School of Mathematical & Computer Sciences

Department of Computer Sciences

Course Scheme & Syllabus

For

Master of Computer Applications
(MCA)

For the year

2020-2022.

BABA GHULAM SHAH BADSHAH UNIVERSITY, RAJOURI,

J&K-185234

Website: www.bgsbu.ac.in

PROGRAMME OUTCOME (PO)

PO-1: To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms.

PO-2: To prepare graduates who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise.

PO-3: To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.

PO-4: To prepare graduates who will thrive to pursue life-long learning to fulfil their goals.

PROGRAMME SPECIFIC OUTCOMES (PSO) of MCA

MCA programme has been designed to prepare graduates for attaining the following program specific outcomes:

PSO-1: An ability to apply knowledge of mathematics, computer science and management in practice.

PSO-2: An ability to identify, critically analyze, formulate and develop computer applications for the betterment of society.

PSO-3: An ability to select modern computing tools and techniques and use them with dexterity so as to devise a optimum solution to a problem.

PSO-4: An ability to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.

PSO-5: An ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PSO-6: An ability to understand the impact of system solutions in a contemporary, global and societal context for sustainable development.

PSO-7: An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.

PSO-8: Develop ability to use research, experiment, contemporary issues to solve industrial problems.

PSO-9: An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

COURSE SCHEME & SYLLABUS FOR MCA

FOR THE YEAR

2020, 2021, 2022

SEMESTER-I

Course Code	Course Title (Core Courses)	Credits	Scheme of Examination			
			Duration	Marks		
			Hours	IA	UE	Total
MCA-151	Discrete Mathematics	4	3	40	60	100
MCA-152	Computer Organization & Architecture	4	3	40	60	100
MCA-153	Operating Systems	4	3	40	60	100
MCA-154	Software Engineering	4	3	40	60	100
MCA-155	Data & File Structures	4	3	40	60	100
MCA-181	Lab 1: C Programming	4	3	50	50	100
MCA-182	Lab 2: Data & File Structures	4	3	50	50	100
Total Marks				**300**	**400**	**700**

Non Credit Course

MCA-156	Mathematical Foundation *	-	-	50	-	50

IA – Internal Assessment
UE – University Examination

Note: * *The student is supposed to gain the minimum required percentage of attendance in this non- credit course and it is mandatory to pass the same. The evaluation of this course is Internal and the marks obtained by the student shall not be added to the first semester aggregate.*

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-151	Discrete Mathematics	3	40	60	100	5	0	0	4

Objective:
The objective of the course is to introduce fundamentals of discrete mathematics to students for application in Computer Science & Engineering. Through examples and exercises, it will raise the student's general mathematical sophistication, i.e. the ability to deal with and create complex structures and convincing arguments.

Unit-I
Logic and Propositional Calculus: Proposition, Basic Logical Operations, Tautologies and Contradictions, Algebra of Proposition, Logical Implications and Equivalence, Propositional Functions, Quantifiers, Normal Forms, Rules of Inference.

Unit-II
Sets and Functions: The concept of set, union, intersection and symmetric difference of sets, compliment of a set, Cartesian product of sets , countable and uncountable sets The concept of a function, one-to-one and onto functions, invertible function, Constant function, Identity function, Polynomial function ,Rational function, Modulus function, floor and ceiling function.

Unit-III
Matrices and determinants: The concept of a Matrix, Sum, difference and product of matrices, transpose of a matrix, elementary row / column operations on matrices, determinant of a matrix of order up to 3, inverse of a matrix of order up to 3, symmetric and skew symmetric matrices , Matrix method to solve a system of n(=2 or 3) linear equations in n(=2 or 3) variables, Boolean matrix.

Unit-IV
Graph Theory-I: Introduction, Graphs, Pseudographs, Subgraphs, Connected Graphs, Disconnected Graphs, Euler Graphs, Operations on Graphs, Hamiltonian Paths and Circuits, Applications of Graph theory: Konigsberg bridge problem, the Traveling Salesman Problem.

Unit-V

Graph theory-II: Trees, Spanning Trees, Fundamental Circuit, Planer Graphs, Kurtowski's Two graphs, Euler's Formula, Matrix Representation of Graphs: Incidence matrix and adjacency matrix, Coloring of Graphs.

Course Outcomes :

After completing this course a student should be:

CO1: Able to explain the concept of proposition, logical connectives and their various properties.
CO2: Able to explain the concept of sets and its types and also know the concept of functions and various types.
CO3: Able to explain the concept of matrix, its types and various operations.
CO4: Able to explain the concept of graph, its types Hamiltonian paths and circuits and some application of graphs.
CO5: Able to explain the concept of trees, Kurtowski's two graphs, coloring of graphs.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Seymour, L (2001)**, "Discrete Mathematics", 2nd Ed**. Tata McGraw Hill, New Delhi.**
2. **Tremblay, J. P & Manhor, R (2004)**, "Discrete Mathematical Structure with Application to Computer Science", 21st edition. **Tata McGraw Hill. New Delhi.**

References:

1. **Deo**, **N (2005)** ,"Graph Theory with applications to Engineering and Computer Science", **PHI.**
2. **Liu**,**C. L (2004)**,"Elements of Discrete Mathematics", 2ndEd. **TMH, New Delhi.**
3. **Rosen**,**K. H (2004)**, "Discrete Mathematics & its Applications", 5th Ed**. Tata McGraw Hill.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-152	Computer Organization & Architecture	3	40	60	100	5	0	0	4

Objective

The course is designed to get the students acquainted with digital electronics and basic number crunching concepts of digital machines. Students might be able to understand the Boolean algebra and circuit theory such counter, register etc and to perform the analysis and design of various digital electronic circuits.

Unit-I

Number Systems: Binary, Octal, Decimal, Hexadecimal, Number Based Conversions, Binary Arithmetic, 1's and 2's compliment of binary numbers.
Logic Gates: NOT, OR, AND, Exclusive-OR, X-NOR, Universal Gates (NAND, NOR).
Boolean Algebra: Logic Simplification, Laws and rules of Boolean Algebra, De-Morgan's Theorems, Sum of Product and Product of Sum form ,Standard SOP and POS forms.
Karnaugh Map and Tabular Simplification: Karnaugh Map, Plotting a Karnaugh Map, Representing standard SOP and POS on K-Map, Simplification of SOP expressions, Don't care Condition, Simplification of POS expressions

Unit-II

Combinational Circuits: Half Adder, Full Adder, Basic Binary Decoder,4 bit Decoder, BCD to Decimal Decoder, Decimal to BCD Encoder.
Sequential Circuits: Introduction, Latches: SR Latch, D Latch, Flip Flops: RS Flip flop, T Flip flop, D Flip flop, JK Flip flop. Conversion of SR Flip-Flop To JK Flip-Flop, Application of Flip- Flops.

Unit III

Counters: Introduction, Counter applications.
Asynchronous Counters: 2-bit Asynchronous Binary Counter, 3-bit Asynchronous Binary Counter, Asynchronous Decade Counter
Synchronous Counters: 2-bit Synchronous Binary Counter, 3-bit Synchronous Binary Counter, 4-bit Synchronous Decade Counter.
Registers: Introduction, Basic Shift Register functions, Serial IN/ Serial OUT Registers, Parallel IN/ Serial OUT Registers, Parallel IN/ Serial OUT Shift Registers. Parallel IN/ Parallel OUT Shift Registers.

Unit IV

Basic architecture of computer: Functional units, Operational concepts, Bus structures, Von Neumann Concept.

Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Addressing modes

Design of ALU: Binary Arithmetic: Addition, Subtraction, Multiplication, Division of signed numbers, Floating point number representation

Unit V

Input-Output Interface: Device Driver, Device Controller and I/O bus.

Address Specifications: Isolated versus Memory-Mapped I/O.

Data Transfer: Synchronous and Asynchronous (Strobe Control, Handshaking).

Modes of transfer: Programmed I/O, Interrupt-Driven I/O, and Direct Memory Access (DMA).

COURSE OUTCOMES:

CO1: Students will be able to understand Number Systems, Computer arithmetic, basics of Logic gates and Boolean algebra.

CO2: Students will be familiarized with the combinational circuits, get to know about the basic building block of memory and the working of different types of Flip Flops

CO3: Students will get to understand the Counters (Synchronous and Asynchronous) and registers

CO4: Students will be able to explain architecture of computer and the working of ALU.

CO5: Students will be able to explain the input-output interface and issues related with data transfer between I/O device and memory..

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Floyd and Jain (2006)**, "Digital Fundamentals", First impression, **Pearson Education.**
2. **M. Mano**, Computer System Architecture, 3rd Ed., **PHI.**

References:

1. **Kumar A.Anand**, **"**Fundamentals of Digital circuits", **PHI.**
2. **Tocci J. Ronald**, "Digital Systems Principles & Applications", **Pearson Education.**
3. **M. Morris Mano**, "Digital Logic & Computer Design", **PHI.**
4. **M. Morris Mano**, "Digital Design", 3rd Edition, **PHI.**
5. **Hamacher**, Computer Organization, 5th Edition,
6. **W. Stallings,** Computer Organization and Architecture, 7th Edition.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-153	Operating Systems	3	40	60	100	5	0	0	4

Objective:

The course aims at introducing students to the fundamental concepts of operating systems. The emphasis is on making students familiar with the principles and processes of operating systems, in context of process management, input/output, memory management and file systems.

Unit-I

Operating System: Introduction, Evolution (Serial processing, Batch Processing, Multiprogramming), Types of OS (Multi-Programming, Time-Sharing, Distributed, and Real-Time Systems), Operating System Structure (Monolithic, Layered, Kernel, Virtual Machine, Client Server Model).

Unit-II

Process Management: Process Concept, Process states, Implementation of process, PCB, Threads, CPU Scheduling, Types of Schedulers, Scheduling Criteria, Scheduling Algorithms(FCFS, SJF, Priority Based, Round Robin, Multilevel Queue).

Unit-III

Inter-process Communication & Synchronization: Race condition, Critical Section Problem, Mutual Exclusion, Synchronization Hardware, Peterson's Solution, Producer -Consumer Problem, Semaphores.

Deadlocks: Model, Prevention, Avoidance, Detection and Recovery.

Unit-IV

Memory Management-I: Basic Hardware, Address binding, Concept of Logical and Physical Addresses, Dynamic loading, Swapping, Single Process Monitor, Multiprogramming with Fixed Partition and Dynamic Partition, Paging (Basic method, Hardware support (TLB)), Segmentation (Basic method, Hardware support).

Unit-V

Memory Management-II: Virtual Memory and its Advantages, Demand Paging (Basic concept), Page Replacement algorithms (FIFO, Optimal Page Replacement, Least Recently Used).

Disk management: Concept of Files and Directories, Disk allocation methods (Contiguous, Non-contiguous, Indexed), Disk Scheduling Methods (FCFS, Shortest seek Time first, Scan Scheduling).

COURSE OUTCOMES:

CO1: Student will be able to Understand the concepts of Evolution, types and structure of Operating System.
CO2: Student will understand the concepts of Process management in Operating System.
CO3: Student will be able to understand Inter-process Communication & Synchronization& Deadlocks in Operating System.
CO4: Student will be able to understand the memory management concepts like Multiprogramming, Paging, TLB, and Segmentation.
CO5: Student will be able to understand the memory management concepts like Virtual Memory Demand Paging, Page Replacement algorithms and Disk management concepts

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Siberscatz A & Galvin, P (2004)**, "Operating System Concepts", **Willey Pub.**

References:

1. **Milankovic**. **M (2004)**, "Operating System Concepts & Designs", **TMH.**
2. **Tanenbaum, A. S (2000)**, "Modern Operating System", **PHI.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-154	Software Engineering	3	40	60	100	5	0	0	4

Objective:

The objective of the course is to teach techniques for effective designing a software product and provide a professionally guided education in software engineering that prepares graduates to transition into a broad range of career options: industry, government, computing graduate program, and professional education. Students might be able to understand the tools and terminology, flow of work and various techniques such as analysis, designing, coding, coding and maintenance with optimum solution.

Unit I

Introduction to Software Engineering: Introduction, Evolving role of software, Concept of software, Changing nature of software, Software Myths, Software Importance, Characteristics, Software Components, Software crises, Software Engineering Challenges (Scale, Quality Productivity, Consistency and Repeatability, Change), Software standard, Software Engineering approach.

Unit II

Software Process Management: Characteristics of Software Process, Introduction to Software Process Models: Waterfall model, Prototyping model, Iterative model, Spiral Model; Planning: Cost Estimation, Uncertainties in Cost Estimation, COCOMO Model for Cost Estimation; Project Scheduling: Average Duration Estimation, Project Scheduling and milestones; Introduction to Staffing.

Unit III

System Analysis: Introduction to Software Requirement Analysis and Specification, Software Requirements: Need for SRS, Requirement Process, Problem Analysis: Analysis Issues, Informal Approach, Structured Analysis (Data Flow Modeling), Object Oriented Modeling, Prototyping, Requirement Specification (Characteristics, Components), Metrics (Size & Quality).

Unit IV

Software Design-I: Function Oriented Design: Design Principles (Problem Partitioning and Hierarchy, Abstraction, Modularity, Top-Down and Bottom-Up Approaches), Module level Concepts (Coupling and Cohesion), Design Notations & Specifications (Structured Charts, Specification), Structured Design Methodology.

Unit V

Software Design-II: Object Oriented Design: OO Analysis and OO Design, Concepts of OOAD: Encapsulation, Abstraction, Inheritance and Polymorphism. Design Concepts. Design

Notations & Specifications, Design Methodology: Dynamic Modeling, Functional Modeling, Defining Internal Classes and Operations.

Introduction to Software Testing: Testing Fundamentals: Error, Fault and Failure, Test Cases and Criteria, Psychology of Testing. Test Strategies for Conventional Software testing (Unit Testing, Integration Testing), Verification and Validation, Validation Testing(Validation Test Criteria, Configuration Review), System Testing, Debugging Process, Debugging Strategies, Testing Techniques(Black Box, White Box Testing).

COURSE OUTCOMES:

CO1: This unit explains basic concepts of Software Engineering. The student shall be acquainted with the various software engineering terminologies.

CO2: The student shall be able to know various software process models and the scenarios during which these models suit the best. The student would also be able to perform Software Project Cost Estimation, Project Scheduling and Project Staffing.

CO3: The goal of this unit is to acquaint the student to design and develop Software Requirement Specification Document and various techniques of Problem analysis.

CO4: The Students will be able to know various concepts of Function oriented approach of System Design along with Module level concepts and notations and charts that are used for developing a function oriented design.

CO5: This unit enables the student to develop Object Oriented Software Design and notations and charts that are used for developing the same. This unit also introduces various Software Test Techniques that are used for testing the software at various levels.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Pressman, R S (2006), "**Software Engineering – A Practitioner's Approach", Sixth edition, **TMH.**
2. **Jalote, P(2005),** "An Integrated Approach to Software Engineering", 3Rd Edition, **Narosa Publication.**

References:

1. **SCHAUM'S Outlines(2005),** "Software Engineering", **TMH**.
2. **Sommmerville(2000)**, "Software Engineering", **Addison Wesley**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-155	Data & File Structures.	3	40	60	100	5	1	0	4

Objective:

The objective of the course is to introduce the fundamental concepts of Data structures so as to implement, evaluate and analyze the same. The papers also acquaint the students to design and develop the programs for a problem and apply the various data structures like Stacks, Queue, Trees, Graphs, etc.

Unit-I

Introduction to Data Structure: Concept, Basic Terminology, Elementary Data Structures, Abstract Data Type, Arrays& its representation, Operations on Arrays, Sparse Arrays, Pointers, Linked List (Singly, Double & Circular), Operations on Linked List (Traversing, Insertion, Deletion etc.), Introduction to Garbage Collection.

Unit-II

Stacks and Queues: Basic Concept, implementation, Applications: Recursion (Fibonacci Series, Factorial & Tower of Hanoi problem), Polish Expressions and their Compilations (Infix, Prefix, Postfix), Queues and their implementation, De-Queues, Priority Queues.

Unit III

Trees: Concept, Binary Trees, Tree Traversal Techniques (Preorder, Post order, In order), Complete Binary Trees, Binary Search Tree & Operations on Binary Search Tree (Searching, Insertion & Deletion), Height Balance and Concept of AVL Trees and purpose of B-Trees.

Unit IV

Graphs: Concept, Directed Graphs, Graph Representation (Adjacency Matrix and Linked Representation), Dijkstra's shortest Path Algorithm, Graph Traversal Techniques (Breadth First Search & Depth First Search).

Searching and Sorting: Linear & Binary Search, Merge Sort, Heap Sort, Quick sort.

Unit-V

Files: Basic terminology Attributes of a File, Classification of Files.

File Organizations: Sequential File Organization, Relative File Organization, Indexed Sequential File Organization (Primary, Clustering and Secondary).

Hashing: Basic concept, Hash Table, Hash Function.

Course Outcomes :

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

CO1. Understand the concept of Data Structure, Abstract Data Type, Arrays& its representation, Operations on Arrays, Sparse Arrays, Pointers, Linked List (Singly, Double & Circular), Operations on Linked List (Traversing, Insertion, Deletion etc.).

CO2 Understand the concept and applications of Stacks and Queues and their implementation.

CO3. Understand the concept and applications of Trees, traversal techniques and various operations and their implementation.

CO4. Understand the concept and applications of Graphs, their representation, traversal techniques and various searching and sorting techniques.

CO5. Understand different types of Files and their implementation.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Baluja G. S**., "Data Structures Through C++", **Dhanpat Rai & Co.**
2. **Seymour Lipschutz**(SCHAUM'S ouTlines), "DATA STRUCTURES", **Tata McGraw Hill.**

References:

1. **R. Kruse,** "Data Structures & Program Design in C", **Pearson Education.**
2. **Dr. PrabhakarGupta,VineetAgarwal, Manish Varshney, "** Data Structure Using 'C', **FIREWALL MEDIA.**
3. **Tanenbaum**, "Data Structures Using "'C" & "C++"", **PHI Publication.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-181	Lab 1: C Programming	3	50	50	100	0	0	6	4

Objective:

The objective of the course is to develop logical ability and basic programming skills in students. Students might be able to apply the syntax of c programming in Turbo C compiler and might be able to write the program applications in C so that they can easily switch over to any other language in future.

Unit-I

Problem Solving: Problem Solving Techniques (Trial & Error, Brain Storming, Divide & Conquer), Flowcharts and Algorithms, Simple Examples of Flowcharts and Algorithms (Real Life Examples).

Unit-II

Introduction to C- Language: Structure & Life Cycle of a C- Program Data types and sizes, Variables, Constants, Keywords, Storage Classes, Operators (Unary, Arithmetic, logical, Bitwise, Assignment, Ternary), Expressions, Control statements (if-else, switch, break, continue, go to), Loops (for, while, do-while).

Unit-III

Arrays, Functions & Sorting: Arrays (Linear and Multi-dimensional); String handling; Functions (built-in and user defined), declaration, definition, and function call, parameter passing and return types, Recursion, Sorting: Bubble Sort, Insertion Sort and Selection Sort.

Unit-IV

Structures and Union: Declaration, Accessing structure and union elements, difference, Array of structures, Nested structures, passing Arrays and Structures to functions; Pointers, Array of pointers, Call by Value and Call by Reference.

Unit-V

File Handling: File Access Modes, Text vs. Binary Files, File I/O Operations, and Error Handling in Files, Formatted Input/output, and Random Access to Files, Reading & Writing File Records with Sorting, Searching and Merging Operations, Command Line Arguments.

Text Books:

1. **Balagurusamy**. **E** , , "Programming in ANSI C,Eight Edition", **TMH, New Delhi**.
2. **Kanetkar Y**,"Let Us C, 16th Edition ", **BPB, New Delhi .**

References:

1. **Mulish**, **C**,"The Spirit of C", **Jaico Publications, New Delhi**.
2. **Keringhan, B. W & Ritche, D.M**, "C Programming language", **PHI New Delhi.**
3. **Schildt,H** , "A Complete Reference in C", **TMH**, **New Delhi**.
4. **Shrivastav**,"C in Depth", **BPB, New Delhi**.

COURSE OUTCOMES:

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

CO1: Design algorithms for the given problem specifications.

CO2: Write C programs for the designed algorithm specification.

CO3: Write C programs to implement Arrays (Linear & Multi-dimensional), Strings, Functions, Pointers, Recursive Functions.

CO4: Write C programs to implement using Functions, User defined data types like Structures and Union, Pointers, Array of pointers, Call by Value and Call by Reference.

CO5 Write C programs for File Management

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-182	Lab 2: Data and File Structures	3	50	50	100	0	0	6	4

Objective:

The objective of the course is to introduce the fundamental concepts of Data structures so as to implement, evaluate and analyze the same. The papers also acquaint the students to design and develop the programs for a problem and apply the various data structures like Stacks, Queue, Trees, Graphs, etc.

Unit-I

Introduction to Data Structure: Arrays & its representation, Operations on Arrays, Sparse Arrays, Pointers, Linked List (Singly, Double & Circular), Operations on Linked List (Traversing, Insertion, Deletion etc.), Introduction to Garbage Collection.

Unit-II

Stacks and Queues: Implementation, Applications: Recursion (Fibonacci Series, Factorial & Tower of Hanoi problem), Polish Expressions and their Compilations (Infix, Prefix, Postfix), Queues and their implementation, De-Queues, Priority Queues.

Unit III

Trees: Binary Trees, Tree Traversal Techniques (Preorder, Post order, In order), Complete Binary Trees, Binary Search Tree & Operations on Binary Search Tree (Searching, Insertion & Deletion), Height Balance and Concept of AVL Trees and purpose of B-Trees.

Unit IV

Graphs: Directed Graphs, Graph Representation (Adjacency Matrix and Linked Representation), Dijkstra's shortest Path Algorithm, Graph Traversal Techniques (Breadth First Search & Depth First Search).

Unit-V

Searching and Sorting: Linear & Binary Search, Merge Sort, Heap Sort, Quick sort.
Hashing:Hash Table, Hash Function.

Course Outcomes :

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

CO1. Understand the Arrays & its representation, Operations on Arrays, Sparse Arrays, Pointers, Linked List (Singly, Double & Circular), Operations on Linked List (Traversing, Insertion, Deletion etc.).

CO2 Understand the applications of Stacks and Queues and their implementation.

CO3. Understand the applications of Trees, traversal techniques and various operations and their implementation.

CO4. Understand the applications of Graphs, their representation, traversal techniques

CO5. Understand Hash Function Files and various searching and sorting techniques.

Text Books:

1. **Seymour Lipschutz**(SCHAUM'S ouTlines), "DATA STRUCTURES", **Tata McGraw Hill.**

References:

1. **R. Kruse,** "Data Structures & Program Design in C", **Pearson Education.**
2. **Dr. PrabhakarGupta,VineetAgarwal, Manish Varshney, "** Data Structure Using 'C', **FIREWALL MEDIA.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-156	Mathematical Foundation	3	50	-	50	5	0	0	-

Objective

This is a bridge course offered to the non- mathematical background students. The main aim of this course is to acquaint the students with the basic knowledge of mathematical foundation.

Unit I

Lattices theory: Introduction, Partially Ordered sets, total ordered sets, Hasse diagrams, well ordered sets, Lattices, Duality, Lattices as poset, Sublattices, types of Lattices: bounded lattices, distributive lattices, compliments, complemented lattices.

Unit II

Boolean algebra and applications: Introduction, basic definitions, duality, basic theorems, Boolean algebra as lattices, sum-of-product forms of sets, sum-of-product forms for Boolean algebra, logic gates and circuits, truth tables.

Unit III

Counting Techniques: Introduction- basic counting principles, permutations and combinations, the pigeonhole principle.

Coordinate Systems and vectors: Rectangular Coordinates in a plane, polar coordinates, rectangular Coordinates in a space, Cylindrical polar coordinates, the concept of vectors, addition and subtraction of vectors, resolution of vectors, scalar and dot product of two vectors, vector and cross product of two vectors.

COURSE OUTCOMES:

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

CO1. Know the concept of partially ordered sets, well ordered sets, lattices, duality, sub latices and types of lattices.

CO2. Understand the concept of Boolean algebra, basic theorems, sum of products forms of sets and Boolean algebra, logic Sets.

CO3. Know the concept of basic counting techniques, permutations and combinations and also rectangle coordinates in Plane, space, cylindrical coordinates, concept of Vector addition, subtraction, scalar and dot product of two vectors..

Text books:

1. **Seymour Liptschutz**, "Discrete Mathematics", 2nd Ed. **Tata McGraw Hill, New Delhi.**
2. **Sastry S. S**., "Engineering Mathematics", Third edition, PHI.
3. **K. H. Rosen,** Discrete Mathematics & its Applications, 5th Ed. 2004, **Tata McGraw Hill.**

Reference Books:

1. **Deo NarSingh**, "Graph Theory with applications to Engineering and computer Sciences", **Eastern economic edition, PHI.**

COURSE SCHEME & SYLLABUS FOR MCA

FOR THE YEAR

2020, 2021, 2022

SEMESTER-II

Course Code	Course Title (Core Courses)	Credits	Scheme of Examination			
			Duration	Marks		
			Hours	IA	UE	Total
MCA-251	Relational Database Management System	4	3	40	60	100
MCA-252	Analysis and Design of Algorithms	4	3	40	60	100
MCA-253	Data Communication & Computer Networks	4	3	40	60	100
	Elective-I	4	3	40	60	100
	Choice Based Open Elective*	4	3	40	60	100
MCA-281	Lab 3: PL/SQL & Linux Essentials	4	3	50	50	100
MCA-282	Lab 4: Java Programming	4	3	50	50	100
Total Marks				**300**	**400**	**700**

Choice Based Open Electives* Offered by the Department of Computer Sciences						
Comp-213	Computer Applications & Operations	4	3	40	60	100

List of Electives -I						
MCA-254	Management Information System	4	3	40	60	100
MCA-255	Basic Accounting					
MCA-256	Simulation and Modeling					
MCA-257	Operations Research					
MCA-258	Object Oriented Analysis & Design					
MCA-259	Compiler Design					
MCA-260	Web Mining					
MCA-261	Software Testing					
MCA-262	Multimedia using Flash					
MCA-263	Linux Administration and Open Source Software					

Note: Students will have to choose one course from the list of Electives depending upon the availability of faculty.

Non Credit Course

MCA-264	Soft Skills*	-	-	50	-	50

IA – Internal Assessment
UE – University Examination

Note: * *The student is supposed to gain the minimum required percentage of attendance in this non- credit course and it is mandatory to pass the same. The evaluation of this course is Internal and the marks obtained by the student shall not be added to the second semester aggregate.*

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-251	Relational Database Management System	3	40	60	100	5	0	0	4

Objective:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve information efficiently and effectively from a DBMS. The course also acquaints students to the fundamental concepts necessary for designing, and implementing database systems. It emphasizes on relational database design and the languages and corresponding facilities provided by the relational database management systems.

Unit-I

Database System Concepts & Architecture: Concept, Characteristics of database, Database system Vs file system, Introduction to DBMS, Advantages, Disadvantages of DBMS, Database users.

Concept of Database system architectures, schemas and instances, DBMS architecture & data independence, Components of DBMS, Database Languages & Interfaces, Centralized & Client/Server Architectures of DBMSs.

Unit-II

PL/SQL: Introduction, Concept, Characteristics of SQL, Advantages of SQL, Data definition in SQL, literals, Operators, Specifying Constraints in SQL, Data manipulation in SQL, Views & Queries, Insert, Update & Delete Operations, Creating users, Grant and revoke object privileges.

Introduction to PL/SQL: variable, constants, data types, Pl/SQL block structure, Condition and iterative control statements, Concept of cursors & trigger.

Unit-III

Data models: Data modeling using ER-Approach (Concept, ER-Notations, Entities, Entity types, Attributes, Attribute types, Relationships Keys concept).

Conventional Data Models & Systems: Network data model concept, Hierarchical model concept.

Relational Data Model: Concept, Relational model Constraints (Entity Integrity, Referential Integrity, Key Constraints, Domain Constraints), Codd's Rules, Relational Algebra (Fundamental Operations).

Unit-IV

Relational Database Design & Normalization: Concept of Functional dependencies (Fully, partial, Transitive), Normalization of relational database, Closure of Attribute Set, Canonical Cover, Norm forms (1NF, 2NF, 3NF, BCNF, 4NF), Join dependencies.

Unit-V

Concurrency: Concept, Transaction states, Transaction properties (ACID Test), Serializability, Recoverability.

Concurrency Control & Recovery Techniques: Concurrency control concept, Concurrency control techniques, Locking (concept, types), Time stamp ordering, Granularity of data items, Dead lock & its Resolution.

Recovery Concepts, Recovery Techniques (Log based, Shadow paging, Checkpoint) Introduction to Database Security.

COURSE OUTCOMES:

CO1. Students will be able to understand the concept database system and its architectures.

CO2. Students might be able to work with PL/SQL (A database designing and development language).

CO3. Students will be to design the database and might be aware about some familiar database models.

CO4. Students might be aware about functional dependencies and be able to normalize the relational database.

CO5. Students might be able to understand the transaction management in relational database management system and related security issues.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Elmarsi, Navathe, S B (2004)**,"Fundamentals of database Systems", **Pearson Education**.
2. **Silbebschatz, A. Korth, H,F. Sudarshan ,S (2006)** ,"Database System Concepts", **TMH .**

References:

1. **Date, C J (2005)**, "An Introduction to Database Systems", **Addison Wesley**.
2. **Desai, B C (2002)**, "An introduction to database Systems", **Galgotia Publications**.
3. **Leon (2004)**, "Database Management Systems", **Vikas Publications.**
4. ***Bayross I.***, "Commercial Application Development using Oracle Developer 2000", **BPB.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-252	Analysis & Design of Algorithms	3	40	60	100	5	0	0	4

Objective:

The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm.

Unit-I

Introduction to Algorithms, the running times of a program. Use of the Big-Oh, Small-o, Big Omega and small Omega notations, Inequalities involving such notation, Efficiency of algorithm. Sorting Algorithms (Radix sort and Bucket sort). Introduction to algorithm design techniques.

Unit-II

Algorithm Analysis and Design Technique: Analysis framework, recursive & non-recursive algorithm (Overview). Analysis of recursive and non- recursive algorithm, Strassen's Matrix multiplication, Divide and Conquer (General methods, Merge sort, Quick Sort),

Unit-III

Greedy Techniques: Knapsack Problems, Prim's algorithm, Krushkal's algorithm, Dijkstra's method, Huffman trees

Transform & Conquer: Horner's rule & Binary Exponentiation, Problem Reduction.

Decrease & Conquer: Depth-First Search and Breadth-First Seach, Topological sorting

Unit-IV

Advanced Data Structures: Hashing & its terminology, Hash Table and Hash function, Hashing techniques, collision resolution techniques.

Dynamic programming: General methods, 0/1 knapsack problem, Travelling salesman problem, Warshal's and Floyd's Algorithm, Optional Binary Search trees.

Unit-V

Design Technique: Back-tracking (8- Queen's Problem, Hamiltonian Cycles)

P, NP and NP-Complete problems: Graph Coloring, Branch and Bound, Approximation Algorithms for NP hard problems. Limitation of Algorithm-power: Lower Bound Arguments, Decision Trees.

COURSE OUTCOMES:

CO1. For a given algorithm student will able to analyze the algorithms to determine the computational complexity and justify the correctness.

CO2. For a given sorting techniques (Count, Radix, Bucket, Merge, Quick) student will able to write algorithm and calculate time complexity.

CO3. Student will be able to solve different kind problems using Divide and Conquer algorithm, Greedy approaches and Dynamic programming.

CO4. Student will be familiarize with Advance Data Structures such as Hashing and different Hashing techniques.

CO5. Student will able to understand, distinguish and solve P, NP and NP-complete problems

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Anany,Levitin**, "Introduction to the Design & Analysis of Algorithm", 2nd Edition, **Pearson Education,2007.**

References:

1. **Horowitz, Ellis**, "Fundamentals of Computer Algorithms", New Delhi, 2005, **Galgotia Publications**
2. **Leiserso, Cormen, Rivert**, "Introduction to Algorithms, , New Delhi, 2nd Edition, 2005, **PHI Publication**
3. **Brately Brassard** , "Fundamentals of Algorithms", New Delhi, 1996, **PHI Publication**
4. **Michael T. Goodrich, Roberto Tamassia**, "Algorithm Design", New Delhi, 2004. **Wiley Publication**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-253	Data Communication & Computer Networks	3	40	60	100	5	0	0	4

Objective:

The aim of this course is to acquaint the students the basics of Data communication and computer networks and concentrates on building a firm foundation for understanding the subject. The paper is based around the OSI Reference Model that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model. This paper provides the student with fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area.

Unit-I

Signals: Concept of analog and digital signals.

Digital-to-Digital Encoding, Line Coding, unipolar, polar (NRZ-L, NRZ-I, Manchester & Differential Manchester encoding) & bipolar**,** Block Coding **(**4B/5B), Scrambling (B8ZS Scrambling).

Analog to digital encoding: Pulse Amplitude Modulation, Pulse code Modulation, Delta Modulation.

Unit-II

Digital to analog Modulation/ encoding: frequency shift keying, amplitude shift keying, phase shift keying, Quadrature amplitude modulation,

Analog-to-Analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation.

Multiplexing: frequency division, wavelength division, time division

Unit-III

Data Link Layer: Pure Aloha, Throughput of pure Aloha, Slotted Aloha, CSMA/CD, Media Access Control in CSMA/CD, MAC Frame Format (IEEE 802.3), Format of Ethernet (DIX) Frame, The Binary Exponential Backoff Algorithm,

Error detection: types of errors, **detection methods**: parity check, cyclic redundancy check, checksum

Error correction: forward error correction, hamming code.

Unit-IV

Introduction: Computer network, LAN, MAN, WAN, Simplex, Half duplex, Full duplex.

Transmission media: Twisted Pair cable, Coaxial cable, Fiber optics: Multi mode & single mode (overview).
Network topologies: Star topology, ring topology, bus topology, mesh topology, Client server n/w, Peer to peer n/w, Distributed n/w,
Wireless n/w: Bluetooth, 802.11a, b, c, n, ac series, comparison of 802.11ac & n.
Models: OSI Model, TCP/IP reference Model, Comparison of TCP/IP & OSI model.

Unit-V
Network layer: Virtual circuits, Shortest path routing, Overview of (Flooding, Broadcast, Multicast IP addresses), IPv4 addresses, IPv4 subnetting, overview of IPv6 addresses, Overview of (Tunneling, Firewalls)
Transport layer: Quality of service, Elements of transport protocol, and Performance problems in computer networks,
Application layer: Basic overview of (FTP, Telnet, HTTP, Email, DNS, World Wide Web, Virtual terminal).

COURSE OUTCOMES:

CO1. Student will be able to understand the Concept of analog and digital signals including encoding techniques.
CO2. Student will be able to understand the Concept of conversion techniques line, Digital to Analog, and Analog to Digital, digital to digital, analog to analog.
CO3. Student will be able to understand the Concept of techniques involved in Data Link Layer like CSMA/CD, Error detection & error correction.
CO4. Student will be able to understand the Concept of Computer Networks like transmission media, Network topologies, Wireless and Network Models like OSI and TCP-IP..
CO5. Student will be able to understand the Concept of Network, Transport and Application Layer.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Tannenbaum (2004),**"Computer Networks", Fourth Edition **PHI.**

References:

1. **Behrouz A. Forouzan (2006)**, "Data communication & Networks", Fourth Edition, **TMH.**
2. **Uyless D.Black (2004)**, "Data Communication & Distributed Networks", 3rd Edition, **PHI.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
Comp-213	Computer Applications and Operations	3	40	60	100	5	0	0	4

Objective:

The objective of this course is to acquaint students with the basic knowledge of computers and train them to understand the preliminary elements of computing and the corresponding tools that are used to handle routine tasks. This course also aware the students regarding the internet based computer applications. The course is fundamental in nature and does not therefore, require any background of computers.

Unit-I

Computer System: Computer and its History, Operating System, Hardware,Software, Firmware.
Processor & Memory: Processor functions, speed, Memory types: RAM/ROM/HDD/ DVD-ROM/Flash drive.
Devices: Input Devices (Key Board, Mouse, Microphone, Webcam, Touch Screen, Scanner, Joystick) and Output Devices (Monitor, Printer, Plotter, Projector, Speaker)

Unit-II

Introduction to Office Tools: Word Processing, Advantages of Word Processing, Fundamentals of MS-Word, Working with Menus and Toolbars, Introduction to Macros.
Working with Spreadsheet: Overview of Excel, Working with Cells, Creating Worksheets, Working with Formulae Bar.
Working with Power Point Presentations: Introduction to PowerPoint, Creating and Designing Slides, Working with Hyperlinks & Animation.

Unit-III

Internet Basics: Concept of Data Communications, Computer Networks: (LAN, PAN, CAN, MAN, WAN), Concept of Internet, History.
Internet Resources: Concept of Email, Attachments, Web Browsing, Browsers (Internet Explorer, Mozilla Firefox, Opera, Google Chrome), Search Engines, URL, File Transfer Protocol (FTP).
Computer Security: Password protection, Viruses, Virus protection software,

Unit-IV
Social Networking: Introduction, Features, Social impact, emerging trends, issues.

Online Resources: Wikipedia, Blog, e-learning, Transliteration, Anti-Plagiarism Software, Sodh Gaga, Sodh Gangotri.
Google Apps: Search Engine, Chrome, Gmail, Docs, Spread Sheets, Slides, Sites, Scholars, Books, Street View, Maps, Calendar, Translate, Photos, Drive, Hangout, Messages, Class Room etc.

Unit-V

Information System: Introduction, Information system Resources (People, Hardware, software, Data, Network), Information system activities (Input of date resource, processing of data into information, output of information products, storage of data resources, control of system performance).Executive information Systems, Strategic uses of Information technology.

COURSE OUTCOMES:

CO1. Students will be able to understand the basics of computer system such as processor, memory, input and output devices.

CO2. Students will be able to work with Office Package such as Word Processor, Spread sheet and PPTs

CO3. Students will be aware about Networking, Internet and Computer System Protection.

CO4. Students might be aware and able to work with various Internet Applications such as Social Net Workings, E-Learning resources and Google Apps.

CO5. Students will be aware about Information system concepts so that they may be able to know the various information system basics.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Sinha , P. K (2005)**,"Computer Fundamentals", BPB, **New Delhi.**
2. **Anita Goel,** "Computer Fundamentals", PEARSON Publications**.**

References:

1. **Theodore S. Rappaport**, "Wireless Communication Principles & Practice", 2nd Ed. **PHI, New Delhi.**
2. **TCI**, "**Introduction** to Computers and Application Software", Publisher: Jones & Bartlett Learning, 2010, ISBN: 1449609821, 9781449609825.
3. **Basandra, Suresh K (2005)**, "Computers Today", Galgotia Publications.
4. **Saxena, S (2005)**, "MS Office for Everyone", Vikas Publications.
5. **Jawadekar, W. S**, "Management Information Systems", **TMH.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-281	Lab 3: Pl/Sql & Linux Essentials	3	50	50	100	0	0	6	4

Objective:

The objective of the course is to acquaint the students how to organize, maintain and retrieve information efficiently and effectively from a DBMS using PL/SQL. Students might be able to design the database schema in PL/SQL environment so that they may write SQL queries to define/manipulate the date stored in the databases.

Unit-I

SQL: Introduction, Data definition in SQL, Creating tables, Inserting data into tables, updating the contents of a table, Deletion operations, Many faces of select command, Modifying the structure of tables, Removing/Deleting/Dropping tables.

Data constraints, Computations used to select data from the tables, Logical operators, Range searching, Pattern Matching, Oracle functions.

Unit-II

Grouping data from tables, Manipulating dates in SQL, Joins, Constructing English sentences with data from tables, Sub queries, Union, Intersect and Minus Clause.

Indexes, Views, Sequences, Creating users, Grant and revoke object privileges.

Unit-III

Introduction to PL/SQL: variable, constants, data types, Pl/SQL block structure, Condition and iterative control statements, Concept of cursors, stored procedures/ functions & triggers.

Unit-IV

System calls. Linux Files: Regular, Device, Directories. Mounting & Un-mounting: File system, File permissions/privileges. Linux file paths (Absolute, Relative)Linux wild-cards.
Linux commands General Purpose utilities (cal,date,echo,printf,who), File-system (pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, wc, chmod). User-related commands. Job scheduling commands (ps, cron, at).

Unit-V

Shell scripting: Introduction, Types of Shells, Vi-editor, Editor modes, , Shell Meta Characters, Shell Variables, Shell Scripts, Shell Commands, The Environment Variables, String Manipulation, Special Command Line Characters , Decision Making and Loop Control, Functions, Arrays, Arithmetic Expression Evaluation, Data Compression Commands, Shell Input & Output.

COURSE OUTCOMES:

CO1. Students will be able to understand the concept database system languages and its architectures.

CO2. Students might be able to work with SQL Commands (create a database and apply queries on it)

CO3. Students will be able to create procedures, triggers.

CO4. Students might be able to work on basic linux commands.

CO5. Students might be able to create basic shell scripts.

Text Books:

1. ***Bayross I.***, "Commercial Application Development using Oracle Developer 2000", **BPB.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-282	Lab 4: Java Programming	3	50	50	100	0	0	6	4

Objective:

This course acquaints students with object oriented programming concepts and other advanced features and their implementation in Java language. The students shall learn to identify Java language components and know how they work together in real time applications.

Unit-I

Data types: Integers, Floating point, Character type and Boolean.
Variables: Assignment, Initialization, type conversion & Casting.
Operators: Arithmetic, Assignment, Modulus, Relational, Boolean and Bitwise.

Unit-II

Arrays: Single and Multidimensional arrays.
Control statements: Conditional statements, Iteration Statements and Jump Statements.
Classes & Methods: Declaring Objects, Creating Methods, Constructors, Command Line Arguments & Argument Passing. Static variables and methods.

Unit-III

Inheritance: Super Class, Member Access, Creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch & Abstract Class.
Packages & Interfaces: Defining and Importing Packages, Understanding Classpath, Access Protection, Defining and Implementing Interfaces.
Exception Handling: Exception Types, Using Try and Catch, Throwing Exceptions, Built-In Exceptions in Java, User Defined Exceptions.

Unit-IV

Multithreaded Programming: Creating & Working with Threads, Thread Priorities, Synchronization and Dead Locks.
String Handling: String Constructor, String Operations, Character Extraction, String Searching & Comparison, String Buffer Class, String Buffer V/s String Class, Lang Package.

Unit-V
I/O Streams: Stream Classes, Reading & Writing to Console, Accessing files & Directories, File Input and Output Stream, Byte Array Input & Output Stream.
Applets: HTML tag for applet, Parameter Passing.

COURSE OUTCOMES:

CO1. The Technical and Programming skills of students will develop in java programming.

CO2. Students will be able to develop the Application Software.

CO3. Students will be able to work with pure object oriented programming environment.

CO4. Students will be able to develop multi-threaded Application Programs.

CO5. Students will be able to work with Applets.

Text Books:

1. **Schildt, H (2004),** "The Complete Reference Java-2 ", Sixth Edition, **TMH.**

References:

1. **Dietel & Dietel (2006),** "Java: How to Program Java 2", Sixth Edition, **Pearson Education.**
2. **Horstmann & Cornell (2006),** "Java2 Vol-1 & Vol-2", Seven Indian Reprint, **Pearson Education.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-254	Management Information System	3	40	60	100	5	0	0	4

Objective:

The aim of the course is to make students well acquainted with the components of the systems of an organization and make decisions that advance the organization's strategy and to implement the organizational structure and dynamics of the enterprise for the purpose of managing the organization in a better way for a competitive advantage.

Unit-I

Management Information System: Concept, Fundamental role of MIS in business, MIS and user, Management as a control system, MIS as a support system to management, MIS in organizational effectiveness, Trends in Information systems, Types of Information systems(Operation support system, Management support system).

Unit-II

Components of an Information System: Information system Resources (People, Hardware, software, Data, Network), Information system activities (Input of date resource, processing of date into information, output of information products, storage of data resources, control of system performance).Executive information Systems, Strategic uses of Information technology.

Unit-III

Decision Support Systems in Business: Introduction, Information, Decisions, and Management, Information Quality, Decision Structure, Decision Support Trends, DSS Components, Online Analytical Processing, Analytical Models (what-if-analysis, Sensitivity analysis, Goal-seeking analysis, & Optimization analysis) Role of Decision making in Business.

Unit-IV

Development of MIS: Concept, The Systems Approach, System thinking, The Systems Development Cycle (The Prototyping Process, System Development Process, System Analysis, System Design, & End-User Development), Implementing new Systems, Implementation Activities (Hardware Evaluation factors, Software Evaluation factors, Testing, Data Conversion, & Documentation).

Unit-V

Management Challenges: Concept, Security & Ethical challenges of Information technology. Ethical responsibility of business professionals (Business ethics, Technology ethics, Ethical guidelines).Other Challenges (Employment challenges, computer Monitoring, Challenges in working conditions, Challenges to individuality).

Security Management: concept, Tools of Security Management, Internetworked Security Defenses (Encryption, Firewalls, e-mail monitoring), other security measures (Security codes, Security monitors, Biometric security).

COURSE OUTCOMES:

CO1. Understand and implement the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.

CO2: Analyze and Evaluate the Information System Resources like (People, Hardware, software, Data, Network) and the Strategic uses of Information technology

CO3. Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives and Effectively communicate strategic alternatives to facilitate decision making.

CO4: System Development and life cycle of Management Information System and the requisite testing strategies.

CO5: Evaluate the Management challenges and security issues to tackle the information system issues and concerns.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Jawadekar, W. S**, "Management Information Systems", **TMH.**
2. **O'Brien, J. A**,"Management Information Systems", **TMH.**

References:

1. **O'Brien, J. A**, "Introduction to Information Systems", **TMH.**
2. **Mcleod, R**, "Management Information Systems", **Pearson Education**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-255	Basic Accounting	3	40	60	100	5	0	0	4

Objective:
The aim of the course is to make students well acquainted with Basic Rules of Accounting. The course is basic in nature and its implementation in any business organization play a major role for the decision making.

Unit-I
Basics of Accounting: Meaning, objectives and Scope of Accounting, Meaning of various terms used, Types of Accounts, Rules for Debit & Credit, Accounting Principles (GAAPs), Branches of Accounting, Classification of Income and Expenditure, Users of Accounting Information, Limitation of Accounting.

Unit-II
Recording of Business Transactions: Journal Entries, Preparation of Ledger Accounts, Subsidiary Books, Cash Book: Single Column, Two Columns, Trial Balance.

Unit-III
Classification of Expenses/ Income, Classification of Assets and Liabilities, Preparation of Trading Account, Preparation of Profit & Loss Account, Preparation of Balance Sheet, 'T' form and Vertical form.

Unit-IV
Depreciation Accounting: Meaning, Objectives of Depreciation, Computation of Depreciation, Methods of changing Depreciation, Straight Line Method, Written Down Value Method.

Unit-V
Understanding Financial Statements of Companies, Analysis of Financial Statements, Ratios Analysis

Course Outcomes:

CO1: To make students familiarize with the basic rules of Accounting

CO2: To develop understanding about the Accounting Principles and Processing the Accounting Information.

CO3: To acquaint students about the preparation of Financial Statements of a Business Organization.

CO4: To understand the need for and process of changing depreciation.

CO5: To make students able to make analysis of Financial Statements for Decision Making.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Book:

1. **Ahmed N, Iqbal J, Saima;** "Accounting for Managers", **M/s. New Delhi Publishers, 90, Sainik Vihar, Mohan Garden, New Delhi- 110059**

References:

1. **Ahmed N, Iqbal J, Saima;** "Financial Accounting", **M/s. New Delhi Publishers, 90, Sainik Vihar, Mohan Garden, New Delhi- 110059**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-256	Simulation & Modeling	3	40	60	100	4	1	0	4

Objective:

This course covers simulation and modeling principles with applications to system development. The content focuses on modeling approaches and surveys applications for complex systems before going to the actual solution of the problem. After completion of this course, students might be able to use various simulation techniques based on real time problems.

Unit I

Introduction to Simulation:

Simulation definition, examples, steps in computer simulation, advantages and disadvantages of simulation, classification of simulation languages. Experimental nature of simulation, CSSLS, CSMPIII language. Continuous Simulation: Pure-pursuit Problem

Unit II

Models: Models types, mathematical model, physical model, analog model. Estimation of model parameters. Principles used in modeling, Distributed Lag Models, Cobweb Models.

System simulation: The Monte Carlo method, Comparison of simulation and Analytical methods, Experimental nature of simulation, Numerical Computation Technique for continuous models, Numerical Computation Technique for discrete models, Progress of a simulation study.

Unit III

Analysis of simulation output:

Nature of problem, Estimation methods, Simulation run statistics, Replication runs, Elimination of initial bias, Batch means, Regenerative techniques, Time series analysis, Spectral analysis, Autoregressive processes.

Unit IV

Queuing Models

Little's theorem, analytical results for M/M/1 queuing system, analytical results for M/M/1/N queuing system, Simulation of an Inventory System.

Random numbers: Random variables, random number generation, Linear Congruential Generators, testing random number generators.

Unit V

Introduction to Simulation languages and some simple simulated models: Introduction to GPSS, General Description, GPSS block-diagram, Simulation of a Manufacturing Shop. SNA, Function, Simulation of a Supermarket, GPSS Model of a Simple Telephone System, An introduction of different types of simulation languages

COURSE OUTCOMES:

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

CO1. Identify the different approaches used indesigning the simulation models.

CO2. Implement the input modeling using different design strategies.

CO3. Analyze different types of simulation output.

CO4. Understand different types of Queuing models and Random Number Generation.

CO5. Write Programs in GPSS for various simulations e.g.,Simulation of a Supermarket.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **G. Gordon**, "System Simulation", **Prentice Hall**.

References:

1. **Nar Singh Deo**, "System Simulation with Digital Computer", **PrenticeHall of India.**
2. **Law and Kelton**, "Simulation Modeling and Analysis", **McGraw Hill**.
3. **T.A. Payer**, "Introduction to Simulation", **McGraw Hill**.
4. **J. Reitman**, Computer Simulation Application", **Wiley**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-257	Operations Research	3	40	60	100	5	0	0	4

Objective:
The aim of this course is to acquaint the students with solution of various linear programming problems, Transportation Problems and Assignment Problems for understanding of the scientific approach to decision making which will help them to determine an optimal solution of interdependent activities in view of available resources.

Unit-I

Introduction to Operational Research: Concept, models, characteristics, Applications.
Linear Programming problems (LPP): Introduction, Formulation, Graphical Solution, , Exceptional cases in LPP (Degeneracy, Unbounded Solution, infeasible Solution, Optimality).

Unit-II

Advanced Linear Programming: Simplex Method, Two Phase method, Big-M method Sensitivity analysis
Dual problems: Relation between primal and dual problems – Dual simplex method

Unit-III

Transportation Problems: Concept, Methods for finding initial solution (Northwest Rule, Least Cost Method, Vogel's Approximation), Test for optimality by Modified Distribution (MODI) Method, Unbalanced Transportation Problem, Maximization case.

Unit-IV

Assignment Problems: Concept, Hungarian Assignment Method (Minimization and Maximization cases).
Integer Programming: Branch and bound technique, Cutting plane algorithm.

Unit-V

Project Management: Basic concepts of Network Analysis, Rules of network Construction, Critical Path Method (CPM), Program evaluation and Review Technique (PERT), Distinction between CPM & PERT.

COURSE OUTCOMES:

CO1. For a given optimization problem, students will be able to solve it using graphical and simplex methods and other techniques.

CO2. For a given optimization problem, students will be able to solve it using simplex methods and other techniques

CO3. For a given transportation problem, students will be able to solve these problems using MODI method.

CO4. Students will be able to solve assignment problems using Hungarian method and they also be able to understand integer programming.

CO5. Student will able to understand project management using CPM and PERT techniques.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **N.D. Vohra**, "Quantitative Techniques in Management",6th Ed.,2004 , **BPB**.

References:

1. **V.K.Kapoor**, "Operations Research Techniques for Management",1st Ed., 2001. **Sultan Chand**
2. **K. Swarup, P.K.Gupta** and **M. Mohan**, "Operations Research", 12th Ed.,2006, **Sultan Chand**
3. **Hamady A. Taha**, "Operations Research", 7th Ed., 2005, **Wesley**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-258	Object Oriented Analysis & Design	3	40	60	100	5	0	0	4

Objective:

The objective of the course is to introduce the students about the techniques which are useful for developing quality software by implementing Object Oriented Design Methodologies. Students might be able to apply dynamic and functional modeling and shall be able to use Unified Modeling Language (UML).

Unit-I

Object Oriented: Concept, Objects and classes, Abstraction, Encapsulation, Polymorphism, Object Oriented Development, The Traditional Paradigm versus the Object-Oriented Development, Need for object oriented approach. Object Orientation, Analysis and Problem Statement, Development and Modeling.

The Object Modeling: Evolution of Object model, Elements of Object Model, Applying Object Model, Links and association, advanced link and association, generalization and inheritance, Grouping Constructs.

Unit-II

Advanced Object Modeling: Aggregation, abstraction classes, generalization as Extension and restriction, multiple inheritance, Meta data, Candidate Keys, Constrains.

Dynamic Modeling: Events and States, Operations, Nested State Diagram, Concurrency, Relation of Object and Dynamic Models.

Functional Modeling: Functional Models, Data Flow Diagrams, Specifying Operations and Constraints. Relation of Functional model to Object and Dynamic Models.

Unit-II

System Design: Concept, Subsystems, Concurrency, Allocation to processor and tasks, Management of data stores, Handling Global Resources, Choosing Software Control Implementation, Handling boundary Conditions, Setting Trade-off priorities.

Object Design: Overview, Combining the three models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, and Document Design Decision.

Unit-IV

Implementation: Implementation using Programming Language, a Database System and outside a Computer.

Programming Style: Object Oriented Style, Reusability, Extensibility, Robustness, Programming-in-the-large.
Unified Process: The Workflows of Unified Process (Requirements, Analysis, Design, Implementation and Test Workflow). The Phases of Unified Process- Inception, Elaboration, Construction, Transition Phase.

Unit-V
UML: Basics, Emergence of UML, Basics of Different Types of Diagrams(Class diagram, Sequence diagram, Use-Case diagram, Collaboration diagram, state-charts, Activity diagram, Package Diagram, Component diagram, Deployment diagram). Class Diagrams: Aggregation, Multiplicity, Composition, Generalization, Association.

COURSE OUTCOMES:

CO1. Student will know about object oriented approach. Object Orientation, Analysis and Problem.

CO2. Student will be able to know about advance, dynamic and functional modeling..

CO3. Student will be able to know about System design and Object design.

CO4. Student will do Implementation using Programming Language and Database System.

CO5. Student will able to understand the basics of UML

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **James R. Rumbaugh, Michael R. Blaha, William Lorensen, Frederick Eddy (2005)**, "Object-Oriented Modeling and Design", **PHI**.
2. **Michael R. Blaha, James R Rumbaugh**, "Object-Oriented Modeling and Design with UML" , 2nd Edition, **PHI**.

References:

1. **Bernd Oestereich**, "Developing Software With UML", **Pearson Education.**
2. **James Rumbaugh**, "Object Oriented Models and Design" 2nd Edition, **Pearson Education.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-259	Compiler Design	3	40	60	100	5	0	0	4

Objective:

The main objective of this course is to provide fundamental concepts and techniques used for developing a simple language compiler. Focusing on both the theoretical and practical, the students shall use a new language to explore the lexical, syntactic and semantic structures of languages in general. At the end of the course, students will understand different considerations and phases of compilation, the impact of language features upon the compilation process, and the practical fundamentals of how a compiler is implemented.

Unit-I

Introduction to Compiler design : Languages Processors, the typical structure of a Complier.
Programming Language: High level programming languages, definition of programming languages, the syntax and semantics of basic data and control structures in high level programming languages.

Unit-II

Lexical analysis: Role of Lexical Analyzer, Input buffering, A simple approach to Design of Lexical Analyzers, Regular Expressions, Finite Automata, Regular expression to Finite Automata, Conversion of NFA to DFA.

Unit-III

The Syntactic Specification of Programming Languages: Definition of Grammars (Context free grammar), derivation, parse tree, non-context free language constructs.
Basics Parsing Techniques: Parsers- Shift reduce parsing, Operator precedence parsing, top - down parsing, Predicative parsers, LR parsers.

Unit-IV

Syntax directed translation: - Syntax directed translation schemes. Implementation of syntax directed translators.
Intermediate code Generation : - Intermediate code, postfix notation, three address code- quadruples triples, translation of Assignment statement, Boolean Expression.

Unit-V

Error Detection and Recovery :- Errors, lexical phase errors, syntactic phase errors, semantic errors.
Code generation & optimization :- Loop optimization, DAG Representation of basic blocks, Global data flow Analysis, Issues in the design of code generator, Peephole optimization, a simple code generator, Register Allocation & Assignment.

COURSE OUTCOMES:

CO1. Students will be aware about the introduction of Compiler Designing and syntax/semantics of Compiler of Programming Language.

CO2. Students will be able to understand the designing and working of Lexical Analyzer.

CO3. Students will be able to understand the Syntactic Specification of Programming Languages and basic parsing techniques.

CO4. Students will be able to implement Syntax Directed Translation and Intermediate Code Generation.

CO5. Students will be able to understand the process of Error detection and Recovery in Compiler and Code Semantic Optimization.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Alfred V.Aho, Jeffrey D Ullman**, " Principles of compiler design", **Addison-Wesley Series.**
2. **Donovan. John. J**, "Systems Programming", **TMH.**

References:

1. **Dhamdhere.D.M**, "System Programming & Operating Systems",2nd Ed. **JMH.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-260	Web Mining	3	40	60	100	5	0	0	4

Objective:

The aim of this course is that to acquaint the students about the types of data which exists on web sites/portals. After that students will be able to know various techniques which are using in mining of data from the web portals.

Unit-I

Introduction to Web Data Mining: Data Mining Foundations, Introduction – World Wide Web (WWW), A Brief History of the Web and the Internet, Web Data Mining-Data Mining, Web Mining. Data Mining Foundations – Association Rules and Sequential Patterns – Basic Concepts of Association Rules, Apriori Algorithm- Frequent Item set Generation, Association Rule Generation.

Unit-II

Supervised Learning: Supervised Learning – Basic Concepts, Decision Tree Induction – Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier Evaluation, Rule Induction – Sequential Covering, Rule Learning, Classification Based on Associations, Naïve Bayesian Classification , Naïve Bayesian Text Classification – Probabilistic Framework, Naïve Bayesian Model .

Unsupervised Learning – Basic Concepts , K-means Clustering – K-means Algorithm, Representation of Clusters, Hierarchical Clustering – Single link method, Complete link Method, Average link method, Strength and Weakness.

Unit-III

Information Retrieval and Web Search: Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing.

Unit-IV

Link Analysis and Web Crawling: Link Analysis – Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery-Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities.

Web Crawling: Concept, A Basic Crawler Algorithm- Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stopword Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts.

Unit-V

Opinion Mining: Concept, Sentiment Classification, Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros and Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam.

Web Usage Mining: Concept, Data Collection and Preprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns.

COURSE OUTCOMES:

CO1. Students will be introduced with the different kind of web mining.

CO2. Students will be able to understand the various techniques for web content mining.

CO3. Student will be able to understand various concepts related to NLP.

CO4. Student will be able to extraction of data from social networks.

CO5. Student will able to explain semantic web and web spam analysis.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **George C, Marcus J. H, James A. M. McHugh, Jason T.L. Wang**, " Mining the World Wide Web: An Information Search Approach", **Kulwer Academic Publishers.**

References:

1. **Soumen Chakrabarti**, " Mining the Web: Discovering Knowledge from Hypertext Data", **Morgan Kufman Publishers.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-261	Software Testing	3	40	60	100	5	0	0	4

Objective:
The objective of the course is to introduce the students the various techniques for testing quality software by implementing the various testing strategies. Students shall also be able to design and conduct a software test process for a software testing project, and define and develop a test tool to support test automation.

Unit I
Introduction to Testing: Verification and Validation; Software Testing for Conventional & Object Oriented Architectures; Testing Completion criteria; Strategic Issues; Test Strategies for Conventional & Object Oriented Software; Validation Testing; System Testing.

Unit II
Testing Tactics: Black Box Testing; Basis Path Testing; Control Structure testing; White Box Testing; Object Oriented Testing Methods(Test Case design, Implications of OO concepts, Fault based Testing, Test Cases);

Unit III
Risk management: Concept, Reactive vs. Proactive Risk strategies, Software risks, Risk identification (Assessing Overall Project Risk, Risk Components and drivers), Risk Projection (Developing a risk table, assessing a Risk Impact), Risk Refinement, Risk Mitigation, Monitoring and Management, The RMMM Plan.

Unit IV
Introduction to Metrics: Process Metrics; Project Metrics; Software Measurement (Size Oriented Metrics, Function Oriented Metrics, OO Metrics); Metrics for Software Quality; Integrating Metrics within the Software Process; Metrics for Small Organizations.

Unit V
Quality Management: Quality Concepts (Quality, Quality Control, Quality assurance, Cost of quality),Software Quality assurance, Software reviews, Formal Technical Reviews, Formal approaches to Software quality assurance, Software Reliability(Measures of Reliability and Availability, Software Safety), ISO 9000 Quality standards.

COURSE OUTCOMES:

CO1: Distinguish between the various test processes based on testing criterion and the practice on various testing strategies for continuous quality improvement of the software product.

CO2: Understand and implement the testing tactics for detection of errors and fault(s) in software models

CO3: Understand and implement Risk management strategies (Risk Mitigation, Monitoring and Management)

CO4: Design and develop correct and robust software products, going beyond the conventional levels of programming.

CO5: Understand and implement the Quality assurance techniques and Quality standards.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Pressman, R S (2006)**, "Software Engineering - A Practitioner's Approach", Sixth Edition, **TMH**.

References:

1. **Jalote, P(2005)**,"An Integrated Approach to Software Engineering", 3Rd Edition, **Narosa Publication.**
2. **SommerVille**, **"**Software Engineering", **Addison Wisley-2000**
3. **SCHAUM'S Outlines(2005)**,"Software Engineering", **TMH.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-262	Multimedia Using Flash	3	40	60	100	5	0	0	4

Objective:
The aim of the course is to make students well acquainted with multimedia concepts, multimedia applications and working knowledge of Flash for creating and implementing animated web pages, movies, etc.

Unit-I
Introduction to Multimedia: Overview, Multimedia elements, Multimedia applications, Multimedia system architecture, evolving technologies for multimedia systems, defining objects for multimedia systems, multimedia data interface standards, data compression (Concept, need and types), multimedia databases.

Unit-II
Multimedia Hardware: Multimedia PC Configuration, OCR, Touch Screen, Scanner, Digital Camera, Speakers, Printer, Plotter, Optical Disk.
Data and File Format standards: types of data, Multimedia formats (general purpose, special purpose), WMA, WMV, WAVE, TIFF file format, RIFF, MIDI, JPEG, AVI, MPEG, TWAIN

Unit-III
Multimedia Application Design: Multimedia Application classes, types of multimedia systems, virtual reality design (Concept, Human factors, multimedia inputs & outputs, modeling, Design Considerations), components of multimedia systems (input, output, storage systems).

Unit-IV
Overview of Flash: Introduction, Flash Basics, Flash drawing: Pencil tool, brush, line, oval, rectangle, eraser, ink bottle, paint bucket, pen, eye dropper. Flash buttons: introduction, simple buttons and advanced buttons. Working with the library
Adding multimedia and other objects: Object element, embedding audio/video, adding Java Applets.

Unit-V
Animating with Macromedia Flash: understanding Flash Layout(stage, screnes, layers, timeline, toolbox and tool panels, launcher bar), working with classic tween animation, motion tween animation, shape tweening. Working with text,
Working with Animation timeline: frames and keyframes, frame-by-frame animation, custom brushes, working with multiple timelines, working with scenes, add interactivity using code snippets.

COURSE OUTCOMES:

CO1. Student will be able to understand the basic concepts of multimedia systems and evolving technologies in multimedia systems.

CO2. Students will be able to understand the hardware requirement for multimedia systems. Student will be able to understand the multimedia file format standards.

CO3. Student will be able to understand the basic concepts of Multimedia application design and components of multimedia systems.

CO4. Student will able to understand the basic concepts of Flash and able to create Flash files. Student will also be able to add multimedia objects in web pages.

CO5. Student will able to understand the Flash layout and create animations using Flash. Student will able to add interactivity using code snippets.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Andleigh, P.K, Thakrar, Kiran**, "Multimedia Systems Design", **PHI.**
2. **Berwal, D. S**, "Multimedia Applications", **VEI.**

References:

1. **Buford, John F.K**, "Multimedia Systems", **Pearson Education.**
2. **Kerman, P**., "Sams Teach Yourself Macromedia Flash 8 in 24 Hours", 3rd Edition, **Pearson Education.**
3. **Reinhardt, R**., **Dowd, S.,** "Macromedia Flash 8 Bible 1st Edition" , 1st Edition, **Wiley.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-263	Linux Administration and Open Source Software	3	40	60	100	5	0	0	4

Objective:

The objective of this course is to make students aware of Basic Linux administration and flavor of open source softwares. It also acquaints the students with the basics of Shell scripting.

Unit-I

Softwares: Concept of open source, Evolution & development of Open Source Technologies(OST) and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU Project, principle and methodologies. Applications of open source (open source teaching and open source media) Risk Factors. Myths regarding open source. Free Software, Closed software, Public Domain Software, Shared software, Shared source.

Unit-II

Basics: Types of Linux distribution, Basic-architecture of Linux: Shell, Kernel, Types of Linux shells.

Linux File system: overview, Inode, Super-block, Boot-block.Users, Groups and Permissions

Linux Installation , Hard Disk Partition Details ,Linux File System: ext2 / ext3 , Dual Boot Installation. Desktop Familiarization , Text and GUI Mode, Virtual Terminals , GNOME and KDE Desktop

Unit-III

System calls. Linux Files: Regular, Device, Directories. Mounting & Un-mounting: File system, File permissions/privileges. Linux file paths (Absolute,Relative)Linux wild-cards.

Linux commands General Purpose utilities (cal,date,echo,printf,who), File-system (pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, wc, chmod). User-related commands. Job scheduling commands (ps, cron, at).

Unit-IV

Linux Redirection: Pipes, types of pipes. File links**.** Filters: grep, sed.

System Administration: Introduction, Login, privileges, File System, Mounting and Unmounting , Creating Files, Formatting File System, Storage of Files , Disk Related Commands, Disk Quotas, Adding User and Group, Deleting User and Group, Password File,

System Booting , Shutting Down, Handling User Accounts, Installing and Managing Terminals, Back Up, Security.

Unit-V

Shell scripting: Introduction, Types of Shells, Vi-editor, Editor modes, , Shell Meta Characters, Shell Variables, Shell Scripts, Shell Commands, The Environment Variables, String Manipulation, Special Command Line Characters , Decision Making and Loop Control, Functions, Arrays, Arithmetic Expression Evaluation, Data Compression Commands, Shell Input & Output.

COURSE OUTCOMES:

CO1. Students will be able to know what open source softwares are and various flavors of Open source Technologies.

CO2. Students will be able to know the installation process of Linux and its knowing about various System calls and Files.

CO3. Students will be able to execute various general purpose and admin commands..

CO4. Students will be able to understand and about linux pipes and basic Linux administration

CO5. Students will be able to know Linux shell Scripting and its basic programming.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsoryobjective-cum-short answer type questions from each unit, each carrying1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Das,S (2002)**, **"**Unix Concepts and Applications", **TMH.**
2. **Richard Petersen (2008)**, **"**LINUX: The Complete Reference", **TMH**.

References:

1. **Andrew M. St. Laurent**, "Understanding O p e n Source and Free Software Licensing", **O'Reilly Media**.
2. **Woods, D, Guliani, G**, "Open Source for the Enterprise", **O'Reilly Media**.
3. **Golden, B**, "Succeeding with Open Source", **Addison-Wesley Professional**
4. **Kanitkar**,**Y (2004)**, " Unix Shell Programming", **BPB.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MC-155	Soft Skills	--	50	--	50	3	0	0	--

Objective: *All over the world English language is spoken, written and read by millions of people. Globalization & the revolution in communication require proficiency in spoken and written English. The objective of the course is to help students to be proficient in English language. Lack of communication skills in English can become major obstacle in securing proper placement in India and abroad.*

Unit-I

Introduction: Communication: its type and mode. Verbal and Non-verbal. Barriers and Strategies to overcome the barriers. Intra Personal, Inter Personal and Group Communication, Impact of Information technology.
Applied Grammar: Tenses, Prepositions, Articles, Modal Auxiliaries.

Unit-II

Speaking Skills: Dialogue, Group Discussion, Presentation, Interview, Public Speech.
Writing Skills: Report Writing, Resumes, Business Letters, Agendas, Minutes.

Unit-III

Reading and Understanding: Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation(from Indian language to English and vice-versa). Article/ Book/ Film review.

Text Books:

1. **Freeman, S(2000),** Study Strategies in English, UOP, **New Delhi.**
2. **Grellett**, **F(1998),** Developing Reading Skills, **Cambridge University Press**.

References:

1. **Lesikar R V and Pettit Jr(1997),** Business Communication: Theory and Applications, **TMH, New Delhi.**
2. **Murphy, R(1998),** Advanced English Grammar, **Cambridge University Press.**
3. **Saben(2000)**, Practical Business Communication, **TMH, New Delhi.**

COURSE SCHEME & SYLLABUS FOR MCA
FOR THE YEAR

2020, 2021, 2022

SEMESTER-III

Course Code	Course Title (Core Courses)	Credits	Scheme of Examination			
			Duration	Marks		
			Hours	IA	UE	Total
MCA-351	Artificial Intelligence & Machine Learning	4	3	40	60	100
MCA-352	Theory of Computation	4	3	40	60	100
MCA-353	Computer Graphics	4	3	40	60	100
MCA-354	Web Technologies	4	3	40	60	100
	Elective-II	4	3	40	60	100
MCA-381	Lab 5: Python Programming	4	3	50	50	100
MCA-382	Lab 6: Web Technologies	4	3	50	50	100
Total Marks				**300**	**400**	**700**

List of Electives-II						
MCA-355	Data Warehousing and Data Mining	4	3	40	60	100
MCA-356	Wireless & Mobile Communication					
MCA-357	Bio Informatics					
MCA-358	Systems Software					
MCA-359	Cryptography & Network Security					
MCA-360	Big Data Analytics					
MCA-361	Internet of Things					
MCA-362	Natural Language Processing					
MCA-363	Android Application Development					
MCA-364	Research Methodology					

Note: Students will have to choose one course from the list of Electives depending upon the availability of faculty.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-351	Artificial Intelligence & Machine Learning	3	40	60	100	5	0	0	4

Objective:

The objective of the course is to acquaint the students to know how to design and develop the intelligent systems. Students might be able to get the knowledge of intelligent agent, knowledge base reasoning, searching and problem solving techniques, working with fuzzy values and multi agents based environment and knowledge acquisition of machine learning techniques.

Unit-I

Introduction to Artificial Intelligence: Foundation and History of Artificial Intelligence, Agents, types of Agents, Intelligent Agents, Structure of Intelligence Agents; Knowledge Based Agent, Environments and its types, Relationship between Environment and Agent.
Introduction to Knowledge representation, Hypothesis, Knowledge Levels, Knowledge Classification, Knowledge Representation Schemas; Logic Based, Procedural, Network and Structural Representations.

Unit-II

Searching and Problem Solving: Searching in Problem Solving, Problem Solving Agents; Uninformed Search Strategies, Breadth First Search, Iterative Deepening Search, Bidirectional Search, Informed Search Strategies; Action and Path Costs, Heuristic Functions, Greedy Best First Search, A* Search, IDA* Search.

Unit-III

Multi Agent Systems and Fuzzy Sets: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools. Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy Control System and Fuzzy Rule Based Systems.

Unit-IV

Introduction to Machine Learning: Overview of Machine learning (ML), Components of a learning problem, Applications, Choosing a Model Representation, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Reinforcement learning, Inductive Learning, Perspectives and issues in Machine learning, Concept of Clustering and Classification.

Unit-V

Neural Network: Neuron, Artificial Neural Networks (ANNs), Perceptrons, Gradient Descent, Backpropagation, Deep learning, Deep Neural Network, Hierarchical Representation, Unsupervised pre training, Activation Functions.

COURSE OUTCOMES:

CO1. Understand basic concepts of Artificial intelligence, early developments in this field, basic knowledge representation, problem solving, and learning methods of Artificial Intelligence. It also enables the students to Understand the applicability, strengths, and weaknesses of the basic knowledge representation

CO2. Implement a search problem as a state space, and how different types of search algorithms work like state space search, heuristic search, Greedy Best First Search, A* Search, IDA* Search.

CO3. understand basic concepts of Multi Agent Systems and Fuzzy Sets

CO4. Understand the basics of Machine Learning and its various techniques.

CO5. Understand the Artificial Neural Networks, types and its various techniques.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Russel,S and Norvig, P**,"Artificial Intelligence, A Modern Approach", **PHI**.
2. **Alpaydin. E, (2014), "**Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", **Third Edition, MIT Press.**.
3. **Kirthi Raman, Phuong Vo.T.H, Et al (2017)**,"Python: Data Analytics and Visualization" , **Packt Publishing**

References:

1. **Night, R**, "Introduction to Artificial Intelligence", **TMH.**
2. **Patterson, D W**,"Introduction to Artificial Intelligence and Expert Systems", Indian Reprint, **PHI**.
3. **Martin T. Hagan, Howard B. Demuth, Mark Beale, Orlando De Jesús,**"Neural Network design",**China Machine Press.**
4. **Tom Mitchell, "**Machine Learning", 1st Edition, **McGraw- Hill**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-352	Theory of Computation	3	40	60	100	5	0	0	4

Objective

The Theory of Computation is a scientific discipline concerned with the study of general properties of computation be it natural, man-made, or imaginary. The objective of the course is to understand the nature of efficient computation. The students shall also get acquainted with the relationship among formal languages along with notion of computability and common paradigms of computing.

Unit – I

Introduction: Finite Automata, Strings, Alphabets and Languages, state tables & diagram. Acceptability of a String by a Finite Automaton (FA). Regular Expressions (RE), Identities for Regular expressions, Conversion of FA to RE and vice versa.

Unit- II

Non-Deterministic Machines: Nondeterministic Finite State Machines, Conversion of NFA to DFA , The Equivalence of DFA and NDFA, Minimization of Finite Automata.

Transducers: Mealy & Moore machines, Conversion: Mealy to Moore, Moore to Mealy. Pumping Lemma for Regular sets.

Unit- III

Grammars: Context free Grammar, Right-Linear Grammar, Left-Linear Grammar, Derivation Trees, Parsing and Ambiguity, Top-down Parsing, Bottom-up Parsing , Chomsky Normal form and Greibach Normal form.

Unit- IV

Context Free languages: Properties of Context free languages. Chomsky Classification of languages.

Push Down Automaton: Introduction, Deterministic and Non Deterministic PDA, Relationship between PDA and CFL, Conversion from PDA to CFG.

Unit- V

Turing Machines: Computing with Turing Machines, Nondeterministic Turing Machines, Unrestricted Grammars, Context Sensitive languages, Church's Thesis, Types of Turing Machine (Multi-tape TM, Multi-Dimensional and Multi-Head TM), Universal Turing Machines, Concept of Halting problem.

COURSE OUTCOMES:

CO1. Students will be aware about the concepts of Automaton Theory and Formal Languages such as Alphabets, Strings and Regular Expressions.

CO2. Students might be able to understand the working of different types of Finite Automaton and these models such as Mealy and Moore Machine.

CO3. Students will be aware about the Grammars of Automaton and its normal forms.

CO4. Students will be able to understand the concept of Context Free Language and Pushdown Automaton.

CO5. Students might be aware about the concepts of Turing Machines and its various types and applications.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbook:

1. **Eugene Xavier, S.P**, "Theory of Automata and Formal Languages and Computation", **New Age International Publishers, New Delhi.**
2. **Mishra, K.L.P., and Chandrasekaran, N. (2010),** "Theory of Computer Science: Automata, Languages and Computation"**, PHI Learning Private Limited, New Delhi.**

References:

1. **Hopcroft, J., and Ullman, J. (1979)**, "Introduction to Automata Theory, Languages and Computation", **Addison-Wesley**.

Course Code	Title	Duration (hrs)	IA	UE	Total Marks	L	T	P	Credits
MCA-353	**Computer Graphics**	**3**	**40**	**60**	**100**	**5**	**0**	**0**	**4**

Objective:

The aim of this course is to provide an introduction to the theory and practice of computer graphics. The course will assume a good background in programming in C or C++ and a background in mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication. Students will use the standard library in programming illustrating the theory and practice of programming computer graphics applications.

Unit I

Introduction to computer graphics, Applications of Computer graphics, Graphical primitives, An introduction to graphical devices, Display Devices (Refresh Cathode Ray Tube, Raster-Scan Displays, Random-Scan Displays, Color monitor, Video Graphic Array, Flat Panel Displays, Plasma Panels), Input Devices.

Unit II

Graphical User Interface: Introduction, Types of Graphical User Interfaces, Designing a Graphical User Interface, Principles for Good Graphical User Interface.
2-D Graphics: DDA Algorithm, Bresenham's Line Algorithm, Midpoint Circle algorithm, Mid-point ellipse algorithm.

Unit-III

Polygon Filling: Boundary-Fill Algorithm, Flood-Fill algorithm.
Windows & View-point: Introduction to window and view-point. Windows to view-point mapping.
Clipping: Point Clipping, Line Clipping, Cohen Sutherland Line Clipping.

Unit-IV

Transformations: Introduction, Representation of a 2D object in matrix form, 2-D Transformations (Translation, Rotation, Scaling), Composite transformations, reflection, shearing.
3-D Transformation: Introduction, 3-D Transformations (Translation, Rotation, Scaling).
3D Projection: Parallel Projection, Perspective Projection.

Unit-V

Visible Surface Detection: Hidden Surface and lines,Back-face Detection Concept, A-Buffer Algorithm
Image Manipulation and Storage: Concept, Filtering (Overview), Mechanisms of image storage, Image processing.

COURSE OUTCOMES:

CO1. The student will get familiar with the basic concept of application of computer graphics, input devices and graphic display.

CO2. The student will learn about graphical user interfaces and study various graphics drawing algorithm.

CO3. Student will be able to fill figures using various graphics filling algorithm and perform window to view point transformation and applied clipping techniques to clipping objects against display window

CO4. Student will be familiarizing with transformation techniques which include 2D and 3D rotation translation and scaling and also perform parallel and perspective projection.

CO5. Student will able to understand the various hidden surface techniques and get the knowledge about the basic concept of image processing and storage

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Donald Hearn and M.Pauline Baker**, "Computer Graphics", **PHI.**

References:

1. **Foley, Van Dam, Feiner, Huges**, "Computer Graphics", **Pearson Edition.**
2. **Steven Harrington**, "Computer Graphics: A–Programming Approach", **TMH.**
3. **ISRD Group** "Computer Graphics", **Tata McGraw Hill, New Delhi.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-354	Web Technologies	3	40	60	100	5	0	0	4

Objective:
The course is designed to acquaint the students with the techniques to design and develop the web based applications. Students might be able to work on the Dot Net Framework Environment (ASP Dot Net) using Database connectivity for developing dynamic applications.

Unit-I

Introduction to HTML and CSS: Introduction, HTML tags: types, Formatting text, Controlling fonts, Tables, Adding pictures, adding links, creating forms working with text boxes, radio buttons, check boxes, dropdown menu, submit button setting up frames, creating web pages, Page Navigation in HTML, Introduction to CSS and its types, CSS properties.
Introduction to IIS: Introduction, configuring IIS. Deploying a web Application.

Unit-II

.Net Framework and IDE: Introduction, .Net Architecture, CLR, MSIL And JIT, Class Library.
Introduction to ASP.NET: Architecture, Application Domain, Life cycle of a Web Form.
Standard Controls in ASP.NET :(Text Box, Button, Label, Image Control, Drop Down List, Check Box Control), Navigation control (Tree view Control, Menu Control), Validation Controls, Login Controls, HTML controls in ASP.NET, Master Page.

Unit-III

OOPS Concepts using C#: Introduction to Classes, Objects and Constructors, Argument Passing, Passing Objects and Lists. Polymorphism, Inheritance (Single and multiple), Interfaces and Inheritance, Abstract Class and Interfaces. Strings & Mutable Strings.
Delegates and Events: Introduction, Delegate: Declaration, Methods, Instantiation, Invocation.
Error & Exception Handling. Working with Date and Time.

Unit-IV

ASP.Net Objects: Request Object, Response Object, State Management in Asp.NET (Hidden Field ,View State, Cookies, Query Strings, Session Application).
Data Base Connectivity: Architecture of ADO .Net, Server Explorer, Connecting with databases using OLEDB and SQL server, working with dbConnection Class, dbCommand Class, dbDataReader Class, dbTransaction Class, dbDataAdapter Class, Data Set Class.

Unit-V

Working with Data and Data Controls: Data Bound Controls (List Control, Iterative Controls, View Controls, GridView Control). Creating New Data Connection in Code and perform data Manipulations in Code. Reporting in ASP.NET.

COURSE OUTCOMES:

CO1. Student will be able to understand the basic principles of web designing and design web pages using HTML and Cascading Style sheets.

CO2. Students will be able to understand ASP.NET architecture. Student will be able to work with ASP.NET standard controls and develop interactive web applications. Student will also implement validation and authentication in web application.

CO3. Student will be able to understand the basic concepts of C# language.

CO4. Student will able to understand the concept of Request and Response objects in ASP.NET. Student will able to implement state management in web applications. Student will able to work with different databases, retrieve and manipulate data using ADO.NET.

CO5. Student will able to make use of databound controls and create reports in ASP.NET.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Platt ,D S (2005),** "Introducing Microsoft .Net", **Microsoft Press,PHI.**
2. **Simon et. al(2005),** " C# for Begineers", **Wrox Publications.**
3. **Simon et. al(2005),** "Professional C#", **Wrox Publications.**
4. **Deitel & Deitel,** "Internet & WWW HOW to Program," 3rd Edition, 2005, **PHI**.
5. **Dino Esposito, "**Programming Microsoft ASP.NET 4", 1st Edition,2011, **Dreamtech Press.**

References:

1. **Schildt, H(2005),** "The Complete Reference C #",**TMH.**
2. **Kogent Learning Solutions Inc (2009), "**Black Book ASP.NET 3.5", Beginners Edition, **Dreamtech Press.**
3. **Imar Spaanjaars, "**Beginning ASP.NET 4: in C# and VB", **WROX publication.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-381	Lab 5: Python Programming	3	50	50	100	0	0	6	4

Objective:

This course acquaints students to understand Python as a scripting language for developers and learn the advanced features of it and their implementation. The students shall learn to identify language components and know how they work together in real time applications.

Unit-I

Basic Concepts: Comments in Python, Statements, Keywords, Identifiers, Variables, Executing python programs(interactively, from a file, other methods),Overview of IPython, Anaconda, Conda and Jupyter Notebook.

Unit-II

Data types: Numbers(integers, floating point, complex and bool), Type casting (Implicit Explicit),
Strings basics: (creating, initializing, accessing elements of string), Operators(Arithmetic, Logical, Bitwise, Boolean, Identity, Special)
Functions: Built- in Functions, Calling a function, passing variables in a function call, Function Arguments.

Unit-III

Flow control statements, if –elif-else…, while loop, For loop, Range function.
Python Exceptions, Built in exception, User defined exception, Single line comments and multiline comments.
Python Modules, Basics of NumPy and SciPy: N dimensional array in Numpy, methods and properties of Numpy, array indexing in Numpy.

Unit-IV

Lists: Accessing list, Operations ,Working with lists , Function and Methods
Tuple: Accessing tuples, Operations, Working Functions and Methods
Dictionaries: Accessing values in dictionaries, Working with dictionaries, Function and Methods

Unit-V

Pandas: Pandas to open csv files, Reading HTML Files, Reading and Writing to JSONfiles. Overview of SymPy and Matplotlib.

COURSE OUTCOMES

CO1. Understand basic concepts of python, writing and Executing python programs (interactively, from a file, other methods).

CO2. Understanding use of **Data types**, Type casting (Implicit Explicit),**String basics**, Operators (Arithmetic, Logical, Bitwise, Boolean, Identity, Special) and **Function**s

CO3. Understand and implement **Flow control statements**, Python Exceptions and **Python Modules**

CO4. Implementing **Lists, tuples** and Dictionaries and various operations on them.

CO5. Understand Pandas, using Pandas to open csv files, Reading HTML Files, Reading and Writing to JSON files.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-382	Lab 6: Web Technologies	3	50	50	100	0	0	6	4

Objective:

The course is designed to acquaint the students with the techniques to design and develop the web based applications. Students might be able to work on the Dot Net Framework Environment (ASP Dot Net) using Database connectivity for developing dynamic applications.

Unit-I

Introduction to HTML and CSS: HTML tags: types, Formatting text, Controlling fonts, Tables, Adding pictures, adding links, creating forms working with text boxes, radio buttons, check boxes, dropdown menu, submit button setting up frames, creating web pages, Page Navigation in HTML, Introduction to CSS and its types, CSS properties.

Introduction to IIS: configuring IIS. Deploying a web Application.

Unit-II

.Net Framework and IDE: CLR, MSIL And JIT, Class Library.

Introduction to ASP.NET: Standard Controls in ASP.NET :(Text Box, Button, Label, Image Control, Drop Down List, Check Box Control), Navigation control (Tree view Control, Menu Control), Validation Controls, Login Controls, HTML controls in ASP.NET, Master Page.

Unit-III

OOPS Concepts using C#: Classes, Objects and Constructors, Argument Passing, Passing Objects and Lists. Polymorphism, Inheritance (Single and multiple), Interfaces and Inheritance, Abstract Class and Interfaces. Strings & Mutable Strings.

Delegates and Events: Delegate, Methods, Instantiation, Invocation. Error & Exception Handling. Working with Date and Time.

Unit-IV

ASP.Net Objects: Request Object, Response Object, State Management in Asp.NET (Hidden Field ,View State, Cookies, Query Strings, Session Application).

Data Base Connectivity:Connecting with databases using OLEDB and SQL server, working with dbConnection Class, dbCommand Class, dbDataReader Class, dbTransaction Class, dbDataAdapter Class, Data Set Class.

Unit-V

Working with Data and Data Controls: Data Bound Controls (List Control, Iterative Controls, View Controls, GridView Control). Creating New Data Connection in Code and perform data Manipulations in Code. Reporting in ASP.NET.

COURSE OUTCOMES:

CO1. Student will be able to understand the basic principles of web designing and design web pages using HTML and Cascading Style sheets.

CO2. Students will be able to understand ASP.NET architecture. Student will be able to work with ASP.NET standard controls and develop interactive web applications. Student will also implement validation and authentication in web application.

CO3. Student will be able to understand the basic concepts of C# language.

CO4. Student will able to understand the concept of Request and Response objects in ASP.NET. Student will able to implement state management in web applications. Student will able to work with different databases, retrieve and manipulate data using ADO.NET.

CO5. Student will able to make use of databound controls and create reports in ASP.NET.

Text Books:

1. **Platt ,D S (2005),** "Introducing Microsoft .Net", **Microsoft Press,PHI.**
2. **Simon et. al(2005),** " C# for Begineers", **Wrox Publications.**
3. **Simon et. al(2005),** "Professional C#", **Wrox Publications.**
4. **Deitel & Deitel,** "Internet & WWW HOW to Program," 3rd Edition, 2005, **PHI**.
5. **Dino Esposito, "**Programming Microsoft ASP.NET 4", 1st Edition,2011, **Dreamtech Press.**

References:

1. **Schildt, H(2005),** "The Complete Reference C #",**TMH.**
2. **Kogent Learning Solutions Inc (2009), "**Black Book ASP.NET 3.5", Beginners Edition, **Dreamtech Press.**
3. **Imar Spaanjaars, "**Beginning ASP.NET 4: in C# and VB", **WROX publication.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-355	Data Warehousing and Data Mining	3	40	60	100	5	0	0	4

Objective:

The main aim of the course is that to acquaint the students about architecture and models of data warehousing to store the data. It also make students understand about the various data mining techniques such as data clustering and classifications of data. The soft computing and its techniques are also introduced.

Unit-I

Data Warehousing: Introduction to Data Warehousing: Definition, Data warehouse vs Operational data base systems, Multi-tiered architecture of data warehouse, Data warehouse models: Enterprise, Data mart and Virtual Warehouse, Metadata repository, Data warehouse modeling: Introduction to Data Cube, OLAP and OLTP.

Unit-II

Data mining Basics: Introduction to Data Mining: Definition, Data mining vs Traditional data analysis, Data mining process, Data mining techniques, Data mining tasks, Data mining applications, Challenges and Issues in data Mining, Future of data mining.

Unit-III

Association Rule Mining and Classification: Association Rule mining: Introduction and Importance, Basic association rule mining Algorithms: Apriori, Sampling and Partitioning. Classification: Introduction and Importance, Different Classification Algorithms: Distance based (k-nearest neighbor) Decision trees (ID3).

Unit-IV

Cluster Analysis: Cluster Analysis: Introduction and Importance, Similarity and Dissimilarity measures, Different Clustering Techniques: Hierarchical Technique (Divisive and Agglomerative), Partitioning (k-means, k-mediods), Density based (OPTICS, DenClue, DBSCAN), Grid based (Sting, CLIQUE).

Unit-V

Soft Computing: Introduction to Soft Computing, Soft Computing vs Hard Computing Introduction to different soft computing techniques (Neural Networks, Fuzzy Sets, Rough Sets and Genetic Algorithms) and their utility in data mining.

COURSE OUTCOMES:

CO1. Students will be able to understand the concepts of Data Warehousing and its various models.

CO2. Students will be able to understand the concepts of Data Mining basics such as Data Mining Processes, Techniques, Tasks, Applications and Issues.

CO3. Students will be able to understand and use the various Data Mining Algorithms related to Association Rule Mining and Clustering such as Apriori, Decision Tree and Sampling and Classifications.

CO4. Students will be able to understand and work with Clustering Techniques such as Partitioning, Hierarchical, Density Based and Grid Based.

CO5. Students will be aware about the concepts of Soft Computing and various techniques such as Neural Network, Fuzzy Sets, Rough Sets and Genetic Algorithm.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Dunham, H,M**, "Data Mining: Introduction and Advanced Topics", **Pearson Education**.
2. **Pang Ning tan, Michael S,B and Kumar V**, "Introduction to data Mining", **Pearson Education.**
3. **Arun K Pujari**, "Data Mining Techniques", **University Press**.

References:

1. **J. Han, M Kamber (2001),** "Data Mining Concepts and Techniques", **ISBN 1-55860-489-8, Morgan Kufman Publishers.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-356	Wireless and Mobile Communication	3	40	60	100	5	0	0	4

Objective:
The objective of the course is to acquaint students with the technologies involved in wireless communications and make them understand the mobile communication infrastructure and operating environments.

Unit I
Introduction to Wireless Communication: Various Types Of Wireless Communication Systems (Paging System, Cordless Telephone Systems, Cellular Telephone Systems); Comparison Of Common Wireless Communication Systems; Applications Of Wireless Communication; Introduction To Various Generations Of Mobile Phone Technologies And Future Trends; Concept Of Mobile Originated & Mobile Terminated Calls.

Unit II
Introduction to Cellular concept: Cell fundamentals; Frequency reuse; Channel Assignment Strategies; Handoff strategies (Prioritizing & Practical Handoff Considerations); Interference & System capacity (Co-channel Interference, Adjacent Channel Interference), Concept of trunking; Concept of Coverage Area, Cell splitting and Sectoring.

Unit III
Wireless transmission concepts: Concept of signals; Antennas, Types of antennas; Signal propagation (Path-loss of Radio Signals, Multi-path propagation); Concept of multiplexing, Comparison of FDM, TDM, CDM Techniques; Basic Concept of Spread Spectrum (SS) Techniques (Direct Sequence and Frequency Hopping Spread Spectrum).

Unit IV
CDMA: Introduction to IS-95 CDMA,Concept of CDMA Channels (Forward and Reverse CDMA channels for a Cell; Concept of Code channels within CDMA Channel; Purpose of Pilot, Sync, Paging and Traffic channels.
General Introduction to GPRS, Bluetooth, Infrared Technology.

Unit V
GSM: Mobile Communication System: Basic GSM architecture; Terminology and interfaces; Components of Wireless Communication Infrastructure (MS, BTS, BSC, MSC) their basic functions and characteristics; Mobility Management Issues – Initiation of handoffs, Types of handoffs, Concept of roaming and Registration; Use of HLR and VLR in Mobile networks. Introduction to 3G and 4G Technology.

COURSE OUTCOMES:

CO1. Students will be able to explain different wireless technologies, their applications and future trends.

CO2. Students will be able to explain the working of cellular networks, frequency reuse, handoff techniques etc.

CO3. Students will be able to explain the wireless transmission concepts such as antennas, Modulation techniques, and spread spectrum etc.

CO4. Students will be able to understand and explain the CDMA technology concepts.

CO5. Students will be able to understand and explain the GSM technology concepts.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Jochen Schiller**, "Mobile Communication", 2nd Ed., **Pearson edition.**

References:

1. **K. Pahlavan**, P. Krishnamurthy "Principles of Wireless Networks", **PHI, New Delhi.**
2.**Theodore S. Rappaport**, "Wireless Communication Principles & Practice", 2nd Ed. **PHI, New Delhi.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-357	Bio Informatics	3	40	60	100	5	0	0	4

Objective:
The aim of the course is to introduce students the fundamental concepts of Bioinformatics. The students shall be able to organize vast reams of molecular biology data in an efficient manner and develop tools that aid in the analysis of such data so as to interpret the results accurately and meaningfully.

Unit-I

Introduction: Aim and branches of Bioinformatics, Applications of Bioinformatics.
Basic Bimolecular concepts: Proteins and amino acids, DNA & RNA, Sequence, structure and function. Forms of biological information,
Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs). DNA sequencing methods: Basic and Automated DNA sequencing.

Unit-II

Biological Databases: Protein Sequence and Structural Databases, Nucleotide Sequence Databases; NCBI, PubMed, Protein Data Bank(PDB), PIR, UniProt, EMBL, GenBank, DDBJ, SRA, UniGene; Specialized Databases: Pfam, SCOP, GO, Metabolic Pathways.

Unit-III

Sequence Analysis: Basic concepts of sequence similarity, identity and homology; Methods of Sequence Analysis - Pairwise sequence alignment methods; Heuristic Methods; BLAST and its variants, Statistics of Sequence Alignment Score; E-Value, P-Value, Scoring matrix, PAM, BLOSUM and Gap Penalty; Multiple Sequence Alignments; ClustalW, Hidden Markov Models, HMM Based Multiple-Sequence Alignment.

Unit-IV

Phylogenetic Analysis: Distance and Character Based Methods and Software, Computing Tools for Phylogenetic Analysis, Distances, GROWTREE, PAUP, PHYLIP and MEGA; Construction and Visualization Phylogenetic Tree; and Application of Phyolgenetic Analysis.

Unit-V
Secondary Structure Analysis Tools: Sequence Motif Databases, Pfam, PROSITE, Protein Structure Classification; SCOP, CATH, Other Relevant Databases, KEGG, Protein Structure

Alignments; Structure Superposition, RMSD, Different Structure Alignment Algorithms, DALI, and TMalign.

COURSE OUTCOMES:

CO1: Gain the knowledge and awareness of the basic principles and concepts of biology.
CO2: Understand and evaluate the existing biological databases and to use this information in computer modeling
CO3: Understand and evaluate the various concepts and methods of sequence analysis.
CO4: Understand and evaluate the various concepts and methods of Phylogenetic sequence.
CO5: Understand the Secondary Structure Analytical Tools.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Jin Xiong,** " Essential Bioinformatics" , **Cambridge University Press Tramontano**.
2. **Mount D.,(2004)**," Bioinformatics: Sequence and Genome Analysis", **Cold Spring Harbor Laboratory Press, New York.**

References:

1. **Teresa K. Attwood, David J.Parry-Smith (1999)**, "Introduction to Bioinformatics", **Pearson Education.**
2. **Jean-michel Claverie CedricNotredame (2002)**, "Bioinformatics for Dummies", **Dummies Publications**.
3. **Chapman**, "Introduction to Bioinformatics", **Hall Series**.
4. **Jiang, R,** " Basics of Bioinformatics" ,**TSINGHUA University Press, Springer**.
5. **Baxevanis, A.D, Francis Ouellellette, B.F. (2009)**," Bioinformatics-a Practical Guide to the Analysis of Genes and Proteins", **Wiley India Pvt Ltd .**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-358	Systems Software	3	40	60	100	5	0	0	4

Objective:

The main objective of this course is to make student familiar with the design concepts of various system software like Assembler, Linker, Loader and Macro pre-processor, Utility Programs such as Text Editor and Debugger.

Unit-I

Introduction to Machine Structure: Concept, Evolution of the Components of a programming system (Assembler, Loaders, Macros, Linkers, Compilers, Operating System).

Unit-II

Assemblers: Introduction, Design of an assembler(statement of the problem, data structure and format of databases, algorithm, look for modularity).
Table Processing: Searching (linear, binary), Sorting(interchange sort, shell sort ,bucket sort, radix exchange sort).

Unit-III

Macros: Introduction, Macros Instructions, Features of a Macro facility(Macro Instruction Arguments, Conditional Macro Expansion, Macro calls within Macros, Macro Instructions defining Macros),Implementation of a Restricted facility- A Two-Pass Algorithm, A Single-Pass Algorithm, Implementation of Macro calls within Macros.

Unit-IV

Loaders & Linkers: Introduction, loader Schemes (Compile and go loaders, general loader scheme, absolute loaders, subroutine linkages), other loader schemes (binders, linking loaders, overlays and dynamic binders), Design of an Absolute loader.

Unit-V

Compilers: Introduction, Statement of problem, phases of compiler (lexical phase, syntax phase, interpretation phase, optimization, storage assignment code generation and assembly phase), passes of a compiler.

COURSE OUTCOMES:

CO1. Students will aware about the Machine (Computer Systems) Structures.

CO2. Students will be aware about Assemblers Designing and its various Functions.

CO3. Students will be able to understand the concepts and functions of Macros within systems.

CO4. Students might be able to understand the designing concepts and functions of Loader and Linker.

CO5. Students will be able to understand the designing concepts and functions of Compiler within Systems.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. **Donovan. John. J**, "Systems Programming", **TMH.**

References:

1. **Dhamdhere.D.M**, "System Programming & Operating Systems",2nd Ed. **JMH.**
2. **Ullman, J.D**, "Fundamantals of Programming System", **Addison and Wesley.**
3. **Leland L. Beck**, "System Software" 4th Ed. **Addison and Wesley.**
4. **Barron D.W**, "Assemblers & Loaders", **Mc. Donald and Javes.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-359	Cryptography & Network Security	3	40	60	100	5	0	0	4

Objective:

The course is designed to acquaint the students about security of computer networks when data is transmitting from source to destination and vice versa. Students might be able to apply the cryptographic techniques (protocols) to ensure the network security.

Unit-I

Introduction to concept of security: Need for security, Security approaches (security models, security management practices), Principles of security, Types of attacks (theoretical concepts, practical side of attacks, packet sniffing, packet spoofing)

Unit-II

Cryptographic Techniques-I: Introduction, Plain text, Cipher text, Substitution techniques, Transposition techniques, Encryption, Decryption, Symmetric Key Cryptography (overview of DES), Steganography, Key range, Key size, Possible types of attacks.

Unit-III

Cryptographic Techniques-II: Asymmetric key Cryptography(Overview), RSA algorithm, Digital signatures, Overview of Knapsack algorithm, Public Key Infrastructure (PKI), Digital Certificates, Private Key Management, PKIX Model.

Unit-IV

Internet Security Protocols: Basic Concepts, Secure Socket Layer(SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), Electronic Money, Email Security, Wireless Application Protocol (WAP) Security.

Unit-V

Network Security & Authentication: User Authentication Mechanism & Network Security, Authentication Basics, Passwords, Authentication Tokens, Certificate based Authentication, Biometric Authentication, Kerberos, Firewalls, IP Security, Virtual Private Networks.

COURSE OUTCOMES:

CO1. The students will get an insight about the various security principles and issues in the computer networks. The students will get the knowledge about various types of attacks that are possible in the world of Internet.

CO2. The students will learn various encryption and decryption techniques for ensuring the data security.

CO3. The students will learn about various Asymmetric key cryptographic techniques, knapsack algorithms and various strategies to manage the public and private keys.

CO4. The students will get familiar with basic concepts about incorporating Internet Security via various mechanisms and protocols like SSL, TLS, etc. The students will learn how to ensure email security by PGP and various other similar protocols.

CO5. Student will able to understand various user authentication mechanisms (biometric, certificate-based, etc) and will be able to learn about various other Network security mechanisms.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Atul Kahate,** "Cryptography and Network Security", **TMH**.

References:

1. **William Stallings**, "Cryptography and Network Security: Principles and Practices," **PHI**.
2. **Bragg, R and Rhodes, M (2004)**,"Network Security: The Complete Reference", **TMH.**
3. **Maiwald, E (2004)**, "Fundamentals of Network Security", **Dreamtech Press.**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-360	Big Data Analytics	3	40	60	100	5	0	0	4

Objective:

The main objective of this course is to make student familiar with the concepts of Big Data that helps them to understand its impact in a better way, and helps it narrow down the target audience, thus improving their marketing campaign. The analytical part acquaints the students to handle the big data from diverse streams. The course also acquaints the students about the knowledge of open source tool Hadoop.

Unit-I

Introduction to Big Data: Fundamentals of Big-data, Big data applications, Challenges in Big Data, Importance of Big Data

Big Data Analytics: Introduction to Big Data analytics, Overview & analytics life cycle, Need, Structured and multi-structured data analysis, Big-data analytics major components.

Unit-II

Models: Analytical models and approaches, Relational and non-relational Databases, Application areas, Design and analysis of Analytics model-Analytics design steps, Choosing and evaluating models, mapping problems to machine learning, evaluating clustering models, validating models. Cluster analysis, K-means algorithm, Naïve Bayes, Memorization Methods, Linear and logistic regression, Unsupervised methods.

Unit-III

Introduction to Hadoop-I: Big Data, Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop, Understanding inputs and outputs of MapReduce, Data Serialization.
Hadoop ecosystem components, Schedulers, Fair and Capacity, Hadoop 2.0 New Features, NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

Unit-IV

Hadoop-II: Clustered Hadoop environment, Advanced HDFS, Graph Algorithms, Searching and Indexing approaches, MapReduce Applications, Introduction to Pig and HIVE- Programming Pig: Engine for executing data flows in parallel on Hadoop, Programming with Hive: Data warehouse system for Hadoop.

Unit-V

Privacy and Security in Big Data: Privacy, Reidentification of Anonymous People, Why Big Data Privacy is self regulating?, Ethics, Ethical Guidelines, Big Data Security , Organizational Security, Steps to secure big data , Classifying Data, Protecting , Big Data Compliance, Intellectual Property Challenge, Overview of Open Problems.

Social network mining concepts.

COURSE OUTCOMES:

CO1. Students will be introduced with the concept of Big Data, and Big data Analytics.

CO2. Students will be introduced with supervised and unsupervised learning and various machine learning algorithms.

CO3. Student will be able to understand Hadoop architecture and EcoSystem.

CO4. Student will be write Map-Reduce Programming and others programming related to Hadoop.

CO5. Student will able to understand privacy and security issues related to Big Data.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. Big Data", Black Book DT Editorial Services, **Wiley publications.**
2. Data Sciences & Big Data Analytics: Discovery Analysing visualizing and presenting Data, EMC Education Services, **Wiley publications.**

Course Code	Title	Duration (hrs)	IA	UE	Total Marks	L	T	P	Credits
MCA-361	**Internet of Things**	**3**	**40**	**60**	**100**	**5**	**0**	**0**	**4**

Objective:

The main objective of this course is to make student familiar with the concepts of Internet of Things and existing technologies based on it. It will provide the way to identify the problems which might be solved by IoT with feasible solution.

Unit-I

Introduction and Concepts: Components of Internet of Things (IoT), Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates.
IoT Architecture: Reference Model, SOA-Based, API-Based

Unit-II

IoT Devices & Objects: Transducers, Actuators, Sensors, Smart Objects, Embedded Devices, Arduino, Raspberry Pi, RFID.
Introduction Communication Technologies: M2M, D2D, D2Gateway, Difference between IoT &M2M.
Introduction to Computing Technologies: Edge Computing, Fog Computing, Cloud Computing with respect to IoT

Unit-III

Intoduction to Protocols: IoT Protocol Stack, IPv6.
Application Layer Protocols: CoAP, MQTT, XMPP, AMQP.
Data Link Protocols: IEEE 802.15.4e, IEEE 802.11 ah, Bluetooth Low Energy, Zigbee, LoRaWAN.
Network Layer Routing/Encapsulation Protocols: RPL, CORPL, CARP, 6LoWPAN.
Session Layer Protocols: MQTT, SMQTT, AMQP, CoAP, XMPP

Unit-IV

Introduction of IoT Privacy and Security: Concept, Threats & Attacks on Different Layers, Security Models, Privacy Preserving Techniques used in IoT
Security in IoT Protocols: MAC 802.15.4: 6LoWPAN, RPL, Application Layer

Unit-V

Data Analytics in IoT: Data Acquiring, Organizing, Processing & Analytics, Concept of Apache Hadoop, Apache Spark, Apache Oozie, Apache Storm
Applications of IoT: Smart Cities, Home Automation, Health, Industry, Energy, Environment, Retail, Logistics, Agriculture, Life Style

COURSE OUTCOMES:

CO1. Students will be introduced with the concept of basic concepts of Internet of Things.

CO2. Students will be introduced with knowledge on enabling technologies of IoT.

CO3. Student will be able to understand machine to machine communication systems.

CO4. Student will be able to analyze the real life problems for providing technology based solution.

CO5. Student will able to identify the problems for providing technology based solutions and have skills on the Design of IoT based Applications.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Textbooks:

1. **Bahga, A ,Madisetti, V (2015)**, "Internet of Things-A Hands-on Approach", **Universities Press (India).**
2. **Buyyaand, R, Dastjerdi,A.V(2016) ,** "Internet of Things: Principles and Pradigms", **Cloud Computing and Distributed Systems (Clouds)** Laboratory, ManjaSoft Pvt Ltd., Australia.
3. **FeiHu**,"Security and Privacy in Internet of Things (IoTs) Models, Algorithms and Implementations", **CRC Press.**

References:

1. **Kellmereit. D, Obodovski. D (2013)** ," The Silent Intelligent-The Internet of Things", Published by **DND Ventures LLC, 1st Edition**.
2. **Hersent. O, Boswarthick . D, Elloumi . O (2017),"**The Internet of Things Key Applications and Protocols", Published by **Wiley, Reprint**.

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-362	Natural Language Processing	3	40	60	100	4	1	0	4

Objective:

The aim of this course is to acquaint the students about natural language processing and learn how computers achieve human-like comprehension of texts/languages. The students shall also be able to understand, draw inferences from, summarize, translate and generate accurate and natural human text and language.

Unit –I

Introduction to Natural Language Processing: Natural Languages and Formal Languages, Regular Expressions and Automata, Words and their Analysis. Tokenization, Stemming, Part of Speech (POS) tagging, Morphological Analysis.

Unit –II

N-Grams and Part of Speech Tagging

N-grams Models of Syntax, Counting Words in Corpora, Simple (Unsmoothed) N-grams, Smoothing, Backoff, Part of speech Tagging, Rule-Based Part of Speech Tagging, Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models and Conditional Random Fields

Unit –III

Syntax Parsing

Context-Free Grammars for English Syntax, Context-Free Rules and Trees, Sentence, Level Constructions, Agreement, Sub Categorization, Parsing with Context-Free Grammars, Top-down Parsing, Bottom-Up Parsing, Feature Structures, Probabilistic Context-Free Grammars.

Unit -IV

Semantic Analysis

Representing Meaning, Meaning Structure of Language, First Order Predicate Calculus, Represe nting Linguistically Relevant Concepts, Syntax-Driven Semantic Analysis, Word-Sense disambiguation, Supervised – Dictionary based and Unsupervised Approaches – Machine Learning.

Unit –V

Applications of Natural Language Processing

Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering.

COURSE OUTCOMES:

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

CO1.Understand the basic concepts of Natural Language Processing, Natural Languages and Formal Languages and Regular Expressions and Automata.

CO2. Understand N-Grams and Part of Speech Tagging using various approaches.

CO3. Understand Syntax Parsing, Context-Free Grammars for English Syntax, and Probabilistic Context-Free Grammars.

CO4. Understand Semantic Analysis, Word-Sense disambiguation using Supervised and Unsupervised Approaches.

CO5.Understanddifferent applications of Natural Language Processing

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

Text Books:

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition),Prentice Hall.
2. Foundations of Statistical Natural Language Processing by Christopher D. Manning andHinrichSchuetze, MIT Press
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python,O'Reilly Media;

References:

1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: AnOutline of Theories, Implementation, and Application with Special Consideration ofEnglish, French, and German (Cognitive Technologies) Softcover reprint.
2. James Allen, Natural Language Understanding, Addison Wesley;

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-363	Android Application Development	3	40	60	100	5	0	0	4

Objective:

The aim of this course is to acquaint the students about the Android OS architecture, applications development lifecycle and its connectivity with databases. The students shall also be able to get familiarize with Android's APIs for data storage, retrieval, user preferences, files and content providers.

Unit – I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Overview of OOPs using JAVA/Kotlin.

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes.

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

Unit -II

Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts – Linear, Relative, Grid and Table Layouts.

User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers.

Event Handling – Handling clicks or changes of various UI components.

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

Unit -III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS.

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity.

Notifications – Creating and Displaying notifications, Displaying Toasts.

Unit -IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference.

Unit -V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update) Creating a Android Application, Deployment of Application on Mobile Phone.

COURSE OUTCOMES:

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

CO1. Understand the basic concepts of Android operating systems and its components.

CO2. Understand user interface and event handling.

CO3. Understand intents and broadcasts: receiver and notification.

CO4. Understand File storage in android environment.

CO5. Understand the connectivity and designing of database with android applications.

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

TEXT BOOKS:

1. Meier. R (2012), "Professional Android 4 Application Development:" , **Wiley India, (Wrox)** ,
2. Sheusi. J. C (2013), " Android Application Development for Java Programmers" , **Cengage Learning.**

REFERENCE:

1. Wei-Meng Lee (2013), "Beginning Android 4 Application Development" , **Wiley India (Wrox).**

Course Code	Title	Scheme of Examination				Hrs/Week			Credits
		Duration (hrs)	IA	UE	Total Marks	L	T	P	
MCA-364	Research Methodology	3	40	60	100	5	0	0	4

Objective:
The course will acquaint the students to learn to review the literature survey aspects of the problem so as to make them able to compile, analyze, and present their results. The course also emphasized on the research publication ethics and the intellectual property rights.

Unit-I

Research: Definition and meaning of Research, Characteristics of research, Types of Research, Steps in research (Identification, Selection and Formulation of research problem), Research Question, Research Design, Formulation of Hypothesis, Review of Literature.

Unit-II

Sources of Literature/Information: General books, Text books, Reference books.
Periodicals: Journals, Magazines, Newspapers, serials, Index Services, Abstracting Services, Newsletters, Bulletins, etc. referred & Peer reviewed journals, ISSN No, Journal Impact Factor.
Electronic Source: open Access, Subscribed; Technophobia & Technophilia.

Unit-III
Sampling Techniques: Sampling theory, types of sampling, Steps in Sampling, Sampling and Non-sampling error, Sample size, Advantages and limitations of sampling. Collection of Data: Primary Data, Meaning, Data Collection methods, Secondary Data, Meaning, Relevance, Limitations.
Statistics in Research: Measure of central tendency, Dispersion, Hypothesis, Fundamentals of Hypothesis Testing, Standard Error, Point and Interval estimates. Important Non-Parametric tests: Sign, Run.

Unit-IV

Para metric Tests: Testing of significance, Mean, Proportion, Variance and Correlation, testing for Significance between means, proportions, Variances and correlation co-efficient. Chi-square tests, ANOVA-One-way and Two-way.

Unit-V

Research Report: Types of reports, contents, styles of reporting, Steps in drafting reports, Editing the final draft, Evaluating the final draft.

Literature review & Information Ethics: Review writing; Acknowledging authors; citation, citation styles; Information ethics, Intellectual theft, Plagiarism, Self Plagiarism.
Copyright, Censorship, Intellectual Property Rights.

COURSE OUTCOMES:

CO 1: Develop understanding on various kinds of research, objectives of doing research, research process and formulation of research problem.

CO 2: The student shall be able to have basic knowledge of Sources of Literature.

CO 3: The student shall be able to learn the Sampling & Statistical Techniques so as to apply the same in various problems during quantitative data analysis.

CO 4: The Students will be able to know various concepts of data analysis-and hypothesis testing procedures

CO 5: This unit enables the student to develop the way of report writing and perform literature reviews using print and online databases; and explain the rationale for research ethics, and the importance of IPR

Note for Paper Setting:

The question paper will be divided into two sections. **Section A** will include 10 compulsory objective-cum-short answer type questions from each unit, each carrying 1 mark. **Section B** will have ten (10) long answer questions, two from each unit. The student will have to attempt one (01) question from each unit. Each question will carry 10 marks.

References:

1. **S.P. Gupta**, " Statistical Methods"
2. **C.R. Kothari**, " Research Methodology Methods and Techniques".
3. **B.N Gupta**, " Statistics (Theory and Practice)".
4. **Santosh Gupta**, "Research Methodology Methods and Techniques".

COURSE SCHEME & SYLLABUS FOR MCA

FOR THE YEAR

2020, 2021, 2022

SEMESTER-IV

Course Code	Course Title (Core Course)	Course Components	Credits	Scheme of Examination			
				Duration	Marks		
				Hours	IA	UE	Total
MCA-451	Major Project (Industrial/ Research)	(A) Project Problem Identification & Seminar	2	--	50	--	**50**
		(B) Dissertation	6	--	50	100	**150**
		(C) Presentation	4	--	40	60	**100**
		(D) Viva-voce	4		40	60	**100**
Total			**16**	--	**180**	**220**	**400**

IA – Internal Assessment
UE – University Examination