MIT
Quest for Excellence

MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABAD

An Autonomous Institute Affiliated to
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad, Maharashtra (India)

Master of Computer Applications
2022-23

FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus Structure w.e.f. 2022-2023

Master of Computer Applications

FYMCA – Semester : I

Sr. No.	Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credits			
			Lecture	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	Practical	Total	Lecture	Tutorial	TA/Practical	Total
1	MCA101	Object Oriented Programming with Java	3	1	-	15	15	20	50	-	100	3	1	-	4
2	MCA102	Discrete Mathematics	3	-	-	15	15	20	50	-	100	3	-	-	3
3	MCA103	Relational Database Management System	3	1	-	15	15	20	50	-	100	3	1	-	4
4	MCA104	Data Structures	3	-	-	15	15	20	50	-	100	3	-	-	3
5	MCA105	Operating System	3	-	-	15	15	20	50	-	100	3	-	-	3
6	MCA121	Lab 1: Object Oriented Programming with Java	-	-	2	-	-	25	-	25	50	-	-	1	1
7	MCA122	Lab 2: Relational Database Management System	-	-	2	-	-	25	-	25	50	-	-	1	1
8	MCA123	Lab 3: Data Structures	-	-	2	-	-	25	-	-	25	-	-	1	1
9	MCA124	Lab 4: Soft Skills	-	-	2	-	-	25	-	-	25	-	-	1	1
10	MCA125	Lab 5: PHP & MySQL	-	-	2	-	-	25	-	25	50	-	-	1	1
11	NC01,NC02	Bridge Course*	Mandatory Non Credit Course												
		Total (Semester-I)	**15**	**2**	**10**	**75**	**75**	**225**	**250**	**75**	**700**	**15**	**2**	**5**	**22**

* one week lectures to be conducted for each Bridge course code.

Bridge Course NC01 : Computer Fundamentals
NC02 : Computer Programming

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FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus Structure w.e.f. 2022-2023

Master of Computer Applications

FYMCA – Semester : II

Sr. No.	Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credits			
			Lecture	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	Practical	Total	Lecture	Tutorial	TA/Practica	Total
1	MCA151	Advanced Java	3	1	-	15	15	20	50	-	100	3	1	-	4
2	MCA152	Numerical Methods and Statistical Techniques	3	-	-	15	15	20	50	-	100	3	-	-	3
3	MCA153	Software Engineering and Testing	3	-	-	15	15	20	50	-	100	3	-	-	3
4	MCA154	Computer Networks	3	1	-	15	15	20	50	-	100	3	1	-	4
5	MCA 181/182	Elective-I	3	-	-	15	15	20	50	-	100	3	-	-	3
6	MCA171	Lab 1: Advanced Java	-	-	2	-	-	25	-	25	50	-	-	1	1
7	MCA172	Lab 2: Software Engineering and Testing	-	-	2	-	-	25	-	25	50	-	-	1	1
8	MCA173	Lab 3: Computer Networks	-	-	2	-	-	25	-	-	25	-	-	1	1
9	MCA174	Lab 4: Python Programming	-	-	2	-	-	25	-	-	25	-	-	1	1
10	MCA175	Lab 5: ASP.Net	-	-	2	-	-	25	-	25	50	-	-	1	1
		Total (Semester-II)	**15**	**2**	**10**	**75**	**75**	**225**	**250**	**75**	**700**	**15**	**2**	**5**	**22**

Elective: I MCA181 : Data Warehousing and Data Mining
MCA182 : Digital Marketing

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Syllabus Structure w.e.f. 2022-2023

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SYMCA – Semester : I

Sr. No.	Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credits			
			Lecture	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	Practical	Total	Lecture	Tutorial	TA/Practical	Total
1	MCA201	Cloud Computing	3	1	-	15	15	20	50	-	100	3	1	-	4
2	MCA202	Design And Analysis of Algorithms	3	1	-	15	15	20	50	-	100	3	1	-	4
3	MCA202	Cyber Security	3	-	-	15	15	20	50	-	100	3	-	-	3
4	MCA204	Machine Learning	3	-	-	15	15	20	50	-	100	3	-	-	3
5	MCA 231/232	Elective-II	3	-	-	15	15	20	50	-	100	3	-	-	3
6	MCA221	Lab : Design And Analysis of Algorithms	-	-	2	-	-	25	-	25	50	-	-	1	1
7	MCA222	Lab 1: Cyber Security	-	-	2	-	-	25	-	25	50	-	-	1	1
8	MCA223	Lab 2: Machine Learning	-	-	2	-	-	25	-	-	25	-	-	1	1
9	MCA224	Lab 3: Competency Skills	-	-	2	-	-	25	-	-	25	-	-	1	1
10	MCA225	Lab 4: Mobile Application Development	-	-	2	-	-	25	-	25	50	-	-	1	1
11	NC03,NC04, NC05,NC06	MOOC Course*	Mandatory Non Credit Course												
		Total (Semester-III)	**15**	**2**	**10**	**75**	**75**	**225**	**250**	**75**	**700**	**15**	**2**	**5**	**22**

One of the MOOC Course out of given MOOC courses must be completed by student.

Elective: II

MCA231 : Block Chain Technology
MCA232 : Artificial Intelligence

MOOC Courses :

NC03 : Internet of Things
NC04 : Big Data
NC05 : Data Science
NC06 : ERP

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Master of Computer Applications

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Sr.No.	Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks					Credits			
			Lecture	Tutorial	Practical	MSE-I	MSE-II	TA	Practical	Total	Lecture	Tutorial	TA/Practical	Total
1	MCA271	Dissertation	-	-	30	-	-	100	150	250	-	-	15	15
2	MCA272	Seminar	-	-	2	-	-	50	-	50	-	-	1	1
		Total (Semester-IV)	**-**	**-**	**32**	**-**	**-**	**150**	**150**	**300**	**-**	**-**	**16**	**16**

Summary of Total Credits and Marks

Semester	Credits	Internal Assessment	External Assessment	Total Assessment Marks
FYMCA – Part : I	22	375	325	700
FYMCA – Part : II	22	375	325	700
SYMCA – Part : I	22	375	325	700
SYMCA – Part : II	16	150	150	300
Total :	82	1275	1125	2400

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1	MCA101	Object Oriented Programming with Java	3	1	-	15	15	20	50	-	100	3	1	-	4
2	MCA102	Discrete Mathematics	3	-	-	15	15	20	50	-	100	3	-	-	3
3	MCA103	Relational Database Management System	3	1	-	15	15	20	50	-	100	3	1	-	4
4	MCA104	Data Structures	3	-	-	15	15	20	50	-	100	3	-	-	3
5	MCA105	Operating System	3	-	-	15	15	20	50	-	100	3	-	-	3
6	MCA121	Lab 1: Object Oriented Programming with Java	-	-	2	-	-	25	-	25	50	-	-	1	1
7	MCA122	Lab 2: Relational Database Management System	-	-	2	-	-	25	-	25	50	-	-	1	1
8	MCA123	Lab 3: Data Structures	-	-	2	-	-	25	-	-	25	-	-	1	1
9	MCA124	Lab 4: Soft Skills	-	-	2	-	-	25	-	-	25	-	-	1	1
10	MCA125	Lab 5: PHP & MySQL	-	-	2	-	-	25	-	25	50	-	-	1	1
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2	MCA272	Seminar	-	-	2	-	-	50	-	50	-	-	1	1
		Total (Semester-IV)	**-**	**-**	**32**	**-**	**-**	**150**	**150**	**300**	**-**	**-**	**16**	**16**

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Syllabus – First Year M.C.A Part-I

Course Code: MCA101 Course: Object Oriented Programming with Java **Teaching Scheme:** Theory : 03 Hrs. /Week Tutorial : 01Hr/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite: Knowledge of Programming language (C/C++).

Course Objectives:

- To enable the students to understand the core principles of the Java language.
- To learn the Object-Oriented approach to programming.
- To use visual tools to produce well designed, effective applications using AWT and Swing

Unit-I	**Object Oriented Programming:** Procedural Vs. Object Oriented Programming, Characteristics of OOPs **Basics of Java:** Introduction, JDK, Byte Code and JVM, Java Buzzwords, Java Environment- Installing Java, Java Program Development, Command Line Argument, Accessing input through keyboard, Basic syntax of Java- Identifiers, Keywords & Data Types, Operators and Expressions, Type Conversion, Comments, Conditional statements, Looping and Branching, Array and String.	**(6 Hrs)**
Unit-II	**Classes in Java:** Class and Objects, Object as parameter, Returning Object, static block, static fields and methods, Overloading Methods, Constructor, this keyword. Wrapper Classes. **Packages:** Defining, Accessing, and using Packages, Interfaces. **Inheritance**: Inheritance basics, Types of Inheritance, using super, Java relationships (IS-A, HAS-A, USES-A), Method Overriding, Use of final keyword, Abstract methods and class	**(10 Hrs)**
Unit-III	**Multithreading:** Thread Life-Cycle, The Main thread, Creating a Thread, Thread Priorities, Synchronization **Exception handling**: Introduction, use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions. **I/O Package**: Introduction of stream, Stream classes-Byte Stream classes, Character Stream classes.	**(10 Hrs)**
Unit-IV	**GUI Programming:** **Applets:** An Overview of Applet, Applet Life Cycle, Applet tag, Using Applets in a Web Page, Passing parameters to Applet **Event Handling:** Event Handling process, The Delegation Model of Event Handling, Event Classes and Interfaces. **Abstract Window Toolkit (AWT) and Swing:** Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, adding a Menu to Window, Extending GUI Features Using Swing Components	**(10 Hrs)**

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Syllabus – First Year M.C.A Part-I

Course Code: MCA101 Course: Object Oriented Programming with Java **Teaching Scheme:** Theory : 03 Hrs. /Week Tutorial : 01Hr/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite: Knowledge of Programming language (C/C++).

Course Objectives:

- To enable the students to understand the core principles of the Java language.
- To learn the Object-Oriented approach to programming.
- To use visual tools to produce well designed, effective applications using AWT and Swing

Unit-I	**Object Oriented Programming:** Procedural Vs. Object Oriented Programming, Characteristics of OOPs **Basics of Java:** Introduction, JDK, Byte Code and JVM, Java Buzzwords, Java Environment- Installing Java, Java Program Development, Command Line Argument, Accessing input through keyboard, Basic syntax of Java- Identifiers, Keywords & Data Types, Operators and Expressions, Type Conversion, Comments, Conditional statements, Looping and Branching, Array and String.	**(6 Hrs)**
Unit-II	**Classes in Java:** Class and Objects, Object as parameter, Returning Object, static block, static fields and methods, Overloading Methods, Constructor, this keyword. Wrapper Classes. **Packages:** Defining, Accessing, and using Packages, Interfaces. **Inheritance**: Inheritance basics, Types of Inheritance, using super, Java relationships (IS-A, HAS-A, USES-A), Method Overriding, Use of final keyword, Abstract methods and class	**(10 Hrs)**
Unit-III	**Multithreading:** Thread Life-Cycle, The Main thread, Creating a Thread, Thread Priorities, Synchronization **Exception handling**: Introduction, use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions. **I/O Package**: Introduction of stream, Stream classes-Byte Stream classes, Character Stream classes.	**(10 Hrs)**
Unit-IV	**GUI Programming:** **Applets:** An Overview of Applet, Applet Life Cycle, Applet tag, Using Applets in a Web Page, Passing parameters to Applet **Event Handling:** Event Handling process, The Delegation Model of Event Handling, Event Classes and Interfaces. **Abstract Window Toolkit (AWT) and Swing:** Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, adding a Menu to Window, Extending GUI Features Using Swing Components	**(10 Hrs)**

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Text Books/Reference Books:

1. Java: The Complete Reference, Hebert Schildt, McGraw Hill
2. Let Us Java, Yashavant Kanetkar, BPB Publications
3. Core Java Vol I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

Digital Reference:

1. https://nptel.ac.in/courses/106/105/106105191/
2. www.spoken-tutorial.org (NMEICT IIT Bombay Java videos)
3. https://www.coursera.org/courses?query=core%20java

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Syllabus – First Year M.C.A Part-I

Course Code: MCA102 Course: Discrete Mathematics **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite: Fundamental of Mathematics

Course Objectives:

- To understand the basic properties and operations related to sets, logical reasoning and probability.
- To study concepts of relation and function.
- To illustrate the basic definitions of graph and trees also properties of graphs and trees.
- To demonstrate problems related to discrete numeric functions, generating functions and recursive functions.

Unit-I	**Sets , Propositions and Probability** Combination of sets, Finite & Infinite Sets, Mathematical Induction, Propositions, Logical Connectives, Well-Formed Formulas, Tautologies, and Logical Equivalences Probability: Discrete Probability, Conditional Probability	**(9 Hrs)**
Unit-II	**Relations and Function** Properties of Binary Relations, Closure of Relations, Equivalence Relations, Partitions, Partial Ordering Relations, Lattices, Chains and Anti-chains, A Job-Scheduling Problem, Functions, Pigeonhole Principles	**(8 Hrs)**
Unit-III	**Graphs and Trees** Basic Terminology, Multigraphs and Weighted Graph, Paths& Circuits, Shortest Path in Weighted Graph, Eulerian Path & Circuits, Hamiltonian Path & Circuits, Traveling Salesman Problem, Factors of a Graph, Planner Graph. Trees, Rooted trees, Path Length in Rooted Trees, Prefix Codes, Binary Search Tree, Spanning Tree & Cut-Sets, Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm	**(10 Hrs)**
Unit-IV	**Discrete Numeric Functions and Generating Functions** Manipulation of Numeric Functions, Asymptotic behavior, Generating functions and Combinatorial Problems, Recurrence Relations, Homogeneous solutions, Particular Solutions, Total Solutions	**(9 Hrs)**

Text Books/Reference Books:

1. Elements of Discrete Mathematics, C. Liu, D. Mohapatra,McGraw-Hill,4th Edition
2. Discrete Mathematical Structures with application to computer science, Tremblay Manohar, McGraw-Hill
3. Discrete Mathematical Structures, B Kolman, R.C. Busby, S. Ross,PHI,6th Edition
4. Discrete Mathematics and its Applications, Kenneth H. Rosen,McGraw-Hill,8th Edition

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Syllabus – First Year M.C.A Part-I

Course Code:MCA103 Course: Relational Database Management System **Teaching Scheme:** Theory:3Hrs/week Tutorial: 1 Hrs/week	Credits:3-1-0(4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 MarksTeacherAssessment:20Marks EndSemesterExamination:50Marks End Semester Examination(Duration):02 Hrs.

Prerequisite: Understanding of data structures and algorithms.

Course Objectives:

- To understand the relational model concepts by means of constraints violation, anomalies and normalization.
- To understand relational algebra and relational calculus.
- To understand database storage structures and access techniques: file and page organizations, indexing methods including B-tree, hashing, query evaluation and query optimization techniques.
- To gain the understanding of the concepts behind transactions and concurrency control
- To learn SQL

Unit-I	**Relational Models and Normalization** Overview of RDBMS, Relational Model concepts , Relational Database Schemas, Relational Algebra, Relational Calculus, Update Operation and Dealing with Constraint Violations, Anomalies in databases, 1NF, 2NF, 3NF and BCNF, 4NF and 5NF	**(9 Hrs)**
Unit-II	**Data Storage and Query Processing** Record storage and Primary file organization- Introduction to Secondary storage Devices, Different Secondary storage Devices, Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index, Index Structure for files –Different types of Indexes- B-Tree, B+ tree.	**(9 Hrs)**
Unit-III	**Transaction Processing** Introduction to Transaction, Transaction Properties(ACID), Introduction to schedule and types of schedules, serializability, serializability issues, Types of serializability and testing mechanisms, Locking mechanisms. Needs and uses of locking system, Concept of Deadlocks. How to resolve the deadlock, Lock protocols, concurrency control mechanism, Recovery management	**(9 Hrs)**
Unit-IV	**SQL Concepts:** Basics of SQL, DDL, DML, DCL, structure- creation, alteration, defining constraints- Primary Key, Foreign key, unique, not null, In operator, aggregate functions, Built in function- numeric, date, string functions, set operations, sub-queries, join, Exist, Any, all, View , Index, Triggers.	**(9 Hrs)**

Text Books/Reference Books:

1. 1. Fundamentals of Database Systems,Elmsari, Navathe,Pearson Education (2008),5 th Edition
2. Database System Concepts, Silberschatz, Korth, Sudarshan, McGraw-Hill, 4 th Edition
3. Database Systems, Concepts, Design and Applications, S.K.Singh, Pearson Education.
4. Database Management Systems Raghu Ramakrishnan, Johannes Gehrke,McGraw-Hill, 3 rd Edition
5. ORACLE 7 the complete reference, Ivan Bayross, BPB publications,3 rd Edition

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Syllabus – First Year M.C.A Part-I

Course Code: MCA104 Course: Data Structures **Teaching Scheme:** Theory : 03 Hrs /Week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite: Knowledge of c programming language and pointers in c.

Course Objectives:

- To Introduce Algorithm Analysis, Fundamental of Data Structure, Problem Solving paradigms
- To Study the representation, implementation and application of Data Structure
- To introduce algorithms strategies and time, space complexity analysis of the problems.

Unit-I	**Introduction**: Data Structures types, Importance of Data Structure, Abstract data Type. **Algorithms**: Complexity, Time space Trade-offs, **Arrays**: Operation Performed on array, Dynamic Memory Allocation **Stack**: LIFO structure, PUSH and POP operations, Polish Notation, **Queue**: FIFO structure, Circular Queue, Operations on Queues.	**(9 Hrs)**
Unit-II	**Introduction**: single linked list, Operations on a Single linked list, Advantages and disadvantages of single linked list, circular linked list, Double linked list	**(9 Hrs)**
Unit-III	**Tree**: General tree terminology, Tree traversal, Operation on Binary Tree **Heap**: Heap Sort **Graphs**: Graph Storage structure (Adjacency Matrix, Adjacency List) Operations on graphs **Traverse Graph** (Depth-First, Breadth-First), Minimum Spanning Tree, Kruskal's algorithm, Prim's algorithm.	**(9 Hrs)**
Unit-IV	**Sorting Techniques**: Basic concepts, Sorting by :Bubble, Insertion and selection. **Hash Function**: Address calculation techniques, Common hashing Functions, Collision resolution, Linear probing, quadratic probing	**(9 Hrs)**

Text Books/ Reference Books:

1. Ellis Horow it Sartaj Sahani,Susan Anderson Freed By Fundamentals of Data Structures in C Universities Press.
2. Lipschut Data structure MGH

Reference Books:

1. Tanenbaum Data and file structure PHI

Digital Reference:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm

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Syllabus – First Year M.C.A Part-I

Course Code: MCA105 Course: Operating System **Teaching Scheme:** Theory : 03 Hrs /Week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite: Basic concept of Operating System.

Course Objectives:

- To Provide an introduction to the internal operation of OS
- To study Process synchronization and deadlock.
- To study Memory Management and file system
- The course will cover Disk Management

Unit-I	**Introduction to Operating system** Definition of OS, History of OS, Types of OS, System Calls and its type, Multitasking, Multiprogramming. **Process & Thread** Process concept, PCB, Process States, Thread, TCB, difference between process and thread, Inter-Process communication, CPU scheduling.	**(6 Hrs)**
Unit-II	**Process Synchronization** Critical Section Problems &Semaphores, Classical Problems of process synchronization. **Deadlocks** Introduction of deadlock, Methods for handling deadlock, Deadlocks Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	**(10 Hrs)**
Unit-III	**Memory Management** Address Spaces and Address Translation, Swapping & memory allocation, Segmentation, Virtual Memory & Demand Paging, Paging, Page Replacement Algorithm, File Management. **File Systems** Files, directories, file system and Directories implementation, file system management and optimization, File Allocation Methods, MS-DOS file system, UNIX V7 file system.	**(10 Hrs)**
Unit-IV	**Disk Management** Disk Structure, Disk Scheduling Algorithm (FCFS, RAID, Network Operating System, Real time operating system, Distributed operating system.	**(10 Hrs)**

Text Books/Reference Books:

1. Operating System principle by Silberschatz, Galvin Gange(Seven edition)
2. Operating System by Dhamdhere (second edition)

Digital Reference:

1. https://nptel.iitm.ac.in/
2. http://en.wikipedia.org/wiki./Operating_system

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Syllabus – First Year M.C.A Part-I

Course Code: MCA121 Course: Lab 1: Object Oriented Programming with Java **Teaching Scheme:** Practical: 2 Hrs./week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Suggested List of Experiments:

1. Program to demonstrate basic constructs of Java:
   a. Looping statement b. Array c. String
2. Program to demonstrate:
   a. Constructor b. Object as parameter and returning object c. Command line arguments
3. Program to implement Wrapper classes and their methods
4. Program to implement:
   A .Inheritance b. Interfaces d. Packages
5. Program to implement:
   a. Exception Handling using try, catch b. User Defined Exceptions
6. Program to demonstrate:
   a. Creating thread using Thread class and Runnable interface b. Thread Priorities
7. Program to demonstrate the use of I/O streams.
8. Design registration form in AWT using Applet/application
9. Program to perform addition, subtraction, multiplication, division using Swing controls
10. Design a GUI interface using Swing and implement event handling.

Term Work :

The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral examination conducted based on the experiments performed.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva – voce based on the syllabus.

Digital References :

1. www.spoken-tutorial.org(NMEICT IIT Bombay Java videos)

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Course Code:MCA122 Course: Lab 2: Relational Database Management System **Teaching Scheme:** Practical:2Hrs/week	Credits:0-0-1 (1) TermWork:25Marks Practical/Oral: 25Marks Total ExaminationMarks:50Marks

Suggested List of Experiments:

1. Database creation, connectivity, user creation and schema authorization
2. Create minimum set of six tables using following constraints: a) Primary key b) Foreign key c) Not Null d) Check e) Unique f) On delete/update cascade g) Default .Use Alter, drop and truncate command on above created table.
3. Insert minimum ten records in each of the above created tables and comment on the Constraints specified. Use delete, update and select commands on created records.
4. Execute Grant and Revoke commands on created tables.
5. Execute SQL queries using Aggregate functions on above tables a) count b) sum c) min d) max e) avg . Use group by and having clause.
6. SQL Queries based on joins (on above created tables):a) Natural Join b) Left Outer Join c) Right Outer Join d) Full Outer Join
7. SQL Queries based on Nested Queries and Views
8. Indexing :
   a. Insert large number of records in the above created schema. Then record the time taken by the Query to insert the data.
   b. Find the Query plan for any two queries which have where clause.
   c. Now create index on un-indexed attribute.
9. Assignment based on concurrency control.
10. Assignment based on Triggers.

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva – voce based on the syllabus.

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Syllabus – First Year M.C.A Part-I

Course Code: MCA123 Course: Lab 3: Data Structures **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work : 25 Marks Total Examination Marks: 25 Marks

Suggested List of Experiments:

1Write a program to demonstrate insertion, deletion, search and displaying of an element in an array.

2. Write a program to demonstrate operations performed on stack.
3. Write a program to demonstrate operations on queue.
4. Write a program to demonstrate operations on singly link list.
5. Write a program to implement singly link list as a stack.
6. Write a program to demonstrate creation, traversing and searching in Binary Search Tree.
7. Program to convert infix expression to postfix and infix to postfix.
8. Write a program to traverse a graph using DFS with an adjacency matrix.
9. Write a program to traverse a graph using BFS with an adjacency matrix.
10. Write a program to demonstrate sorting algorithm.(using any one of these techniques: bubble, Insertion, selection)

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance based on assignment.
3. Oral/Viva examination based on the above syllabus.

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Course Code: MCA124 Course: Lab 4: Soft Skills **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work : 25 Marks Total Examination Marks: 25 Marks

Course Objectives:

- To encourage the all-round development of students by focusing on soft skills.
- To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
- To develop and nurture the soft skills of the students through individual and group activities.
- To expose students to the right attitudinal and behavioral aspects and to build the same through activities

Suggested List of Experiments:

1. Usage of grammatically correct language in verbal communication.
2. Self and peer introduction
3. Self-Evaluation and Self-Management techniques
4. Time Management Tools practice
5. Formation of Teams and identification of leadership qualities
6. Motivate/Inspire yourself and others
7. Personal grooming and corporate etiquette
8. Group Discussion and Interview Techniques
9. Presentation/Public Speaking Techniques
10. Professional written Communication (Job Application,Resume,Report Writing)

Term Work :

The term work shall consist of at least 10 experiments/ assignments based on the syllabus.
Assessment of term work should be done which will consider the points below and the marks should be awarded accordingly.

- Continuous lab assessment throughout the semester.
- Practical Performance throughout the semester.

Reference Books:

1. Covey, Stephen R., "Seven Habits of Highly Effective People: Powerful Lessons Personal Change
2. Mitra, Barun, "Personality Development and Soft Skills", Oxford University Press, 2016.
3. Ramesh, Gopalswamy, "The Ace of Soft Skills: Attitude, Communication and Etiquette for Success", Pearson Education, 2013.

Digital Reference:

1. http://psydilab.univer.kharkov.ua/resources/ucheba/softskills
2. https://www.indeed.com/career-advice/resumes-cover-letters/soft-skills
3. https://www.feedough.com/soft-skills-definition-importance-list-examples/
4. https://www.mindtools.com
5. BBC Learning English - BBC Learning English - Homepage

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Course Code: MCA125 Course: Lab 5: PHP & MySQL **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work : 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Couse Objectives :

- To understand server side programming language.
- To understand fundamental concept of developing dynamic web pages.
- To design and use database objects.
- To design and deploy dynamic web applications.

Suggested List of Experiments:

1. Program based on HTML tags (text formatting, images, font, hyperlink, list and tables)
2. Program based on CSS (Inline, Internal and External CSS) , css properties for position, text, font, borders, margin, padding, color, shadow, images.
3. Program based on HTML form elements using Bootstrap.
4. Program based on PHP variables, Decisions and loops.
5. Program based on different types of Arrays in PHP.
6. Program based on Form Validation through regular expression.(phone number and email validations)
7. Program based on Functions (Simple and Parameterized Functions, Function call by values and references, Optional parameter, Return statement, Recursion)
8. Demonstration on Database and table, relationships using MYSql.
9. Program based on Database connectivity though PHP and MYSql.
10. Program based on Insert, Select, Update and Delete operations on database tables.

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments and mini project submitted by the candidate and viva-voce based on the syllabus.

1. Allow minimum 1 or maximum 2 students per mini project group.
2. The report of mini project is to be submitted in typed form and with spiral binding.
3. The report should have all necessary diagrams, charts and printouts.

Text Books/Reference Books :

1. PHP: The Complete Reference – Steven Holzner, McGraw Hill Education Private Ltd. 2007.
2. Web Technologies HTML, CSS, Javascript, ASP.Net, Servlet, JSP, PHP, ADO.NET, JDBC and XML Black Book by Kogent Learning Solutions Inc.
3. PHP and MYSQL – Mike McGrath, McGraw Hill Eduction Private Ltd. 2012.
4. MYSQL: The complete reference- VikramVaswani, McGraw Hill Education Private Ltd. 2004.

Digital References :

1. www.w3schools.com 2. www.tutorialspoint.com 3. www.javatpoint.com

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Syllabus – First Year M.C.A Part-I

Bridge Course NC01 : Computer Fundamentals

Unit-I	**Computer System Characteristics And Capability:** Basic structure, ALU, memory, CPU, I/O devices. Development of computers. Classification of computers:(Micro, mini frame, super computer, pc, server, workstations)
Unit-II	**Data Representation With in Computer**: BIT, BYTE, WORD, ASCII, EBCDIC, BCD Code. Introduction to Number system: Binary, Octal, Decimal and Hexadecimal. Conversation from one number system to another number system. Introduction to Basic Gates. **Input Devices and Output Devices:** Keyboard, Direct Entry: Card readers, scanning devices (BAR CODE, OMR, MICR),Voice input devices, Light pen, Mouse, Touch Screen, Digitizer, scanner. CRT, LCD/TFT, Dot matrix printer, Inkjet printer, Drum plotter, Flatbed plotter
Unit-III	**Introductory concepts of DBMS :** Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA
Unit-IV	**Relational Model :** Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus **Entity-Relationship model :** Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema

Text Books:

1. V.Rajaraman, Computer Fundamentals, PHI Learning
2. "Fundamentals of Database Systems" by Elmsari, Navathe, 5th Edition, Pearson Education (2008).
3. "Database System Concepts" by Silberschatz, Korth, Sudarshan, 4th Edition, McGraw Hill Publication.

Reference Books:

1. Ashok Arora ,Fundamentals of Computer Systems.
2. "Database Systems, Concepts, Design and Applications" by S.K.Singh, Pearson Education.
3. "Database Management Systems" by Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Publication.

Digital Reference:

1. www.w3schools.com /sql
2. www.tutorialspoint.com /sql

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Syllabus – First Year M.C.A Part-I

Bridge Course NC02 : Computer Programming

Unit-I	**Problem Solving:** Algorithm and Flowchart **Programming basics:** Overview, Character set, Keywords and Identifiers, Constants and Variables, Data types, Operators and Expressions, Operator precedence and associativity, Type casting **C Programming basics:** Basic structure of C program, Formatted and Unformatted Input and Output **C++ Programming basics:** Output with cout, Input with cin, Cascading and Manipulators
Unit-II	**Control Structures:** Decision making statements– if statement, switch statement, Looping statements – while statement, do while statement, for statement, Nested loops, break and continue statement, goto statement **Arrays:** Introduction, Declaration and Initialization, Accessing Array elements, Memory, representation of Array, One dimensional Arrays, Two dimensional Arrays ,Character Arrays and Strings
Unit-III	**Functions:** Introduction, Standard Library Functions, User Defined Functions (UDF) – Declaration, Definition, Function call, Parameter Passing - by value and by reference, Recursion, Storage Classes **Structures and Pointers:** Defining Structure, Declaration, Initialization, Array of Structures, Pointers
Unit-IV	**Object Oriented Concepts using C++:** Features of Object Oriented Programming, Class and Objects, Object as function arguments, Returning an object from function, Friend function, Inline function, Function overloading, Default arguments

Text Books/Reference Books:

1. The Complete Reference C - HERBERT SCHILDT, Tata McGraw-Hill
2. Let us C, Yashvant Kanetkar, BPB Publication
3. Exploring C, Yashvant Kanetkar, BPB Publication
4. Object Oriented Programming in C++ - Robert Lafore, Galgotia

Digital Reference:

1. www.spoken-tutorial.org (NMEICT IIT Bombay C and CPP videos)
2. https://nptel.ac.in/courses/106105171

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Syllabus – First Year M.C.A Part-II

Course Code: MCA151 Course: Advanced Java **Teaching Scheme:** Theory : 03 Hrs. /Week Tutorial : 01Hr/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite: Knowledge of Programming in Core Java

Course Objectives:

- To understand the advance principles of Java programming language
- To learn J2EE Specifications to produce well designed, effective web applications using JSP and supportive technologies.

Unit-I	**RMI and JDBC:** Object Oriented Terminologies, Object Serialization Basics, Remote Method Invocations (RMI), Overview, RMI Architecture, Developing applications with RMI, JDBC IntroductionJavaDatabaseConnectivity,JDBCdrivertypes,JDBCArchitecture, JDBC Application steps, Types of statement, CRUD operation using JDBC. **Collections:** Collection framework, Collection interfaces and classes.	**(10 Hrs)**
Unit-II	**Servlets:** Web terminologies, Web Application Basics, Brief HTML review, Servlet Overview, Servlet Life Cycle, Handling GET and POST requests, Request Dispatcher interface, Session Management	**(08 Hrs)**
Unit-III	**Java Server Pages (JSP)**: Basics and Overview, JSP architecture, JSP tags and JSP expressions, Life cycle of a JSP, Model View Controller (MVC), JSP implicit Objects, JSP Directives: page, include, taglib, JSP Action tags, JSP Bean Tags: <jsp:useBean>, <jsp:getProperty>,<jsp:setProperty>, Working with Databases.	**(08 Hrs)**
Unit-IV	**JQuery:** Introduction,Validation using JQuery, JQuery forms, JQuery Examples. **Maven project and Web services:** Maven :What is Maven, ANT Vs Maven, Install Maven, Maven Repository, Local Repository, Central Repository, Remote Repository, Maven Pom.xml, Maven Example, Maven Web App, Maven Plugin Web services :WS Components, SOAP Web Service, RESTful Web Service, SOAP vs RESTSOA	**(10 Hrs)**

Text Books/Reference Books:

1. Core Java VolI and II, CayS Horstmann, Fary Cornell, Sun Microsystems Press
2. J2EE the Complete Reference, First Edition by Jim Keogh, 2002Tata McGraw Hill
3. Java Servlet Programming, Second Edition by Jason Hunter, William Crawford, O'Reilly
4. C. Xavier, Java Programming: A practical approach, McGraw Hill India Education2011.

Digital Reference:

1. https://www.edureka.co/blog/advanced-java-tutorial
2. Java2 Complete Reference by Herbert Schildt (Fourth Edition) (Ebook)

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(Faculty of Science & Technology) Syllabus – First Year M.C.A Part-II	
Course Code:MCA152 Course: Numerical Methods and Statistical Techniques **Teaching Scheme:** Theory:3Hrs/week	Credits:3-0-0(3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks TeacherAssessment:20Marks End Semester Examination:50Marks End Semester Examination(Duration):02Hrs

Prerequisite: Knowledge of basic mathematics and statistical terms.

Course Objectives:

1. Understand statistical and numerical methods, algorithms and techniques to solve mathematical problems.
2. Learn to develop numerical methods and estimate statistical errors using basic calculus concepts and results.
3. Understand the basic concepts and master the Statistical techniques in scientific computing.
4. Gain the concept and the need to analyze and predict its importance in different subjects throughout the course.

Unit-I	**Roots of Equation** Bisection method, Regula -Falsi method, Newton-Raphson method, Rate of convergence. **Linear Algebraic Equations** - Gauss Elimination methods, Gauss Jordan method, Gauss Seidel methods, LU decomposition technique	**(9 Hrs)**
Unit-II	**Interpolation :** Finite difference, Newton's forward and backward interpolation formulae, Central Difference formulae – Gauss forward and backward difference formulae, Newton's divided difference Formula, Lagrange's interpolation formula. **Numerical Integration :** Trapezoidal rule, Simpson's 1/3 and 3/8 rule,Waddle's rule **Ordinary Differential Equations:** Euler's Method, Midpoint method, RungeKutta Method	**(9 Hrs)**
Unit-III	**Measures of location:** Mean, Median, Mode, Percentiles, Quartiles; Measures of Variability: Range, Inter-quartile Range, Variance, Standard Deviation, Coefficient of Variation. **Probability Theory:** Probability concept, Types of probability – a-priori probability and empirical probability, objective and subjective probability. Calculations of probability – in case of simple events, mutually exclusive events, compound events. Bayes theorem. **Probability Distribution :**Random variable, Normal Distribution, Binomial theorem, Poisson Distribution, Exponential Distribution,	**(9 Hrs)**
Unit-IV	**Regression and Correlation Analysis:** Regression analysis and its assumptions, Simple linear regression model – scattered diagram method and least square method. Correlation Analysis, Coefficient of determination and coefficient of correlation, Methods of coefficient of correlation – Karl Pearson coefficient of correlation.	**(9 Hrs)**

Text Books/Reference Books:

1. R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition
2. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi

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3. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson , Education, Asia , 8th edition
4. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw- Hill, New Delhi.
5. Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
6. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.

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Syllabus – First Year M.C.A Part-II

Course Code: MCA153 Course: Software Engineering and Testing **Teaching Scheme:** Theory : 03 Hrs /Week Tutorial : 01 Hr/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Basic knowledge of software.

Course Objectives:

- Introduction to software development life cycle.
- To train student to create good test case is one that has a high probability of finding an as yet undisco vered error.
- To get familiar with Software Testing Tools.
- To understand the basics of software Engineering.

Unit-I	**Introduction:** Define Software, Software Characteristics, Software Applications, Software Myths, Need of Software, evolving role of software, Define Software Engineering, Software Engineering a Layer Process.**Software Process Model:** A Generic Process Model, Prescriptive Process Model, Specialized Process Model, Unified Process, Personal and Team Process Model.	**(9 Hrs)**
Unit-II	**Requirement Specifications:** SRS, SRS Structure and Contents of the SRS, Types of Requirements- Functional and Non-Functional Requirements, Requirement Definition.**Project Scheduling:** Basic Concepts and Principles, Work Breakdown Structure, Task Network/Activity Networks, Gantt chart, PERT Chart, CPM.**Analysis and Design:** Decision Tree, Decision Table, Structured English, Functional Decomposition Diagrams, Data Flow Diagram (Physical and Logical), Entity Relationship Diagram, Data Dictionary-Definitions, Components, UML Diagrams (Structural and Behavioral)	**(9 Hrs)**
Unit-III	**Levels of Testing:** Verification and Validation Model, Techniques of Verification: Peer Review, Walkthrough, Inspection. Types of testing, Unit testing, Integration testing, Function Testing System testing, Installation Testing, Usability Testing, Regression testing **Performance testing;** Load Testing, Stress Testing. Security testing, Volume testing ,**Acceptance testing:** Alpha testing, Beta testing, Gamma testing. Positive & negative testing. Static testing Vs Dynamic testing.**Black Box methods:** Random testing, Equivalence partitioning, Boundary-value analysis, Error guessing. **White Box methods:** Basis path testing, Statement coverage, Branch coverage, Decision coverage, Condition coverage. Advantages & disadvantages of Black box and White box testing.	**(9 Hrs)**
Unit-IV	**Risk Management:** Reactive versus Proactive Risk Strategies, Risk Identification, Assessing Overall Project Risk, Risk Projection, Developing a Risk Table, Assessing Risk, Risk Plan.	**(9 Hrs)**

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	Testing Strategy: type of project, type of software. Test Plans, Test Case, Test Data. Defect, Causes of defect, Defect analysis & prevention, Defect Reporting, Defect types, Defect Severity, Defect Tracking Workflow, Test reporting, Defect rates and schedules.	

Text Books/Reference Books:

1.Rex Black, "Software testing", Wrox Publications
2.Dr. K.V. K. K. Prasad, "Software testing tools", Dreamtech Publications
3.Boris Bezier, "Software testing techniques", Dreamtech Publications
4. Roger Pressman, "Software Engineering- a practitioner's approach", McGraw Hill

Digital Reference:

1.www.onestoptesting.com, **2.**www.wikipedia.org

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Syllabus – First Year M.C.A Part-II

Course Code: MCA154 Course: Computer Networks **Teaching Scheme:** Theory: 03 Hrs /Week Tutorial : 01Hrs/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Basic knowledge of computer architecture and Operating systems

Course Objectives:

- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- To introduce a set of advanced technologies in networking
- To learn advanced routing protocols and router architecture
- Understand security threats, and the security services and mechanisms to counter them Comprehend and apply relevant cryptographic techniques

Unit-I	**Introduction :** Components, Data Representation, Data Flow, Physical Structure, Categories of Network, OSI Model, TCP/IP Model. **Physical Layer**:Transmission Model (Serial and Parallel), Multiplexing, Transmission Media (Guided and Unguided) , Switching (Circuit Switching, Packet Switching)	**(6 Hrs)**
Unit-II	**Data Link Layer :** Types of Error, Block Coding, Liner Block coding, Cyclic coding, Checksum, Framing, Flow Control and Error control, Protocols, Connecting Devices. **Network Layer :** IPv4, IPv6, Addresses mapping, Routing : RIP, OSPF, EIGRP, BGP	**(10 Hrs)**
Unit-III	**Transport Layer :** Process to Process delivery, UDP, TCP, Flow control and Congestion control **Application Layer :** DNS, Electronic Mail : SMTP, MIME, POP3, IMAP, FTP	**(10 Hrs)**
Unit-IV	**Cryptography:** Symmetric and Asymmetric cryptography, DES, 3DES, AES, IDEA, RSA, Diffie-Hellman , Security Services, CIS, Digital Signature	**(10 Hrs)**

Text Books/Reference Books:

1. Data Communications and Networking ,Behrouz A. Forouzan , TMH,4th Ed.
2. Cryptography and Network Security ,AtulKahate , TMH, 2nd Ed.
3. Computer Networks , Andrew S. Tanenbaum, Pearson,5th Ed
4. Network Essential Notes , GSW MCSE Study Notes
5. Internetworking Technology Handbook , CISCO System
6. Computer Networks and Internets with Internet Applications , Douglas E. Comer
7. Cryptography and Network Security , William Stalling

Digital Reference:

1. https://www.youtube.com/playlist?list=PLWPirh4EWFpHJrW1D9UB24wsbM3zx7QMx
2. https://www.youtube.com/playlist?list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up

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Syllabus – First Year M.C.A Part-II

Course Code: MCA181 Course: Elective-I : Data Warehousing and Data Mining **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite: Knowledge of RDBMS and OLTP

Course Objectives:

- To understand the fundamentals of Data Warehousing, architecture and Data Mining
- To understand methods for data pre-processing and develop problem-solving, and decision-making skills.
- To learn basic data mining algorithms, methods, and tools.
- To understand the real time applications of mining.

Unit-I	**Introduction to Data Warehousing and Components** Introduction to Decision Support System: DSS Defined, DSS Characteristics, Need for data warehousing, Operational & informational data, Data Warehouse definition and characteristics, Operational Data Stores. Architectural components, Data Preprocessing: Need of Preprocessing Data, Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization.	**(9Hrs)**
Unit-II	**OLAP in the Data Warehouse** A Multidimensional Data Model, Schemas for Multidimensional Databases: Stars, Snowflakes, Star join and Fact Constellations Measures, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model, Need for OLAP, OLAP tools , Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web	**(9Hrs)**
Unit-III	**Data Mining Algorithms Concept Description** Concept Description, Data Generalization and Summarization-Based Characterization, Mining Descriptive Statistical Measures in Large Databases. Mining Association Rules: Association Rule Mining, Market Basket Analysis, The Apriori Algorithm, Mining Multilevel Association Rules, Constraint-Based Association Mining, Sequential mining.	**(9Hrs)**
Unit-IV	**Classification and Prediction** Classification and Prediction Data Classification Process, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification. **Cluster Analysis** Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Clustering Methods.	**(9 Hrs)**

Text Books/Reference Books:

1. Data Warehousing Fundamentals, Paul Punnian , John Wiley Pub, 2nd Edition
2. Data Mining Concepts and Techniques, Han Kamber,Morgan Kaufmann,4th Edition
3. Data Warehousing, Data Mining and OLAP, Alex Berson, S.J. Smith, McGraw-Hill
4. Data Mining: Introductory and Advanced Topics, Margaret Dunham, Morgan Kaufmann
5. Data Mining: Methods and Techniques, A B M Shaukat Ali, Saleh A Wasimi, Cengage Learning

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Syllabus – First Year M.C.A Part-II

Course Code:MCA182 Course: Elective-I : Digital Marketing **Teaching Scheme:** Theory: 03 Hrs /Week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Students must have knowledge of Marketing.

Course Objectives:

- To understand basics of digital marketing.
- To understand Social media marketing.
- To understand advertising strategies using googleAdWords.

Unit-I	**Digital Marketing Introduction:** What is Digital Marketing? Why Digital Marketing? Digital Marketing platforms? Digital Marketing Strategy, Types of Digital Marketing – Organic & Paid, Digital Marketing VS Traditional Marketing. How is it different from traditional marketing? ROI between Digital and traditional marketing?	**(6 Hrs)**
Unit-II	**Search Engine Optimization (SEO)** What is SEO?How do search engines work? SEO Tools Web position Analysis, Competition Analysis, Google Algorithms and Updates	**(10 Hrs)**
Unit-III	Social Media Optimization (SMO) **Facebook** - Profile Creations, Creating groups and pages, Tips and Guides, Posts And promotions, Events Creations, Video Marketing, Promotional Techniques, Integration Techniques. **Twitter** -Set-up and usage Tips, Promoted Tweets, Video Marketing, Promotional Techniques, Integration Techniques, Analytics. **LinkedIn**-Profile Creations, Company Page Creations, Tips and Guides, Linkedin posts Linkedin promotions Linkedin Groups, Video Marketing, Promotional Techniques, Integration Techniques,**Instagram** -Integration Techniques, Promotional Techniques.	**(10 Hrs)**
Unit-IV	**Introduction to SEM** Google Adwords, Search Advertising, Display Advertising, Mobile Advertising, Video Advertising, Shopping Advertising, Report generation, Google Adwords Express, Setup, Google Mapping Ads	**(10 Hrs)**

Text Books/Reference Books:

1. Digital Marketing For Dummies by Ryan Deiss& Russ Henneberry
2. Social Media Marketing All-in-one Dummies by Jan immerman, Deborah Ng
3. Social Media Marketing by Tracy L. Tuten, Michael R. Solomon
4. The Art of Digital Marketing by Ian Dodson
5. Digital Marketing by Seema Gupta

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Syllabus – First Year M.C.A Part-II

Course Code: MCA171 Course: Lab 1: Advanced Java **Teaching Scheme:** Practical: 2 Hrs./week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Suggested List of Experiments:

1. Program to create a client – server application in Java to demonstrate Remote Method Invocation.
2. Program to demonstrate Serialization and Deserialization
3. Program to demonstrate Collection framework (Make use of any collection class or interface)
4. Program to insert, delete, update and fetch records from database using JDBC (CRUD operations)
5. Program to create registration login form using servlet.
6. Program to create login form using servlet and Session as state management technique.
7. Program to create dynamic web page using Model View Controller (MVC)
8. Program to demonstrate JQuery
9. Program to demonstrate RESTfulWebServices GET and POST method.
10. Program to demonstrate using Maven dependencies.

Term Work :

The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral examination conducted based on the experiments performed.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva – voce based on the syllabus.

Digital References :

1. www.spoken-tutorial.org (NMEICT IIT Bombay Java videos)

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Course Code: MCA172 Course: Lab 2: Software Engineering and Testing **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Suggested List of Experiments:

1. Write down the problem statement for a suggested system of relevance and do requirement analysis and clevelop Software Requirement Specification Sheet (SRS) for suggested system.
2. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
3. To perform the user's view analysis (Use case diagram) and the structural view diagram for the suggested system (Class diagram, object diagram).
4. To draw the behavioral view diagram: State-chart diagram, Activity diagram
5. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram
6. Create a Test Plan and Test Cases For E-mail Registration and Login Form.
7. Selenium Installation
8. Practical based on XPath to find elements on web site in Selenium.
9. Practical based on window handles using Selenium.
10. Practical based on take screenshot in Selenium.

Sample Projects:

1. Passport automation System 2. Book Bank 3. Online Exam Registration
4. Stock Maintenance System 5. Online course reservation system 6. E-ticketing
7. Software Personnel Management System 8. Credit Card Processing 9. E-book management System.
10. Recruitment system

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva – voce based on the syllabus

Text Books/Reference Books :

1. Rex Black, "Software testing", Wrox Publications
2. Dr. K.V. K. K. Prasad, "Software testing tools", Dreamtech Publications
3. Boris Bezier, "Software testing techniques", Dreamtech Publications
4. Roger Pressman, "Software Engineering- a practitioner's approach", McGraw Hill

Digital References :

1. www.w3schools.com

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Syllabus – First Year M.C.A Part-II

Course Code: MCA173 Course: Lab 3: Computer Networks **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Total Examination Marks: 25 Marks

Suggested List of Experiments:

1. Basic Network commands like: ipconfig, hostname, ping, tracert, netstat
2. Windows 2003 server installation and basic configuration
3. DHCP server configuration
4. DNS &FTP server configuration
5. Basic Routing configuration
6. Default and Static Configuration
7. Configure RIPVer1 andVer2
8. Configure OSPF
9. Configure EIGRP
10. Access list / NAT technology

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

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Course Code: MCA174 Course: Lab 4: Python Programming **Teaching Scheme:** Practical: 2 Hrs./week	Credits: 0-0-1 (1) Term Work: 25 Marks Total Examination Marks: 25 Marks

Course Objectives:

- To understand basic concepts of python.
- To acquire the object oriented skills in python.
- To understand how to deal with strings, files and database using python
- To learn implementation of python projects.

Suggestive List of Programs:

1. Python Installation with Python basics (data types, operators, etc.)
2. Working with different conditional and looping statements in python.
3. Working with various string operations.
4. Implementing built-in data structures list, sets, tuples and dictionary
5. Implementing OOPS concept with Python (Class, Object, Inheritance, Polymorphism, Abstraction, and Encapsulation).
6. Create own module/import external module in program.
7. Using File Handling in Python.
8. Working with Database using Python.
9. Programs related to python libraries like Numpy, Pandas, Scipy etc.
10. Mini Project.

Term work Assessment:

The assessment of term work shall be done based on the following:

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Text Books/ Reference Books:

1. The Complete Reference Python – Hebert Schildt, McGraw Hill
2. Python Crash Course ,Eric Matthes (No Starch Press, 2016)

Digital References :

1. www.spoken-tutorial.org(NMEICT IIT Bombay Python videos)
2. https://docs.python.org/3/tutorial/

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Course Code: MCA175 Course: Lab 5: ASP.Net **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Couse Objectives:

- To implement OOPS concepts
- Designing dynamic pages using server controls
- Use server-side validation controls
- To connect to the database using ADO.NET technology
- To implement State management techniques
- To develop project using ASP.NET and SQL Server

Suggested List of Experiments:

1. Write and demonstrate basic C# programs to implement OOP concepts using console- based applications.
2. Design and demonstrate a Login form using CSS, DIV and server-side controls
3. Design and demonstrate a web application using Master pages and themes.
4. Demonstrate Ajax controls, Ad Rotator control for Image rotation and Validation controls for validating webpage
5. Demonstrate client and server-side state management for maintaining the state of user
6. Create a database, tables and stored procedures using SQL Server
7. Demonstrate to display records in Grid View control using ADO.NET
8. Demonstration to Perform CRUD operations using ASP.NET and ADO.NET controls (Insert and Read operations)
9. Demonstration to Perform CRUD operations using ASP.NET and ADO.NET controls (Update and Delete operations)
10. Demonstration to Create dynamic web application using MVC design pattern and use crystal report for displaying database records

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments and mini project submitted by the candidate and viva-voce based on the syllabus.

1. Allow minimum 1 or maximum 2 students per mini project group.
2. The report of mini project is to be submitted in typed form and with spiral binding.
3. The report should have all necessary diagrams, charts and printouts.

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Text Books/Reference Books :

1. Beginning Visual C# 2012 Programming, Karli Watson, Jacob Vibe Hammer, Jon D. Reid, Morgan Skinner, Daniel Kemper, Christian Nagel, ISBN: 978-1-118-31441- 8 December 2012
2. Professional C# 2012 and .NET 4.5 , Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan S kinner , ISBN: 978-1-118-31442-5 November 2012
3. Professional ASP.NET MVC 5 , Jon Galloway, Brad Wilson, K. Scott Allen, David Matson ISBN: 978- 1-118-79475-3

Digital References:

1. www.w3schools.com 2. www.tutorialspoint.com 3. www.lynda.com

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Syllabus – Second Year M.C.A Part-I

Course Code: MCA201 Course: Cloud Computing **Teaching Scheme:** Theory : 03 Hrs /Week Tutorial : 01 Hrs/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Intermediate knowledge of operating systems.

Course Objectives:

- To introduce cloud computing technology through its various aspects.
- To understand virtualization technology and its functionality in cloud computing.
- To get familiar with Mobile Cloud Computing Concept.
- To aware of different service and privacy aspects of cloud computing.
- To study various service differences between variety of Cloud Computing Service Providers.

Unit-I	**Introduction:** Definitions, Components, Characteristics / Properties / Features, Cloud Computing Vs On-Premise System, Types of Cloud, Evolutions of Cloud Computing, CC Opportunities and Challenges, Advantages and Disadvantages of Cloud Comp, Cloud Computing Architecture, Computing Services	**(10 Hrs)**
Unit-II	**Virtualization:** Introduction, Types of Virtualization, I/O Virtualization, Storage Virtualization, Network Virtualization, Memory Virtualization, Virtualization and Cloud Computing	**(10 Hrs)**
Unit-III	**AWS Cloud:** AWS Cloud History, AWS Cloud Use Cases, AWS Global Infrastructure, AWS Regions, AWS Availability Zones, AWS Console.**IAM:** Permissions, Polices, IAM Roles for services, Security tools, MFA.**AWS EC2 Section:**EC2 Basics, EC2 Instance Types Basics, SSH Overview, EC2 Instance Connect, EC2 Instance Role, Shared Responsibility mode for EC2.	**(10 Hrs)**
Unit-IV	**Mobile Cloud:** Mobile Computing, Architecture, Need, Characteristics, Advantages and Disadvantages, Mobile cloud Applications, Issues or CSF for Mobile Cloud Computing	**(6 Hrs)**

Text Books/Reference Books:

1. Cloud Computing, Implementation, Management, and Security, Jhon W. Rittinghouse, James F. Ransome
2. Cloud Computing A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeterm
3. Enterprise Cloud Computing, Technology, Architecture, Applications, Gautam Shroff
4. Cloud Computing Bible. Barrie Sosinsky
5. Mastering Cloud Computing, Rajkumar Buyya, Chritian Vecchiola, S Thamarai

Digital Reference:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://nptel.ac.in/courses/106/105/106105223/
3. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-cs65/

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Syllabus – Second Year M.C.A Part-I

Course Code: MCA202 Course: Design And Analysis of Algorithms **Teaching Scheme:** Theory: 03 Hrs /Week Tutorial : 01Hrs/Week	Credits: 3-1-0 (4) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Basic concept of Data Structure.

Course Objectives:

- To study different methods to devise an algorithm
- To use computational complexity to analyze algorithms

Unit-I	**Introduction:** Introduction and a brief review of Elementary Data Structures, Definition of an Algorithm, Algorithm specification, Performance analysis: -Space and time complexity, Asymptotic Notation, Performance Measurement, hashing.	**(6 Hrs)**
Unit-II	**Divide and Conquer:** General method of Divide and Conquer, Binary search, finding the maximum and minimum, merge sort, quick sort, Strassen's Matrix Multiplication.	**(10Hrs)**
Unit-III	**The Greedy Method:** General method, Knapsack Problem, Tree vertex splitting, Job sequencing with deadlines, Minimum cost spanning trees, optimal storage on tape, optimal merge Patterns, Single sources shortest paths. Basic Search and Traversal Techniques - Techniques for graphs-BFS and DFS, connected components and spanning trees - prims and kruskal Algorithms, Biconnected Components and DFS.	**(10Hrs)**
Unit-IV	**Dynamic Programming, Backtracking and Branch and Bound Technique:** The general method of Dynamic Programming-Matrix chain multiplication, Longest common subsequence, String editing, The general method of backtracking, The 8- queens problem, sum of subsets, Graph coloring, Hamiltonian cycle, Knapsack problem using backtracking, The method of branch and bound, 0/1 knapsack problem, Traveling sales person problem using branch and bound.	**(10 Hrs)**

Text Books/Reference Books:

1. The Design and Analysis of Computer Algorithms, Aho, Hopcroft,Ulman, Addison Wesley
2.Fundamentals of Computer Algorithms, E. Horowitz and S. Sahni, GalgotiaPub
3.Design and Analysis of Algorithm, Sachin Dev Goya

Digital Reference:

1.https://nptel.ac.in/courses/106/106/106106131/
2.http://openclassroom.stanford.edu/MainFolder/CoursePage.php

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Syllabus – Second Year M.C.A Part-I

Course Code: MCA203 Course: Cyber Security **Teaching Scheme:** Theory : 03 Hrs /Week	Credits: 3-0-0 (3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite: Basic knowledge of cryptography.

Course Objectives:

- Understand the basic concept of cyber security
- Study the process of implementing cyber security
- Understand the software, hardware and network related security issues and its solutions.
- Become familiar with web service security technologies.

Unit-I	**Introduction:** Cyber Security Myths, Information Security versus Cyber security, Business Continuity and Risk Management. Steps for setting up Cyber Security in organization. Principles of Security, Symmetric and Asymmetric Key Encryption, Hash, Message Authentication Code, Vulnerabilities, Types of attack, Digital Signature, Digital Certificate, Public key Infrastructure.	**(9 Hrs)**
Unit-II	**Vulnerabilities:** Denial of Service (DOS), Distributed DOS (DDOS), Session Hijacking and spoofing, Pharming attack, Wireless LAN vulnerabilities. Phishing, Buffer overflow, format string attacks, Cross site Scripting (XSS), SQL injection **Malwares:** Virus and worm features, Internet scanning worms, Topological worms, web worms, Mobile malware, Botnet.	**(9 Hrs)**
Unit-III	**Software Security:** Access Control in operating system: Discretionary Access Control, Mandatory Access Control, Role Based Access Control **Firewall:** Firewall Functionality and Access Control List, Firewall Type, Placement of Firewall. **Intrusion Prevention and Detection:** Prevention versus detection, Types of Intrusion detection system, DDOS attack prevention/Detection, Malware detection.	**(9 Hrs)**
Unit-IV	**Hardware Security:** RFIDs and E-Passport: RFID Basics, Applications, Addressing RFID Privacy Issues, Electronic Passport. **Electronic Payment:** Introduction, Enabling Technologies, Cardholder Present E- Transaction, Payment Over the Internet, Mobile Payment, Electronic Cash. **Web Services Security:** Entities involved, Technologies for web services- XML, SOAP, WSDL and UDDI, WS-Security, SAML, WS-Trust.	**(9 Hrs)**

Text Books/Reference Books:

1. Bernard Menezes, Network Security and Cryptography, Cengage Learning India Pvt Ltd, 2011
2. DejanKosutic, 9 Steps to Cyber Security the Manager's Information Security Strategy Manual, EPPS Services Ltd, Zagreb, 2012
3. William Stallings, Cryptography and Network Security: principles and practice, Prentice Hall, 2010.
4. AtulKahate, Cryptography and Network Security, Second Edition, Tata McGraw Hill,2008

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Syllabus – Second Year M.C.A Part-I

Course Code: MCA204 Course: Machine Learning **Teaching Scheme:** Theory: 3 Hrs/week	Credits: **3-0-0 (3)** Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite: Knowledge of statistics, Linear algebra and basic knowledge of programming concepts

Course Objectives:

- To understand different machine learning algorithms like classification, regression, clustering, and dimensional reduction.
- To apply various algorithms and models according to data

Unit-I	**Introduction to Machine Learning:** What is machine learning, What is Artificial Intelligence, Relationship between machine learning and Artificial Intelligence, Machine learning techniques, applications **Descriptive Statistics :** Data exploration (histograms, bar chart, box plot, line graph, scatter plot), qualitative and quantitative data, measures of central tendency, measures of dispersions, measure of positions, other measures : quartile, percentile and inter quartile range **Statistical analysis :** population and sample, statistical analysis process, data distribution, dispersion standard deviation, variance, Gaussian Distribution and Descriptive Stats, Correlation Between Variables, Statistical Hypothesis Tests, Estimation Statistics.	**(9Hrs)**
Unit-II	**Data wrangling and preprocessing:** data acquisition, data exploration techniques, data preprocessing data wrangling techniques, data transformation techniques **Learning techniques:** supervised, unsupervised and reinforcement Learning	**(9Hrs)**
Unit-III	**Linear Regression :** Regression basics: Relationship between attributes using Covariance and Correlation**Multiple Linear Regression :** Relationship between multiple variables: Regression (Linear, Multivariate) in prediction Residual analysis, Identifying significant features, feature reduction, Hypothesis testing of Regression Model, Confidence intervals of Slope, R-square and goodness of fit.	**(9Hrs)**
Unit-IV	**Classification :** Naïve Bayes Classifier, decision tree, **K-Nearest Neighbors :**K-nearest neighbor algorithm, things to consider while designing K-nearest neighbor algorithm.**Support Vector Machines :** Linear learning machines and kernel space, kernels and working feature space.**Ensembles methods :** Bagging & boosting and its impact on bias and variance, Random forest, Gradient Boosting Machines and XGBoost	**(9 Hrs)**

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Text Books/Reference Books:

1. Introduction to Machine Learning with Python,Andreas C., Muller and Sarah Guido,O'Reilly Media
2. Think Stats: Exploratory Data Analysis, Allen B. Downey, O'Reilly Media, 2nd Edition
3. The Elements of Statistical Learning: Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer,2nd Edition
4. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer
5. Python machine learning, Sebastian Raschka and vahidMirjalili,Packt 2nd Edition
6. Machine Learning, Tom M. Mitchell, McGraw-Hill

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Syllabus – Second Year M.C.A Part-I

Course Code:MCA231 Course: Elective – II : Block Chain Technology **Teaching Scheme:** Theory:3Hrs/week	Credits:3-0-0(3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 MarksTeacherAssessment:20Marks End Semester Examination:50Marks End Semester Examination(Duration):02 Hrs.

Prerequisite: knowledge of Information technologies, Information security, and computer science.

Course Objectives:

- Understand how blockchain systems (mainly Bitcoin) work
- Familiarize with the functional/operational aspects of cryptocurrency .
- Understand concepts of Bitcoin and their usage
- Know when and why you may want to use Blockchain within your environment

Unit-I	**Introduction** Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs. Private Blockchain, Understanding Cryptocurrency to Blockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain. Basic Crypto Primitives: Hash functions, Properties of a hash function, Hash pointer and Merkle tree, Public key cryptography, Digital signatures, Zero-knowledge systems	**(9 Hrs)**
Unit-II	**Bitcoin and Blockchain** Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashcashPoW, BitcoinPoW, Attacks on PoW and the monopoly problem, Proof of Stake,Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.	**(9 Hrs)**
Unit-III	**Permissioned Blockchain** Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned blockchain-Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.	**(9 Hrs)**
Unit-IV	**Blockchain Application Development** Enterprise application of Blockchain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Blockchain, Blockchain enabled Trade, We Trade –Trade Finance Network, Supply Chain Financing, Identity on Blockchain.	**(9 Hrs)**

Text Books/Reference Books:

1. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015.
2. Josh Thompsons, "Blockchain: The Blockchain for Beginners-Guide to Blockchain Technology and Leveraging Blockchain

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Programming"
3. Daniel Drescher, "Blockchain Basics", Apress; 1st Edition, 2017.
4. AnshulKaushik, "Blockchain and Crypto Currencies", Khanna Publishing House, Delhi.
5. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt
Publishing.

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Syllabus – Second Year M.C.A Part-I

Course Code:MCA232 Course: Elective – II : Artificial Intelligence **Teaching Scheme:** Theory:3Hrs/week	Credits:3-0-0(3) Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 MarksTeacherAssessment:20Marks End Semester Examination:50Marks End Semester Examination(Duration): 02 Hrs.

Prerequisite: Strong knowledge of Mathematics. Good command over programming languages. Good Analytical Skills. Ability to understand complex algorithms. Basic knowledge of Statistics and modeling.

Course Objectives:

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, and other machine learning models.
- Explore the current scope, potential, limitations, and implications of intelligent systems.

Unit-I	**Introduction to AI** Introduction to AI, Importance of AI, AI and its related field, Concept of AI, history, current status, scope, agents, environments, Problem Formulations, AI techniques, Criteria for success. Problems, problem space and search: Defining the problem as a state space search : Generate and test, hill climbing, best first search technique	**(9Hrs)**
Unit-II	**Knowledge Representation** Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation. Using Predicate Logic: Represent ting Simple Facts in logic, Representing instances and is-a relationship, Computable function and predicate	**(9Hrs)**
Unit-III	**Natural language processing** Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing. Learning: Introduction learning, Rote learning, Learning by taking advice, Learning in problem solving, Learning from example-induction, Explanation based learning.	**(9Hrs)**
Unit-IV	**Probabilistic Reasoning** Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov mode	**(9 Hrs)**

Text Books/Reference Books:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Prentice, 3rd Edition
2. Artificial Intelligence, Elaine Rich and Kevin Knight, McGraw Hill, 2nd Edition
3. A Classical Approach to Artificial Intelligence, Trivedi, M.C., Khanna Publishing House, 2nd Edition
4. Artificial Intelligence, SarojKaushik, Cengage Learning

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Syllabus – Second Year M.C.A Part-I

Course Code: MCA221 Course: Lab 1: Design And Analysis of Algorithms **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Suggested List of Experiments:

1. Implement the hashing techniques using linear probing.
2. Implement the hashing technique using quadratic probing.
3. Implement binary search recursive and iterative using divide and conquer (D&C).
4. Implement min-max algorithm using simple and recursive divide and conquer method.
5. Implement quick sort algorithm using divide and conquer method.
6. Implement merging and merge sort algorithm.
7. Implement knaps sack using greedy method.
8. Implement job sequencing using greedy approach.
9. Implement string editing.
10. Assignment based on 10 theory questions.

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance based on assignment.
3. Oral/Viva examination based on the above syllabus.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

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Course Code: MCA222 Course: Lab 2: Cyber Security **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Suggested List of Experiments:

1. Networking and Communication Commands
2. Symmetric and Asymmetric Encryption using Open SSL command line tool
3. Hash and Digital Signature using Open SSL command line tool, PKI using Open SSLCommand Line Tool
4. Access Control in Operating System(Linux)
5. Study Manual for Wire Shark and perform the following using Wire shark
   - Identify the first 2 packets (i.e. their packet numbers) containing HTTP GET request.
   - What webpage was visited in the above 2 packets?
   - What version of HTTP was used?
   - What is the destination IP address in the above packets?
   - List the source and destination ports of the packets travelling from the client to the server in the above packets?
   - In the HTTP server's response, look at the information sent about the server. What server software was used?
   - What are the IP addresses of the server?
   - What are the MAC addresses of the client and server?
   - How many Web Pages (not websites) have been opened?
   - What is the time difference between first HTTP GET and the first HTTP response (OK)?
   - Count the total number of HTTP GET requests.
   - What is the time difference between the first and last HTTP GET requests? Hint: Follow a similar procedure as mentioned previously.
   - How may packets were exchanged between the server (corresponding to the both IP ad- dresses) and the client? (Note: Their sum must be equal to the total no. of packets)
   - Find the total no. of HTTP requests sent by the host spongebob.wikia.com.
6. SQL Injection
7. Cross Site Scripting
8. Buffer Overflow Vulnerability and its remedies
9. Network Based IDS Tool OSSEC
10. Software Firewalls (IPTABLES)
11. Case Study on any three Cyber Security Tools

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

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Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

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Course Code: MCA223 Course: Lab 3: Machine Learning **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Total Examination Marks: 25 Marks

Suggested List of Experiments:

1. Case study on Business understanding and data understanding
2. Program to implement data preprocessing and data wrangling.
3. Program to implement linear regression and Multiple linear regressions.
4. Program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
7. Program to implement the SVM for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8. Program to implement the SVM for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
9. Program to implement the Random forest for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
10. Program to implement the XGBoost for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

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Course Code: MCA224 Course: Lab 4: Competency Skills **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Total Examination Marks: 25 Marks

Prerequisites: Basic Mathematics

Course Objectives:

On successful completion of the course the students will be able to:

- Understand the basic concepts of Logical reasoning skills
- Understand the basic concepts of Arithmetic aptitude Skills
- Make Data Interpretation
- Understand the basic concepts of Verbal ability Skills

Suggested List of Experiments:

A. Based on Logical reasoning
1. Statements and assumptions, statement and conclusion
2. Statement and argument and theme detection
3. Making judgments and logical deduction

B. Based on Arithmetic aptitude
4. Time and work
5. Time and distance
6. Profit and loss
7. H.C.F. and L.C.M

C. Based on Data Interpretation
8. Table charts Bar charts and Pie charts

D. Verbal ability
9. Spotting errors
10. Ordering of words

Reference Book :

1. Quantitative Aptitude - R. S. Agarwal, S.Chand.

Web Links :

1. https://www.indiabix.com/
2. https://www.freeonlinetest.in/

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Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance based on assignment.
3. Oral/Viva examination based on the above syllabus.

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Course Code: MCA225 Course: Lab 5: Mobile Application Development **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 (1) Term Work: 25 Marks Practical Exam : 25 Marks Total Examination Marks: 50 Marks

Course Objectives :

- To create basic Android applications using open-source platform
- To enhance ability of students for developing Android apps and publish onto the physical devices like tablets, Smartphone's etc..

Suggested List of Experiments:

1. Setup environment and demonstrate Hello world application with different sizes and color on same activity/page.
2. Create application to display college information minimum on 4 activities with switching between activities using intents
3. Create application for making splash screen where your collage logo displayed and after 5sec it goes to home activity of your collage information.
4. Create application using Web View where animated slider (HTML) displayed.
5. Create application to display List of courses using ListView and GridView using its adapter.
6. Create application using form control widgets with validation control.
7. Create application to connect database and retrieve login credentials and maintain keep sign in option using Shared Preferences.
8. Make CRUD application using database for student information.
9. Create application to read media files (Images) from internal storage and display it on screen.
10. Create application to read Rest API JSON string using JSON parsing and update and delete data in same way.

Term Work :

Term work shall consist of minimum 10 Programs/Assignments to be developed based on the above suggestive list of experiments. The assessment of term work shall be based on the following criteria.

1. Continuous assessment.
2. Performance of experiment/program demonstration in Lab.
3. Oral/Viva examination based on the above list of experiments.

Practical Examination :

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments and mini project submitted by the candidate and viva-voce based on the syllabus.

1. Allow minimum 1 or maximum 2 students per mini project group.
2. The report of mini project is to be submitted in typed form and with spiral binding.
3. The report should have all necessary diagrams, charts and printouts.

Digital References :

1. https://www.tutorialspoint.com

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Syllabus – Second Year M.C.A Part-I

Course :NC03 : Internet of Things/ NC04 : Big Data / NC05 : Data Science / NC06 : ERP

Course Name : MOOC Course

Guidelines :

This course aims to create an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available.

MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills. MOOCs are courses delivered online and accessible to all for free. MOOCs typically comprise video lessons, readings, assessments, and discussion forums.

Massive because enrollments are unlimited and can run into hundreds of thousands.
Open because anyone can enroll — that is, there is no admission process.
Online because they are delivered via the internet.
Course because their goal is to teach a specific subject.

MOOCs course provider like, SWYAM, NPTEL, Spoken Tutorial ICT MHRD, EDX, Coursera, Udemy, Udacity or similar ones can help students in acquiring knowledge and also advancement in career.

About Course and Grade
Non Credit course is compulsory. Students have to enroll themselves for any one of the mentioned courses given in scheme of syllabus. No grade points are associated with non-credit courses and are not accounted in the calculation of the performance indices SGPA & CGPA.

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Course Code: MCA271 Course: Lab : Dissertation **Teaching Scheme:** Practical: 30 Hrs	Credits: 0-0-15 (15) Term Work: 100 Marks Practical Exam : 150 Marks Total Examination Marks: 250 Marks

Course Objectives:

- To understand methodologies and professional way of documentation.
- To get industrial exposure for real time projects.
- To demonstrate a systematic understanding of project.
- To understand established techniques of project report development.

Guidelines for Students:

- The candidate should complete the project work individually.
- The project can be done within the institute or it can be sponsored and performed in an industry.
- The student should present their work to internal guide though offline/online mode every week.
-

Guidelines for Project Assessment:

- The faculty(Internal Guide) to student ratio for the dissertation work must be 1:5.
- The final examination will consist of the demonstration of work which will be assessed by two Examiners (one internal and one external).
- Evaluation of dissertation and oral examination will be jointly given by internal and external examiner.

General Instruction Regarding Preparation of Project Report: Typing:

- The typing shall be standard 12ptsin double spaced using black ink only.
- Margins must be Left 2 inches Right 1.5 inches Top 1.5 inches Bottom1.5inches
- PaperA4 size Bond Paper.(Both side printing)

Copies:

Two hard-bound copies (Black Rexine with Golden Embossing as per format displayedherewith) One original and one clean Xerox Copy.

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad

College Logo

A PROJECTREPORT ON

<Project Title>

<Company Name>

Submitted By

<Student Full Name>

Under the Guidance of

<Internal Guide Name>

<Department Name>

Master of Computer Applications

<College Name>

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The **suggestive format** of the report contents are as follows:

Sr. No.		Contents	PageNumber
1.		**INTRODUCTION**	
	1.1	Company profile	
	1.2	Existing System and Need for System	
	1.3	Scope of Work	
	1.4	Operating Environment at Server Side– Hardware and Software	
	1.5	Operating Environment at Client Side – Hardware and Software	
	1.6	Detailed Description of Technology Used	
2.		**PROPOSED SYSTEM**	
	2.1	Proposed System	
	2.2	Objectives of System	
	2.3	User Requirements	
3		**ANALYSIS&DESIGN**	
	3.1	Data Flow Diagram (DFD)	
	3.2	Entity Relationship Diagram (ERD)	
	3.3	UML Diagrams(Use Case, Activity, Sequence, Class Diagrams)	
	3.4	Table Design	
	3.5	Menu Tree Diagram (Site Map in case of Web Application)	
	3.5	Menu Screens	
	3.6	Test Procedures and Implementation-With a Test Case	
4.		**USER MANUAL**	
	4.1	User Manual	
	4.2	Operations Manual /Menu Explanation	
	4.3	Forms and Report Specifications	
5		**Drawbacks and Limitations**	
6		**Proposed Enhancements**	

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7		**Conclusion**	
8		**Bibliography**	
9		**ANNEXURES**	
	9.1	Input Forms With Data	
	9.2	Output Reports with data(If applicable)	
	9.3	Sample Code	

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Syllabus – Second Year M.C.A Part-II

Course CodeMCA272 Course: Lab : Seminar **Teaching Scheme:** Practical: 2 Hrs	Credits: 0-0-1 (1) Term Work: 50 Marks Total Examination Marks: 50 Marks

Guidelines for Seminar

1. Seminar is to be independently delivered by each candidate.
2. The topic selected should be associated with current trends in Computer field.
3. A report is to be submitted before the presentation.
4. Presentation must be done using power point presentation.
5. Theseminar presentation and the report is to be evaluated by internal examiner of the Department.

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Syllabus – Second Year M.C.A Part-II

rse CodeMCA272 rse: Lab : Seminar **ching Scheme:** itical: 2 Hrs	Credits: 0-0-1 (1) Term Work: 50 Marks Total Examination Marks: 50 Marks

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Presentation must be done using power point presentation.

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Master Copy

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