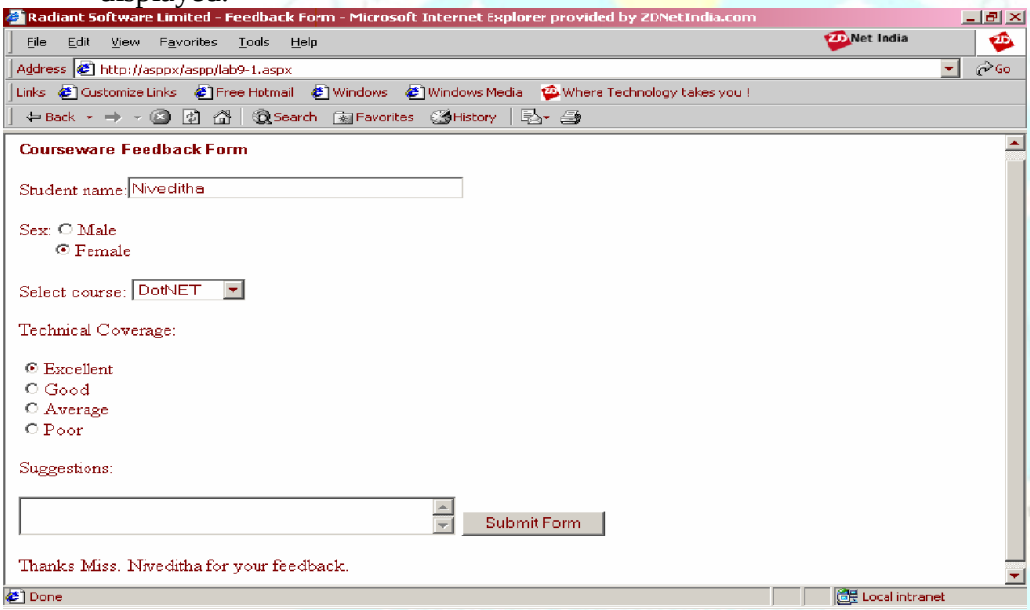
	• Assignments based on data management	
6.	**Databound Controls** • Assignments based on GridView, DetailsView, SqlDataSource etc	**4**
	Total	**24**

Reference Books:

- Beginning ASP.Net 4.5 in C#, Apress, Mathew McDonald
- ASP.Net 4.5 Unleashed, Sams, Stephen Walther
- Pro ASP.Net MVC 4, Apress, Adam Freeman

List of Experiments:

- Write a program to display the following feedback form. The different options for the list box must be ASP-XML, DotNET, JavaPro and Unix,C,C++. When the Submit Form button is clicked after entering the data, a message as seen in the last line of the above figure must be displayed.



- Write a program that displays a button in green color and it should change into yellow when the mouse moves over it.

- Write a program containing the following controls:
  - A ListBox
  - A Button
  - An Image
  - A Label

  The listbox is used to list items available in a store. When the user clicks on an item in the listbox, its image is displayed in the image control. When the user clicks the button, the cost of the selected item is displayed in the control.

- Write code that displays two advertisements alternately. When the user clicks on one of the advertisements, he/she is redirected to “www.amazon.com”, and the other advertisement redirects the user to “www.fabmart.com”. The weightage of the amazon advertisement is 50 and that of the other one is 40. The advertisement should be centered horizontally and should cover 60% of the width of the screen. Its height should be 80 units. The width of the border should be 5 units.

- Write a program to get a user input such as the boiling point of water and test it to the appropriate value using Compare Validator.

- Write a program that uses a textbox for a user input name and validate it for RequiredField Validation.

- Write a prgoram that gets user input such as the user name, mode of payment, appropriate credit card. After the user enters the appropriate values the Validation button validates the values entered.

- Create a Form that receives the user name, address, date, nationality, country preferred for working and skill sets from the user and stores the user name in the client using cookies. The country preferred data should appear in a drop down list whereas, others should be entered in a textbox. Validate all the controls. The Form is named “formexp.aspx”. The date should appear between “1/1/1900” and “1/1/2090”.

- Write a program to create a table **emp** in the **master** database with the following fields:

Field Name	Datatype
eno	Integer
ename	Varchar(20)
salary	Float

Suppose the emp table contains the following records:

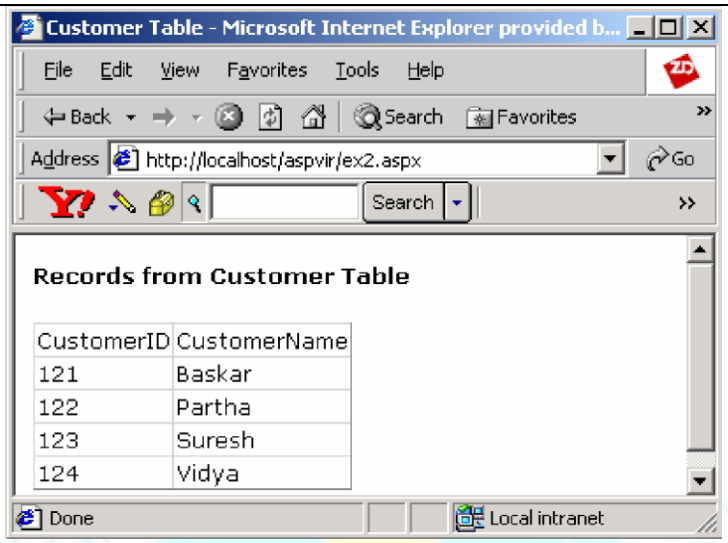
Eno	Ename	Salary
98	Shalini	9200
99	Ramesh	7800
100	Rishab	7000
101	Dharani	7800
102	Vijay	8500
103	Yamuna	9500

- Select the names of the employees from the **emps** table. Retrieve the result in a DataSet and display it in a CheckBoxList.

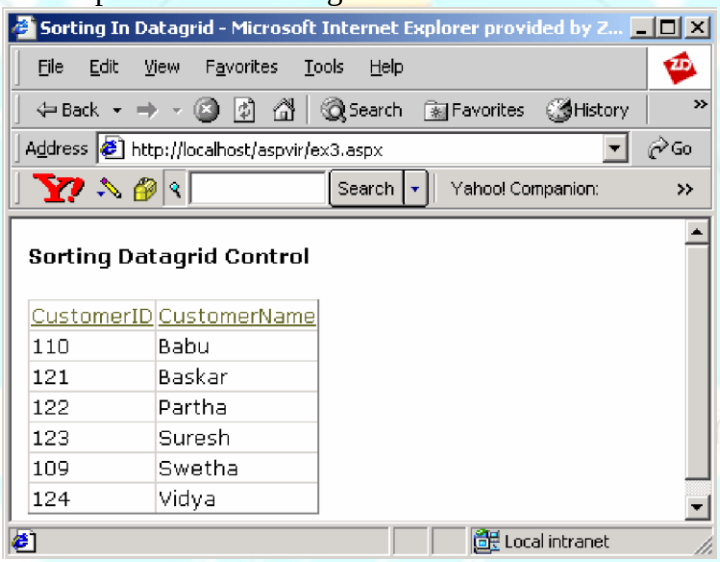
- Select names from the **emps** table. Retrieve the result in a DataSet. Bind the DataSet to a RadioButtonList and display the result in three diferent forms as follows:
  - The RepeatDirection property of the RadioButtonList is set to horizontal and its RepeatLayout property is set to Table.
  - The RepeatDirection property of the RadioButtonList is set to Vertical and its RepeatLayout property is set to Table.
  - The RepeatLayout property of the RadioButtonList is set to flow.

- Create a RadioButtonList that displays the names of some flowers in two columns. Bind a label to the RadioButtonList so that when the user selects an option from the list and clicks on a button, the label displays the flower selected by the user.

- Write a program to display the records from the database as shown in the figure:



- Write a program to implement the sorting feature in the customer table as shown in the figure:



- Create a user control that contains a list of colors. Add a button to the Web Form which when clicked changes the color of the Form to the color selected from the list.

- Create a user control that displays the current date and time. Include it in a Web Form and refresh it each time a button is clicked.

- Create a component that receives two numbers from the user through a Web Form, and based on the user's selection it adds or subtracts the two numbers and returns the result to the Web Form. The result should be displayed in the Web Form.

Program:	MCA (First Year)			Semester : II			
Course :	Business Process Domain Lab			Code : MCA2518			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**IE-1**	**IE-2**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

Prerequisite:

PPMOB

Objectives:

1. To learn & understand the processes and practices in business and their applications
2. To make students understand the necessity and importance of Marketing in business Environment.
3. To Develop understanding about business management concepts for applying these to application development

Outcomes:

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

1 Outline the concepts of marketing

2. Analyze the marketing mix for product or service

3. Make use of various Human Resource functions and processes

4. Develop the Customer Relationship Management strategy

5.Demonstrate effective understanding of relevant functional areas of Banking , Insurance

6.Outline the key concepts of Supply Chain Management

Detailed Syllabus:

Unit	Description	Duration
1	**Introduction to Marketing:** Core concepts of marketing Functions of Marketing Manager.	4
2	**Marketing Mix:** Origin & Concept of Marketing Mix, 7P's	4
3	**Human Resource** Recruitment, selection Processes, Employee Appraisal, Leave Types, Salary calculation, Income Tax calculation, PF, Gratuity, Bonus.	4
4	**Customer Relationship Management (CRM)** Consumer Behavior: Buying roles, Five steps consumer buyer decision process	4

	CRM Applications in various industries.	
5	**Banking and Insurance :** Loans and various types of loans Loan Sanction Process Insurance, types of insurance Insurance processes	4
6	**Supply Chain Management (SCM)** Major drivers of Supply chain, Value in Supply Chain- quality, delivery, flexibility, Make Vs Buy, Managing Inventory in Supply chain Transportation Management system (TMS)	4
	Total	**24**

Reference Books:

1. Marketing Management: A South Asian Perspective, 14th Edition, Philip Kotler, K. Keller, Abraham Koshy and Mithileshwar Jha

2.Supply Chain Management - by Donald J Bowersox; David J Closs; M Bixby Cooper; John C Bowersox, McGraw-Hill Education

3. Personnel Management by C.B.Mamoria, V.S.P Rao, Himayalaya Publication House

4. Customer Relationship Management by Kristin Anderson and Carol Kerr, TMGH

5. Management of banking and Financial Services, by Padmalatha Suresh & Justin Paul, Pearson India Ltd, New Delhi

List of Activities:

1. Activity Based on Marketing
2. Activity Based on Marketing Mix
3. Activity based on Human Resource
4. Activity Based on Customer Relationship Management
5. Activity based on Banking and Insurance
6. Activity based on concept of Supply Chain Management

Mini Project-I

Program:	MCA (First Year)			**Semester : II**			
Course :	Mini Project-I			**Code :** MCA2701			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credit**	**CE**	**MTE**	**ETE**	**Total**
-	2	-	1	-	-	-	-
				Evaluation Scheme			
				TW	OR	PR	Total
				25	-	-	25

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 develop practical ability and knowledge about tools/techniques in order to solve the real world problems
  - To expose the students to use software engineering approach to analyze and formulate the real world problem
  - To gain deeper understanding in specific functional areas
  - To inculcate the skills of team work
  - To enhance communication skill
  - To gain the insight of technical writing

- **Course Outcome :** After learning the course, the students should be able to:
  - Analyze projects problem with systematic approach
  - Construct the solutions for real world problems with systematic approach
  - Make use of acquired knowledge for the project work
  - Develop professional skills required to carry out project management.

- **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, as a fulfillment of requirement of mini project:
    - Industry Internship
    - Interdisciplinary Project
    - Startup Idea with Proof of Concept (POC)
    - Paper Publication
    - Copyright
    - Achievement in National/International Project competition / Hackathon / Business Plan Competitions
    - Social Activity
    - Any other activity fulfilling need and objectives of Mini Project with the prior permission of internal academic panel

  - A candidate is 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 25 marks. This evaluation shall be based on no. of 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.

Audit Course-2

Course:	Team Building & Leadership				Code: M_2962A	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	IE1	IE2	ETE	Total
1	1	-	--	--	--	--

Objectives:

1. Develop and strengthen interpersonal skills
2. Become familiar with and discuss different leadership models.
3. Familiarize students with the characteristics of team building.

Outcomes:

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

1. Use leadership and teamwork knowledge to develop projects.
2. To develop the capacity to work collaboratively in a team

Detailed Syllabus:

Unit	Description	Duration
1.	**Leadership:** Will and motivation, Personal leadership, self-knowledge, and self-control, using power responsibly and respectfully: the leader as a team-builder, Ability to plan future actions and transmit that vision to others. Taking the initiative and stimulate others. What the word "leader" means, Types of leadership, Traditional, legal, and legitimate leader. Categories: autocratic, democratic, charismatic, paternalistic, authentic, spiritual, dictatorial, etc.	6
2.	**Team work** Why is teamwork important? The evolution from group to team: development stages. Advantages and disadvantages of teamwork. How to determine roles in a team. Traditional vs. virtuoso teams, forming effective and balanced teams, Strengthening teams within the organization. Creating a friendly and collaborative environment. Strategies to develop the team's mission, vision, values, and objectives. Shared objectives vs. personal motivation. Distinguishing purpose and tasks in the team. Encouraging participation. Creating team identity, creating high-performing teams.	6
	Total	12

Text Books

1. Stephen Covey, The Seven Habits of Highly Effective People, Free Press, 1989.
2. Ronald A. Heifetz, Leadership without Easy Answers, Belknap Press, 1994.
3. Michael E. Porter, Competitive Strategy, Free Press, 1980.

Reference Books:

1.John Kotter, Leading Change: Why Transformation Efforts Fail,
2.Ikujiro Nonaka, The Knowledge-Creating Company
3.Michael West, The Secrets of Successful Team Management, Chap. 2,"Self-Management,"pgs.32-61

Course : English For Research Paper Writing				Code : M_2962B		
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE1**	**IE2**	**ETE**	**Total**
1	**1**	**-**	**--**	**--**	**--**	**--**

Objectives:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Ensure the good quality of paper at very first-time submission

Outcomes:

After learning the course the students should be able to:

1. **Develop the ability to plan and prepare and research papers and reports**
2. **Write a research article, review article, thesis chapter and other related academic research text effectively**

Detailed Syllabus:

Unit	Description	Duration
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness, Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Writing the Introduction,Review of the Literature, Methods, Results, Discussion, Conclusions, TheFinal Check.	**6**
2	Key skills needed: Title, Abstract, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	**6**
	Total	**12**

Text Books:

1. Dey R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
3. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Course :	Disaster Management			Code : M_2962C		
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	IE-1	IE2	ETE	Total
1	1	-	--	--	--	--

Objectives:

1. To orient engineers about various natural and manmade disasters.
2. To teach the concept of Disaster management and measures to be taken at different stages of disaster management.
3. To provide insight about global, national and regional level scenario of disaster management.

Outcomes:

After learning the course the students should be able to:

1. Learn different disasters and measures to reduce the risk due to these disasters.
2. Learn institutional frame work for disaster management at national as well as global level.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction** – Hazard and Disaster. Concepts of Hazard, Vulnerability, Risks. Different Types of Disaster : A) Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc B) Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Causes, effects and practical examples for all disasters.	6
2.	**Natural disasters**- Earthquakes, Tsunami, Floods, Drought, Landslides, Cyclones and Volcanic eruptions. Their case studies. Coastal disasters. Coastal regulation Zone. **Disaster Prevention and Mitigation**. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters, Models in Disasters. **Disaster Management** : Role of Government, International and NGO Bodies. Role of IT in Disaster Preparedness Role of Engineers on Disaster Management.	6
	Total	12

Reference Books:

1. Pandey, M., 2014. Disaster Management, Wiley India Pvt. Ltd., 240p.
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd
3. Jagbir Singh, Disaster, Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
4. J.P. Singhal, Disaster Management, Laxmi Publications
5. C. K. Rajan, NavalePandharinath, Earth and Atmospheric Disaster Management : Nature and

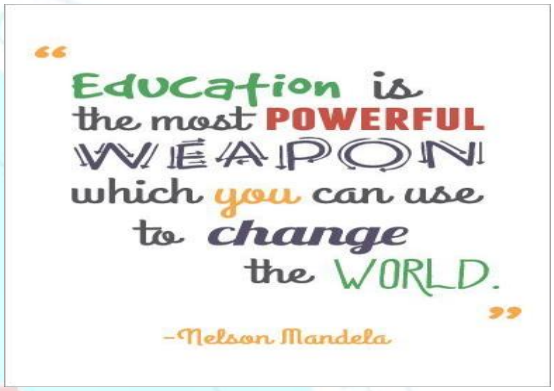
Manmade, B S Publication

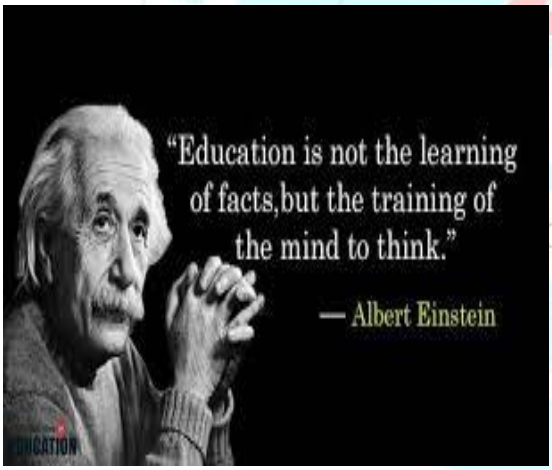
6. Shailesh Shukla, Shamna Hussain, Biodiversity, Environment and Disaster Management, Unique Publications

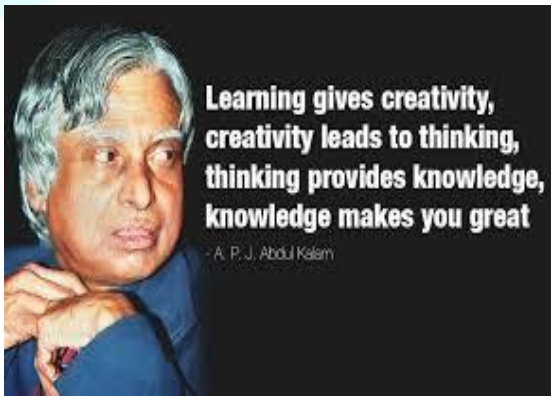
Text Books:

1. Disaster Administration and Management, Text & Case studies- SL Goel-Deep and Deep Publications
2. Disaster Management- G.K Ghosh-A.P.H. Publishing Corporation
3. Disaster management – S.K.Singh, S.C. Kundu, Shobha Singh A – 119, William Publications, New Delhi.
4. Disaster Management – Vinod K Sharma- IIPA, New Delhi,1995
5. Encyclopedia of Disaster Management- Goel S.L. - Deep and Deep Publications, New Delhi, 2006.


An investment in knowledge pays the best interest.
Benjamin Franklin
EVERYDAYPOWER


Education is the most POWERFUL WEAPON which you can use to change the WORLD.
-Nelson Mandela


"Education is not the learning of facts,but the training of the mind to think."
— Albert Einstein


Learning gives creativity, creativity leads to thinking, thinking provides knowledge, knowledge makes you great
- A. P. J. Abdul Kalam