SHREE RAMDEOBABA COLLEGE OF ENGINEERING & MANAGEMENT, NAGPUR
DEPARTMENT OF COMPUTER APPLICATION

CHOICE BASED CREDIT SYSTEM

Semester-I

Sr. No.	Code	Course	Category	L	P	Credits	Maximum Marks			Exam Duration
							Continuous Assessment	End Sem Exam	Total	
1	MCT530	Computer Organization & Architecture	CORE	4	0	4	40	60	100	3 Hrs.
2	MCT531	Concepts in Data Structures	CORE	4	0	4	40	60	100	3 Hrs.
3	MCP531	Concepts in Data Structures Lab	CORE	0	4	2	25	25	50	-
4	MCT532	Principles of Programming Languages	CORE	4	0	4	40	60	100	3 Hrs.
5	MCT533	(01)Discrete Mathematics & Graph Theory	CORE	4	0	4	40	60	100	3 Hrs.
6	MCP533	(01) Numerical Methods lab	DSE	0	4	2	25	25	50	-
7	MCT534	(01)Principles of Management	AEC	4	0	4	40	60	100	3 Hrs.
8	MCP534	Basics of Computer Hardware Lab	DSE	0	4	2	25	25	50	-
9	HUP 501	(01)Communication Skills (02)Environmental Science	AEC	0	2	2	50	-	50	-
		TOTAL		20	14	28				

CORE	AEC	DSE	Total Credits
18	6	4	28

Semester-II

Sr. No.	Code	Course	Category	L	P	Credits	Maximum Marks			Exam Duration
							Continuous Assessment	End Sem Exam	Total	
1	MCT535	Theory of Automata & Formal Languages	CORE	4	0	4	40	60	100	3 Hrs.
2	MCT536	Introduction to Operating System	CORE	4	0	4	40	60	100	3 Hrs.
3	MCP536	(01)Computer Workshop-I Lab	AEC	0	4	2	25	25	50	-
4	MCT537	Concepts in Software Engineering	CORE	4	0	4	40	60	100	3 Hrs.
5	MCP537	Concepts in Software Engineering Lab	CORE	0	4	2	25	25	50	-
6	MCT538	Object Oriented Programming-1	CORE	4	0	4	40	60	100	3 Hrs.
7	MCP538	Object Oriented Programming-1 Lab	CORE	0	4	2	25	25	50	-
8	MCP539	(01) Game Programming Lab (02) PHP Programming Lab	DSE	0	4	2	25	25	50	-
9	HUP502	(01) Soft Skills (02) Professional Practice & Ethics	AEC	0	2	2	50	-	50	-
				16	18	26				

CORE	AEC	DSE	Total Credits
20	4	2	26

Semester-III

Sr. No.	Code	Course	Category	L	P	Credits	Maximum Marks			Exam Duration
							Continuous Assessment	End Sem	Total	
1	MCT620	Database Management Systems	CORE	4	0	4	40	60	100	3 Hrs.
2	MCP620	Database Management Systems Lab	CORE	0	4	2	25	25	50	-
3	MCT621	Design and Analysis of Algorithms	CORE	4	0	4	40	60	100	3 Hrs.
4	MCT622	Object Oriented Programming-2	CORE	4	0	4	40	60	100	3 Hrs.
5	MCP622	Object Oriented Programming-2 Lab	CORE	0	4	2	25	25	50	-
6	MCT623	Computer Networks	CORE	4	0	4	40	60	100	3 Hrs.
7	MCP623	(01)Mobile Application Development Lab (02)Linux System Administration & Maintenance lab (03)Ethical Hacking Lab (04)System Programming Lab	DSE	0	4	2	25	25	50	-
8	MCT624	(01)Development Frameworks & Virtual Machines (02)Advanced Computer Architecture (03) Image Processing (04) Introduction to RTOS (05) Pattern Recognition	DSE	4	0	4	40	60	100	3 Hrs.
9	HUP601	(01) Business Correspondence & Report Writing (02)Constitution of India & Human Rights	AEC	0	2	2	50	-	50	-
		TOTAL		20	14	28				

CORE	AEC	DSE	Total Credits
20	2	6	28

Semester-IV

Sr. No.	Code	Course	Category	L	P	Credits	Maximum Marks			Exam Duration
							Continuous Assessment	End Sem	Total	
1.	MCT625	Compiler Construction	CORE	4	0	4	40	60	100	3 Hrs.
2	MCT626	Internet & Web Technologies	CORE	4	0	4	40	60	100	3 Hrs.
3	MCP626	Internet & Web Technologies Lab	CORE	0	4	2	25	25	50	-
4	MCT627	Elective-I (01) Introduction to Object Oriented Programming	GE	4	0	4	40	60	100	3 Hrs.
5	MCT628	(01)Software Documentation (02) Multimedia & its Applications	AEC	2	0	2	50	-	50	-
6	HUT602	(01) Human Resource Management (02) Organizational Behavior	AEC	4	0	4	40	60	100	3 Hrs.
7	MCT629	(01) Advanced Databases (02) Introduction to Internet of Things (03) Operation Research (04) Computer Graphics & its Application (05) High Performance Computing	DSE	4	0	4	40	60	100	3 Hrs.
8	MCP629	(01) Programming in Python Lab (02) Web Development Lab	DSE	0	4	2	25	25	50	-
		TOTAL		22	08	26				

CORE	AEC	DSE	GE	Total Credits
10	6	6	4	26

Semester-V

Sr. No.	Code	Course	Category	L	P	Credits	Maximum Marks			Exam Duration
							Continuous Assessment	End Sem	Total	
1	MCT720	Elective-II (01)Artificial Intelligence (02)Data Mining	DSE	4	0	4	40	60	100	3 Hrs.
2	MCP720	(01)Artificial Intelligence Lab (02)Data Mining lab	DSE	0	4	2	25	25	50	-
3	MCT721	Elective-III (01) Introduction to Web Development	GE	4	0	4	40	60	100	3 Hrs.
4	MCP721	**(01) Technical Seminar** **(02) Mini-Project**	AEC	0	2	2	50	-	50	-
5	MCT722	(01) Distributed Database Management Systems (02) Distributed Systems (03) Big Data & Analytics (04) Information Retrieval	DSE	4	0	4	40	60	100	3 Hrs.
6	HUT 701	(01) Presentation & Interview Skills	AEC	2	0	2	50	-	50	-
7	MCP722	(01) API level Programming Lab (02) R Programming Lab (03) Big Data & Analytics Lab	DSE	0	4	2	25	25	50	-
8	MCT723	Business Intelligence	AEC	2	0	2	40	60	100	3 Hrs.
		TOTAL		16	10	22				

AEC	DSE	GE	Total Credits
6	12	04	22

Semester-VI

Sr.No.	Course Code	Course Name	Category	Contact Hours/ Sem	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Semester Examination	Total	
1	MCP723	Project Work-Full Time	AEC	20	20	300	300	600	-
	TOTAL					200-Internal 100-Company Mentor			

Total Credits:-

CORE	AEC	DSE	GE	Total Credits
60	48	34	08	150

Total Credits:- 28(I Sem)+26(II Sem)+28(III Sem)+26(IV Sem)+22(V Sem)+20(VI Sem)=150

SYLLABUS OF SEMESTER - I, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT 530 **Course: Computer Organization & Architecture**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. Identify the elements of modern instructions sets, hardware components and their impact on processor design.
2. To discuss in detail computer arithmetic operations and control unit operations.
3. To study in detail function of each element of a memory hierarchy and the concept of Pipelining.
4. To study the performance of CPU, memory and I/O operations.

Course Outcomes

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

1. Solve arithmetic operations of binary number system and the elements of modern instructions sets, hardware components and their impact on processor design.
2. Perform computer arithmetic operations and control unit operations.
3. Conceptualize elements of a memory hierarchy, I/O organization and pipelining.
4. Design basic computer system and to measure the performance of CPU, memory and I/O operations.

Syllabus

UNIT-I

Basic Structure of Computer Hardware & Software: Introduction, Memory Locations and Address, Main memory operations, Instructions & Instruction Sequencing, Addressing modes, Assembly language, Basic I/O operations, Stacks, Subroutines.

UNIT-II

The Processing Unit: Fundamental concepts, Execution of Complete Instruction, Multiple bus Organization, Hardwired control, Micro Programmed Control, Introduction to RISC, CISC.

UNIT-III

Input–Output Organization: Accessing I/O devices, Interrupts, Direct Memory Access, Buses

UNIT-IV

Arithmetic Operations : Number arithmetic, Logic design of Fast adders, Addition & Subtraction, Arithmetic & Branching conditions, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers & operations, IEEE standards.

UNIT-V

The Main Memory: Semiconductor RAM, ROM memories, Multiple-module memories and Interleaving, Cache memories, Virtual memories, Memory management requirements.

UNIT-IV

Pipelining: Basic Concepts, Data Hazards, Instruction Hazard, Influence on Instruction Set, Performance Consideration.

Text Books:

1. Computer Organization: Carl Hamacher, Zvonko Vranesic & Safwat Zaky. Mc-Graw Hill, Fifth edition.
2. Computer Architecture & Organization: J.P.Hayes , McGraw-Hill.
3. Computer organization and Design: David A. Patterson, John L. Hennessy

Reference Book:

1. Computer Organization & Architecture: William Stalling, Prentice Hall.
2. Computer Architecture: Behrooz Parhami, Oxford University Press.
3. Computer System Architecture: Morris Mano

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT531 **Course: Concepts in Data Structures**

L: 4 Hrs.,T: 0 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. Be familiar with writing recursive methods.
2. To compare and analyze various data structures.
3. To know various applications of different data structures.
4. To learn advanced data structures such as balanced search trees, hash tables and priority queues.

Course Outcomes

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

1. Explore concept and innovative applications of various data structures.
2. Conceptualize optimal techniques in storing, searching and sorting.
3. Implement binary tree traversals and operations on binary search trees to design applications like directory structure management and expression trees.

Syllabus

UNIT-I

Introduction to Data Structures: Definition, Concept of data types, Abstract Data Type. Arrays implementation in memory, Types of arrays. Applications of Arrays: Polynomial Representation Using Arrays, Addition and multiplication of Two Polynomial, Sparse Matrices and its operations.

UNIT-II

Linked List - Concept of Linked Lists, Types, Operations on Linked lists, concept of Doubly Linked List, Header Linked List. Other Operation & Applications: Reversing a Linked List, Concatenation of Two Lists, Representation of Polynomials.

UNIT-III

Stacks: Definition and example, primitive operations on Stacks, Arithmetic expressions - (Infix, Postfix and Prefix), Evaluating postfix expression, converting an expression from infix to postfix. Applications of Stacks: Uses of stacks in simulating recursive procedures/ functions.

UNIT-IV

Queues - Definition and examples of queues, primitive operations, Types of Queues.

Trees: Definition and Basic Terminology of trees, Binary Tree, Binary Search Tree, Tree Traversal, types of Trees (Threaded Binary Tree, Height Balanced Tree), Introduction to B-trees.

UNIT-V

Graphs and digraphs: Representations and traversals like Depth First Search Technique and Breadth First Search Technique, Connectivity algorithms, shortest path, Minimal spanning tree.

UNIT VI

Sorting & Searching: General Background, Different Sorting & Searching Techniques and their complexities. Files: File attributes and organization. Introduction to Hashing, Different Hashing Techniques and Collision Handling Mechanisms.

Text Books:

1. Data Structures and Program Design: Robert Kruse, PHI.
2. Classical Data Structure: Samanta, PHI.
3. Data Structures using C/C++: Tanenbaum, PHI.

Reference Books:

1. How to solve it by Computers: R G Dromey, PHI.
2. Science of Programming: David Greece: Springer Verlag New York Pub.
3. Fundamentals of Data Structures: Elis Horowitz, SartajSahani, Galgotia Publications.
4. Schaum's Outlines Data structure: Seymour Lipschutz, Tata McGraw Hill 2nd Edition.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP531 **Course: Concepts in Data Structures Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. Able to implement programming logic basic constructs static and dynamic data structures and different operations on it.
2. Able to implement various mathematical expression evaluation and memory & CPU management using stacks and queues.
3. Able to implement different types of trees, optimization techniques and different algorithms on graphs and diagraphs.
4. Able to implement different hashing and collision techniques.

Course Outcomes

On Successful completion of course, students will be able to:

1. Implement various data structures and operations on them.
2. Implement various mathematical expression evaluation and memory & CPU management using stacks and queues.
3. Implement different types of trees, optimization techniques and different algorithms on graphs and diagraphs.

Syllabus

Minimum 8 practicals based on theory subject.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT532 Course: Principles of Programming Languages

L: 4 Hrs., T: 0 Hrs., P:0 Hrs.,Per week Total Credits: 4

Course Objectives

1. Be familiar with syntax and semantics of programming languages.
2. To know the concepts of Object oriented languages.
3. To understand exception and event handling in programming languages.
4. To get familiarize with the concepts of functional and logic programming constructs.

Course Outcomes

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

1. Describe syntax & semantics of programming languages.
2. Design & implement subprogram constructs.
3. Apply exception and event handling programming constructs.
4. Implement functional & logic programming constructs.

Syllabus

UNIT-I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues.

Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

UNIT-II

Elementary and Structured Data Types, Structured data type and objects, Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types. Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co-routines, Scheduled sub programmes, concurrent execution.

UNIT-III

Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism. Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management.

UNIT-IV

Introduction to Exception Handling, Exception Handling in Ada, Exception Handling in C++,Exception Handling in Java, Introduction to Event Handling, Event Handling with Java, Event Handling in C#

UNIT-V

Introduction to Functional Programming, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative Languages.

UNIT-VI

Introduction to Logic Programming, Basics of Predicate Calculus, Predicate Calculus and Proving Theorems, The Origins of Prolog, Basic Elements of Prolog, Deficiencies of Prolog, Applications of Logic Programming

Text Books:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Robert.W.Sabesta "Concept of Programming Language", 10th Edition, Pearson Publication.

Reference Books:

1. Programming languages –Ghezzi, 3/e, John Wiley
2. Fundamentals of Programming Languages, Galgotia Publications.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT533-01 Course: Discrete Mathematics and Graph Theory

L: 4 Hrs., T: 0 Hrs., P:0 Hrs.,Per week Total Credits: 4

Course Objectives

1. To demonstrate the basic concepts of set theory, apply induction and other proof techniques particularly those found in the area of computer science.
2. To introduce Mathematical Logic, especially Propositional Logic and Predicate Logic.
3. To develop an understanding of counting, functions, relations and graph theory.
4. To introduce a number of Discrete Mathematical Structures, serving as tools for simulation modeling and algorithmic thinking.

Course Outcomes

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

1. Use various logical notations related to set theory, modular arithmetic and relations.
2. Build up truth –tables using various connectives and solve inference logic as well as predicate logic problems.
3. Analyze basics of graph theory, shortest path and partial order sets.
4. Demonstrate concept of functions and mathematical structure in various computer science applications.

Syllabus

UNIT-I

Teaching Scheme & Syllabus For Master in Computer Application

Fundamentals: Sets and Relations, Operations on sets, Sequences, Division in the Integers, Boolean Matrices ,Mathematical Structures, Methods of Proof, Mathematical Induction.

UNIT-II

Mathematical Logic: Statements and Notation, Proposition and Logical operations, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, Inference Theory of the Predicate Calculus.

UNIT-III

Counting: Permutations, Combinations, The Pigeonhole Principle, Recurrence Relations, Relations and Digraphs-Product Sets and Partitions, manipulation of Relations, Transitive Closure & Warshall's Algorithm.

UNIT-IV

Functions: Functions for Computer Science, Permutation Functions, Growth of Functions.

UNIT-V

Graph Theory: Basic Concept of Graph Theory, Euler's Path & Circuits, Hamiltonian Path & Circuits, Partially Ordered Sets Lattices, Finite Boolean Functions as Boolean Polynomials, Trees. (Minimal Spanning Trees)

UNIT-VI

Semi-groups & Groups: Binary Operations Revisited, Semi-groups, Group Products & Quotients of Groups.

Text Books:

1. Discrete Mathematical Structures: Bernard Kolman, Robert C. Busby & Sharon Ross, PHI.
2. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay & R. Manohar, Tata McGraw Hill.
3. Discrete Mathematics: J.K. Sharma, McMillan.

Reference Books:

1. Discrete Mathematics: S.K. Chakraborty and B.K. Sarkar, Oxford Uni. Press, India.
2. Combinational Mathematics: C.J. Liu.
3. Discrete Mathematics with Graph Theory: E. Goodaire, PHI.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP 533-01 **Course: Numerical Methods Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs.,Per week **Total Credits: 2**

Course Objectives

1. To learn the basic concepts of Numerical methods.
2. To know the applications of Numerical methods.

Course Outcomes

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

1. Apply the concepts of Numerical Methods practically.
2. Develop and execute Numerical Methods programs in Matlab / Mathematica / Maple.

Syllabus

Minimum 8 practicals based on the following:-

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula−Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the initial value problem using Euler's method and compare the result with the exact solutions.
10. Solve the boundary value problem using finite difference method.

Note: Programming is to be done in any one of Computer Algebra Systems:
MATLAB / MATHEMATICA / MAPLE.

SYLLABUS OF SEMESTER - I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT534-01 **Course: Principles of Management**

L: 4 Hrs.,T: 0 Hr., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To present a thorough and systematic coverage of management theory, the basic roles, skills and functions of management.
2. To draw student's attention towards social responsibility, managerial ethics, and the importance of various types of management.
3. To emphasize on basic areas which are required as prerequisites for understanding subjects like Organizational Behavior, Human Resource Management, etc.
4. To cover in details the foundations of planning and decision-making, organizational design, managing change and innovation, leadership, motivation, communications, supervision and control of operations.

Course Outcomes

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

1. Describe and discuss the various components of management, identify and explain issues involved in managing a diverse workforce.
2. Discuss and apply the planning, organizing and controlling the processes in the organization.
3. Identify, discuss and/or describe various theories related to the development of leadership skills, motivation techniques, teamwork and effective communication.
4. Work effectively as a team member through group projects, case studies and problem analysis.

Syllabus

UNIT- I

Foundation of Management: Meaning and nature of Management, Development of Management thought, Levels of Management, Role of managers, Managerial skills.

UNIT- II

Functions of Management: Planning, Decision-making, Directing and supervision, Coordination, Communication, Managerial control.

UNIT- III

Marketing Management: Marketing and concepts of Marketing, Marketing Management, Marketing environment, Marketing Research, Market Segmentation, Marketing Planning.

UNIT- IV

Human Resource Management: Human resource planning; Analyzing work and Designing Job, Performance appraisal and Incentive-Based Payments, Job safety, and health; Work Stress.

UNIT- V

Financial Management: Meaning and nature of financial management, Financial Statements, Budget, Ratio analysis.

UNIT- VI

Organization Behavior: Meaning and elements of organization behavior, Individual behavior, group behavior, Organizational Change and Development.

Text Books:

1. Principles of Management: P. C. Tripathi and P.N. Reddy, Tata McGraw Hill Publisher, New Delhi.
2. Marketing Management: Global Perspective Indian Context : V. S. Ramaswamy and S.Namakumari, MacMillian Publishers India Ltd, New Delhi.
3. Industrial and Business Management: Martand T Telsang, S.Chand Co. Ltd, New Delhi.
4. Human Resource Management: K. Aswathappa; Tata-McGraw-Hill Publishing Co. Ltd, New Delhi.

Reference Books:

1. Industrial Engineering and Management: P. Khanna and A. Sarup, Dhapat Rai Publication, New Delhi.
2. Financial Management: Ram M Kishore, Taxman Allied Services Pvt Ltd.

SYLLABUS OF SEMESTER -I, M.C.A. (Master in Computer Application)

Course Code: MCP534 **Course: Basics of Computer Hardware Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To understand basic concept & structure of computer hardware & networking.
2. To identify the earlier and existing configuration of the Motherboard and other peripherals.
3. To apply knowledge to identify / rectify onboard problems & to work on different OS.
4. To integrate the PCs into Local Area Network & re-install operating systems.

Course Outcomes

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

1. Conceptualize the basics of computer hardware devices and their evolution.
2. Assemble CPU by interfacing different hardware components.
3. Format machine, install OS and prepare machine for LAN setting.
4. Use the troubleshooting commands of UNIX and DOS.

Syllabus

Minimum 8 practicals and assignments based on the following:-

1. Components inside a computer
2. Networking hardware.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUP501-01 **Course: Communication Skills**

L: 0 Hrs., T: 0 Hrs., P:2 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To know the basics of verbal communication.
2. To learn Basic English grammar and its usage.

Course Outcomes

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

1. Verbally condense larger amounts of information into concise, condensed analysis.
2. Prepared for Group discussion, Personal interviews, etc.
3. Give a clear, organized and accurate oral presentation of course material.

Syllabus

1. Various strategies to overcome oral communication apprehension.
2. Presentation skills - visual aid and public speaking skills.
3. Mock presentation sessions.
4. Basic English grammar.

SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code : HUP501 – 02 **Course : Environmental Science**

L : 0 Hrs., T : 0 Hrs., P : 2 Hrs., Per week **Total Credits : 2**

Course Objectives

1. To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
2. To develop a sense of community responsibility by becoming aware of scientific issues in the larger social context.

Course Outcomes

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

1. Learn about different components of environment & ecology.
2. Understand principles of environmental impact assessment.
3. Know different types of Pollutions, their effects, standards & control.

Syllabus

1. Introduction, components of the environment, environmental degradation
2. Ecology: Elements of Ecology; Ecological balance and consequences of change, principles of environmental impact assessment
3. Air Pollution and Control: Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.
4. Water Pollution and Control: Hydrosphere, natural water, pollutants: their origin and effects, river / lake / ground water pollution, standards and control.
5. Land Pollution: Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.
6. Noise Pollution: Sources, effects, standards and control

Reference Books:

1. Environmental Science, Cunningham, TMH
2. Environmental Science, Wright & Nebel, PHI
3. Fundamentals of Ecology, Dash, TMH
4. Environmental Pollution Control Engineering, C.S.Rao, New Age International
5. Environmental Pollution Analysis, S.N.Khopkar, New Age International
6. Environmental Management, N. K. Oberoi, EXCEL BOOKS
7. Environmental Management, Mukherjee, VIKAS
8. Ecosystem Principles & Sustainable Agriculture, Sithamparanathan, Scitech

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT535 Course: Theory of Automata & Formal Languages

L: 4 Hrs., T: 0 Hrs., P:0 Hrs., Per week Total Credits : 4

Course Objectives

1. To learn the basic properties of formal languages and formal grammars
2. To understand the concepts of deterministic and nondeterministic finite automata and to prove or disprove theorems in automata theory using its properties.
3. To learn computing with Turing machines.
4. To determine the decidability and intractability of computational problems.

Course Outcomes

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

1. Learn notion of a regular set and its representation by DFA's, NFA's, and regular expressions
2. Understand context-free language and its representation by context-free grammars and push-down automata.
3. Implement universal model of computation and its representation by a Turing machine.
4. Analyze an unsolvable & undecidable decision problem.

Syllabus

Unit I:

Strings,Alphabet,Language,Operations,Finitestatemachine,Definitions, Finite automation model (FA), Acceptance of strings and languages, Non-deterministic finite Automation, Deterministic finite automation, Equivalence between NFA & DFA, Conversion of NFA into DFA, Minimization of FSM, Myhill-Nerode Minimization theorem, Finite Automata with output:Moore & Mealy machines.

Unit II:

Regular sets, Regular expressions (RE), Identity rules, Manipulation of regular expressions, Generalized Transition graph, Equivalence between RE and FA, Pumping lemma for regular sets, Closure properties of regular sets, Regular grammars (RG), Right linear and Left linear grammars, Equivalence betweenregular linear grammar and FA, Interconversion between RE and RG.

Unit III:

Context-free grammar, Derivation trees, Ambiguity, Reduction of CFG's, Elimination of ϵ-Productions, Unit Productions and Left Recursion, Chomsky normal form, Greibachnormal form.

Unit IV:

Definition of Pushdown Automata (PDA), Model, Acceptance of CFL, Enumeration of properties of CFL, Non determinism, acceptance by two methods and their equivalence between PDA and CFG, closure and decision properties of CFLs.

Unit V:

Basic Model of Turing Machine, recursively enumerable set, recursive sets, variants, TM as a computer function, Halting Problem, Universal Turing Machine.

Unit V:

Decidability, Properties of recursive and recursively enumerable languages, Undecidability, Post correspondence problem, Church's hypothesis, Recursive function theory.

Text Books:

1. Hopcroft, Ullman, “Introduction to Automata Theory, Language and Computation”, Nerosa Publishing House, 3rd Edition
2. Dr. O. G. Kakde, “Theory of Computation”, University Science Press

Reference Books:

1. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science (Automata, Languages and Computation)”, PHI, 3rd Edition
2. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT536 **Course: Introduction to Operating Systems**

L: 4 Hrs., T: 0 Hrs., P:0 Hrs., Per week **Total Credits : 4**

Course Objectives

1. To study various elements of operating systems and concurrent processes problems.
2. To understand various memory management, deadlock avoidance and prevention techniques.
3. To learn different protection and security concerns of operating system.
4. To understand core functionalities of different operating system like windows / UNIX.

Course Outcomes

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

1. Identify various elements of operating system and concurrent processes problems.
2. Analyze various memory management, deadlock avoidance and prevention techniques.
3. Understand different protection and security concerns of operating systems.
4. Understand core functionalities of different operating system like windows / UNIX.

Syllabus

UNIT-I

Introduction - Types of OS, Operating system services, user view, and system view. File system Introduction, Access methods, Allocation methods, Directory system, protection, Implementation issues, Disk and drum scheduling.

UNIT-II

Process - Introduction, Threads, CPU Scheduling, Concurrent processes Precedence graph, the critical section problem, Semaphores, Classical process coordination problem, Inter-process communication.

UNIT-III

Memory Management –Concept of Fragmentation**,** Swapping, Multiple partition, Paging, Segmentations, Combined systems.

Virtual memory - Overlays, Demand Paging, Performance of demand paging, Page replacement, Allocation algorithm, Thrashing.

UNIT-IV

Deadlocks - Characterization, prevention, avoidance, Banker's algorithm for deadlock avoidance, combined approach

UNIT-V

Protection Goal, Mechanisms and Policies, Domain of protection, Access matrix, Dynamic protection structures. Security- The security problem, User authentication, Program threats, System threats.

UNIT-VI

Case Studies: UNIX Operating System /Windows Operating System.

Text Books:

1. Operating System Concepts: *Siliberschatz Galvin: John Wiley & Sons.*
2. Modern Operating Systems: *Andrew Tanenbaum, PHI.*
3. Operating System, internals and Design Principles: Williams Stallings.

Reference Books :

1. An Introduction to Operating System: *H.M.Dietel, Pearson Education.*
2. Operating System: *Charles Crowley, IRWIN Publications.*
3. Operating systems: Archer J. Harris, Schaum's Outline, McGraw Hill Publication

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP536-01 **Course: Computer Workshop-I Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To know the basics of operating systems.
2. To learn commands of UNIX and automate tasks using scripts.
3. To learn how to use gdb and DDD

Course Outcomes

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

1. Learn the basics of operating systems.
2. Use and run the commands of Linux.
3. Use and develop programs on IDEs.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

* Introduction to Linux/Unix OS
* Installing Linux (or any variant)
* Introduction to using different tools for identification of possible errors in C program gdb, concepts of “core dump”, backtracing using “bt”, using “info” to dump all registers, creating watch list / watch variables.
* DDD (Data Display Debugger)–introduction and usage.
* IDE for code development
* Create a project, using multiple .c and .h files with cross-references
* Bash scripting –variables, conditionals, loops, finding logged in users.
* Parameter passing to C program from shell (argc / argv)

SYLLABUS OF SEMESTER –II, M.C.A. (Master in Computer Application)

Course Code: MCT537 **Course: Concepts in Software Engineering**

L: 4 Hrs. P: 0 Hrs. Per week **Total Credits: 4**

Course Objectives

1. To enable the development of skills through which the student will gain expertise to engineer software of high quality by following sound analysis and design principles.
2. Learn to plan and execute the project effectively through requirements analysis, estimation, risk management and project scheduling activities.
3. To develop various project management techniques for managing real world projects and object oriented approach towards software engineering.
4. To inculcate quality consciousness in students through effective testing strategies and software quality management.

Course Outcomes

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

1. Develop skills to engineer software of high quality by following sound analysis and design principles.
2. Learn successful project execution strategies like requirements analysis, estimation, risk management and project scheduling activities.
3. Use various project management techniques for managing real world projects and to develop an object oriented approach towards software engineering.
4. Inculcate quality consciousness through effective software quality management.

Syllabus

UNIT-I

Introduction to Software Engineering: Software engineering paradigms, Generic view of software engineering, Software metrics, Measures and metrics, Estimation, Risk analysis, Scheduling, Metrics of software quality.

UNIT-II

Software Project Management: Software project estimation and planning, Decomposition techniques, Risk Management, Software reengineering, Requirement analysis, Task Analysis, Software prototyping.

UNIT-III

Object Oriented Analysis: Object oriented analysis and data modeling, Object oriented concepts, Class Based Modeling, Inter object communication, Finalizing object definition, Object oriented analysis modeling.

UNIT-IV

Agile Development: About Agility, Agility and cost of change, Agile process, Agile process models (Adaptive software development, Scrum, Dynamic system development method), Agile Software development Approaches

Data Modeling: Data modeling concepts, Warner diagrams and the DSSD approach, Jackson system development.

UNIT-V

Software Design Engineering: The design process and fundamentals, Effective modular Design, Dataflow oriented design, Transform analysis, Transaction analysis, Design heuristics,

Object oriented design methods and concepts, Refining operations.

UNIT-VI

Software Quality Management: Software quality assurance, Quality metrics, Halstead's S/W science, Software testing techniques, S/W testing fundamentals, White box testing, Black box testing, Validation testing, System testing, Debugging software maintenance maintainability, Maintenance tasks, Reverse engineering and reengineering.

Text Books:

1. Software Engineering : *Roger S. Pressman, TMH*
2. Software Engineering For Students : *D.Bell, AddisonWisley,*

Reference Books:

1. Fundamentals of Software Engineering: *Ghezzi, Jazayeri & Mandrioli, PHI*.
2. Software Engineering concept: *Richard Fairley, Tata McGraw Hill*.
3. Fundamental of Software Engineering,: *Mall, PHI.*

SYLLABUS OF SEMESTER –II, M.C.A. (Master in Computer Application)

Course Code: MCP 537 **Course: Concepts in Software Engineering Lab**

L: 0 Hrs. P: 4 Hrs. Per week **Total Credits: 2**

Course Objectives

1. To learn basic concepts of automation tools.
2. To understand UML constructs and their usage.
3. To learn Software testing and its applications.

Course Outcome

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

1. Analyze and implement various concepts in different automation tools
2. Analyze and design software system using various UML constructs
3. Identify and model test cases.
4. Perform User Interface level testing using automation tool.

Syllabus

Minimum 8 Practicals based on the theory subject.

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT538 **Course: Object Oriented Programming-1**

L: 4 Hrs, T: 0 Hrs., P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To know object oriented features, class and member concept and their implementation.
2. To understand various Mathematical Operator Overloading concepts and its implementation.
3. To study and understand the concept of File Handling, operations on file, Pointers manipulation and management techniques.
4. To Study different Templates, Exception Handling Technique and it's implementation.

Course Outcomes

On Successful completion of course, students will be able to:

1. Conceptualize object oriented features, class and member concepts and their implementation.
2. Implement various Mathematical operator overloading concepts.
3. Develop programs based on different operations on files and file pointers manipulation and management techniques.
4. Implement different templates, Exception handling technique.

Syllabus

UNIT I

OOPs Features: Data encapsulation, Inheritance, Data abstraction, Polymorphism and Difference between OOPS and POP, Benefits of OOP, Applications of OOP.

UNIT II

Class and Members: Concept of a class, Access control of members of a class, Instantiating a class, Static and Non-static data members and member functions, Friend Function, Array Of objects, Constructors and Destructors: Different types of Constructors.

UNIT III

Inheritance: Deriving a class from another class, Different types of Inheritance, Access control of members under derivation, Different ways of class derivation, Virtual Base Classes and abstract Classes. Virtual Functions

UNIT IV

Operator Overloading: Overloading unary and Binary Operators, Rules for Overloading Operators. Streams: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted console I/O Operations, Managing output with manipulators.

UNIT-V

File Handling: Classes for File stream operations, Opening and closing File, Detecting End Of File, File opening modes, File Pointers and their Manipulations, Sequential and Random input - output operations on file.

UNIT-VI

Templates: Class Templates, Function Templates. Exception Handling: Basics, Exception Handling Mechanism, Throwing, Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.

Text Books:

1. Object Oriented Programming Using C++: E. Balaguruswamy.
2. The C++ Programming Language: Stroustrup B., Addison Wesley.
3. Mastering C++: K Venugopal, Raj Buyya, T ravishankar

Reference Books:

1. The Complete Reference: Herbert Schildt, 4th Edition, Tata McGraw Hill
2. Object oriented Programming in C++: Robert Lafore

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP538 **Course: Object Oriented Programming-1 Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To understand the class and member concept and are able to implement it using different access modifiers.
2. To learn programming using mathematical operator overloading.
3. To learn how to implement different File Handling Operations and pointer manipulation programs.
4. To understand the concepts of Templates and Exception Handling.

Course Outcomes

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

1. Conceptualize the class and member concepts as to implement them using different access modifiers.
2. Implement programs using mathematical operator overloading.
3. Implement different file handling operations and pointers manipulation programs.
4. Implement templates and Exception handling concept

Syllabus

Minimum 8 practicals based on theory subject.

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP539-01 **Course: Game Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To understand Game Designing and Development.
2. To design the logic and develop Game Engine Model.
3. To enable the students to create Interactive Games.

Course Outcomes

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

1. Model and develop a new Gaming System.
2. Develop interactive games with their knowledge gained out of various Gaming Platforms.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

* Mobile Gaming for the Android
* Adventure Game Studio - Unity
* Developing 2D and 3D interactive games using OpenGL

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP539-02 **Course: PHP Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn programming skills to construct a complete end to-end Information system solution.
2. To get exposure of important technologies and components including languages, clients and middleware development tools.

Course Outcomes

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

1. Create and maintain a dynamic web site
2. Use PHP to add server-side processing to a Web site
3. Design and create web applications that dynamically access a database

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

* Handling HTML form with PHP
* PHP conditional events and Loops
* PHP Functions
* String Manipulation and Regular Expression
* Arrays in PHP

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUP502-01 **Course: Soft Skills**

L: 0 Hrs., T: 0 Hrs., P:2 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn several work related skills making students competent and confident in handling tasks effectively and efficiently.
2. To develop all-round personalities with a mature outlook to function effectively in different circumstances.
3. To develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.

Course Outcomes

At the end of the course students will have:

1. Ability to conceptualize fundamental of personal interview skills and effective group discussion strategies
2. Ability to prepare effective resume.

Syllabus

* Resume making
* Personal interview skills
* Effective Group Discussion strategies
* Mock GD and PI sessions

SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUP502-02 **Course: Professional Practice & Ethics**

L: 0 Hrs., T: 0 Hrs., P:2 Hrs., Per week **Total Credits:2**

Course Objectives

1. To make the students aware of their responsibilities and duties as a computer professional.
2. To acquaint and help the students to analyze the social implications of the rapid computerization.
3. To gain knowledge about the ethical issues involved in computing, and improve Communication skills.

Course Outcomes

1. Make students aware of their responsibilities and duties as a computer professional.
2. Acquaint and help students to analyze the social implications of the rapid computerization.
3. Adopt the ethical issues involved in computing, and improve communication skills.

Syllabus

UNIT I

Introduction: History of Computing - Social Context of Computing – Privacy – Profiling – Anonymity - Data Matching – Mining - Censorship - offensive Materials.

UNIT II

Professional Ethics and Responsibilities: Methods and Tools of Moral Analysis - Professional and Ethical Responsibilities - Risks and Liabilities of Computer-Based Systems - Computer Crime - Computers and Work - Broader Issues on the Impact and Control of Computers - Professional Ethics and Responsibilities Surveillance - Data Protection and Encryption - Computers in Workplace - Computer Crime and Legal Issues.

UNIT III

Intellectual Property Rights: Intellectual Property - Privacy and Civil Liberties - Privacy Enhancing Technology

– OPS - P3P - Filtering - Blocking – Rating - Computer Crimes - Economic Issues in Computing – Monopolies - Labor and Computing.

UNIT IV

Frameworks: Philosophical Frameworks - Encryption - Identification - Anonymization - Information Technology and the Law.

UNIT V

Computer Ethics :Introduction to Computer Ethics - Philosophical Bases for Computer Ethics - Professional Ethics - Privacy laws - Information Ethics - On-line Ethics - The Meaning of Ethics - Professional Ethics - Social Ethical and Professional Issues in Computing

UNIT VI

Computerizing The Workplace: Property Rights and Intellectual Property - Reliability and safety of computer systems - Accountability and responsibility in Information Technology –

Freedom - Information and Images - Censorship of the Internet - Intellectual Property - Privacy - Responsibility - What Computers Should Not Do - Quality of Life and Work - Virtual Reality – Minds – Machines - and Morality - Unwrapping the Gift - Privacy and Personal Information - Encryption and the Interception of Communications - Can We Trust the Computer - Freedom of Speech in Cyberspace - Intellectual Property.

Reference Books:

1. John Weckert and Douglas Adeney, “Computer and Information Ethics”, Greenwood Press, 1997.
2. G. D. Johnson, “Computer Ethics”, 3rd Edition, Prentice-Hall, 2003.
3. S. Al-Fedaghi, “Professional and Computer Ethics”, Kuwait University Press, 2003

SYLLABUS OF SEMESTER –III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT620 **Course: Database Management Systems**
L: 4 Hrs. P: 0 Hrs. Per week **Total Credits: 4**

Course Objectives

1. To know how to design, manipulate and manage databases.
2. Develop preliminary understandings and skills for designing a database information system.
3. Understand implantation of database systems in real world problems.

Course Outcomes

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

1. Design and implement a database schema, database objects for a given problem-domain.
2. Recognize the context, phases and techniques for designing and building database information systems in business.
3. Correctly use the techniques, components and tools to build application for real world problem.

Syllabus

UNIT-I

Database Management System: Introduction, Conventional File Processing System, Components of DBMS, Advantages and Disadvantages, Three-level Architecture proposal for DBMS, Abstraction and Data Integration, Data Independence

Data Models: Introduction, Types of Data Models, Entity-Relationship Model: E-R diagram, Reduction to relational schemas, Generalization, Specialization & Aggregation

UNIT-II

The Relational Model: Keys, Relationship, Integrity rules, Relational Algebra.

SQL: Overview of SQL, DDL, integrity constraints, DML, set operations, null values, aggregate functions, sub-queries.

UNIT-III

Intermediate SQL: Views, Indexes, Abstract Data type, **Advanced SQL:**Functions, Procedures, Cursors, Triggers, PL-SQL.

Relational Database Design: Functional Dependency, Normalization.

UNIT-IV

File Organization: Fixed length vs Variable length records, organization of records in files.

Indexing & Hashing: Introduction, Ordered indices, B-Tree and B+-Tree file organization, Static & Dynamic hashing.

UNIT-V

Query Processing: Overview, Measures of Query Cost, Selection Operation, Join Operation

Query Optimization: Overview, Estimating Statistics of Expression Results , Transformation of Relational Expressions, Cost-Based Optimization, Heuristic Optimization.

UNIT-VI

Concurrency Control: Concept of Transaction, Serializability, Problems of Concurrent Access: lost update, inconsistent read phantom record, locking protocols, timestamp based protocols.

Database Recovery: Deadlock Detection and Recovery, Log based Recovery, Recovery with concurrent transactions.

Text Books:

1. Database Systems Concepts: *Silberschatz, Korth, Sudarshan, McGraw-Hill.*
2. An Introduction to Database Systems: *Bipin C. Desai, Galgotia.*
3. SQL & PL/SQL using Oracle: *Ivan Bayross, BPB Publications.*

Reference Books:

1. Fundamental of Database Systems: *Elmasri, Navathe, Somayajulu, Gupta Pearson Publications*
2. Database Management System: *Raghu Ramkrishan, Johannes, McGraw Hill*
3. An Introduction to Database Systems: *C.J.Date, Narosa*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER –III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP620 **Course: Database Management Systems Lab**

L: 0 Hrs. P: 4 Hrs. Per week **Total Credits: 2**

Course Objectives

1. To give a good formal foundation on the relational model of data.
2. To present SQL and procedural interfaces to SQL comprehensively.
3. To introduce the concepts and techniques relating to query processing by SQL Implementations.
4. To understand the concepts of PL/SQL and implementation of it.

Course Outcomes

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

1. Understand, appreciate and effectively explain the underlying concepts of database technologies.
2. Design and implement a database schema, database objects for a given problem-domain.
3. Declare and enforce business rules on a database using RDBMS.
4. Normalize a database, populate and query a database using SQL DML/DDL commands.
5. Programming for real world problem using PL/SQL.

Syllabus

Minimum 8 Practicals based on theory subjects

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER –III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT621 **Course: Design and Analysis of Algorithms**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To introduce key techniques for designing and analyzing computer algorithms.
2. Pointing out the importance of designing efficient algorithms by comparing different complexity classes.
3. To study algorithm design paradigms and approaches for their analysis.
4. To give an insight into tractable and intractable problems and different techniques to deal with them.

Course Outcomes

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

1. Design, evaluate and compare different algorithms using worst-, average-, and best-case analysis.
2. Synthesize efficient algorithms using various algorithm design paradigms and apply them in different domains.
3. Apply the algorithms and design techniques to solve certain NP and NPC problems.

Syllabus

UNIT-I

Elementary Algorithmics: Asymptotic analysis of algorithms. **Analysis of Algorithms:** Analyzing control structures, Amortized Analysis, recurrences and generating functions.

UNIT-II

Introduction to Graphs: Basic definition of Graphs, Operations on Graphs, Graph Connectivity and Traversals-BFS, DFS, Shortest Path Algorithms

Network Flow: Maximum flow problem and Ford – Fulkerson algorithm, maximum flows and minimum cuts in a network.

UNIT-III

Greedy Algorithms, Minimum spanning trees and shortest paths, Knapsack Problem, Scheduling with deadlines, Scheduling without deadlines.

UNIT-IV

Divide and Conquer: Multiplying large numbers, binary search, quick sort, merge sort, matrix operations. Finding the median – Matrix multiplication.

UNIT-V

Dynamic Programming: The Principle of optimality, knapsack problem, shortest paths, Chained matrix multiplication-approaches using recursion.

UNIT-VI

Back Tracking & Branch Bound: Traversing trees, traversing graphs, Branch and Bound, The Mini-max principle.

Introduction to NP and Intractability: Introduction to NP Completeness, Polynomial reductions, NP-Complete Problems, NP-Hard Problems.

Text Books:

1. Algorithm Design: *Jon Klienberg & Eva Tardos, Pearson India Education services Pvt. Ltd.*
2. Fundamentals of Algorithms: *Gilles Brassard and Paul Brately,Prentice Hall India Ltd.*
3. Introduction to Algorithms: *Thomas H. Cormen et.al, Prentice Hall of India.*

Reference Book:

1. Computer Algorithms–Introduction to Design and Analysis: *Sara Baase and Alien Van Gelder – Addison –Wesley Publishing Company.*
2. An Introduction to Analysis of Algorithms: *Robert Segdewick, Philippe Flajolet*

3. Fundamentals of Computer Algorithms: Ellis Horowitz and Sartaj Sahani.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT622 **Course: Object Oriented Programming-2**

L: 4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objective

1. To learn principles of object-oriented programming.
2. To learn the concept of Multithreading, Exception handling, Streams, Generic and Collection classes.
3. To learn the basic concepts of JSP and Servlets.

Course Outcomes

On Successful completion of course, student will be able to:

1. Illustrate the principles of object-oriented programming to create modular programs.
2. Apply the concept of Multithreading, Exception handling, Streams, Generic and Collection classes.
3. Apply the basic concepts of JSP and Servlets.

Syllabus

UNIT-I

Features of Object Oriented Programming languages like data encapsulation, inheritance, polymorphism and late binding. Introduction to class and Methods, Access control of members of a class, instantiating a class, Constructors, Garbage Collection, finalize() Method.

UNIT-II

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism. Abstract classes and methods, interface, implementation of interface, creating packages, importing packages, static and non-static members.

UNIT-III

Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Generics, generic class with two type parameter, bounded generics, Collection classes: Arrays, Vectors, Array list, Linked list, Hash set, Queues, Trees

UNIT-IV

Introduction to streams, byte streams, character streams, file handling in Java, Serialization Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, InterThread communications.

UNIT-V

JSP-Why JSP?, JSP Directives, Writing simple JSP page, Scripting Elements, Default Objects in JSP, JSP Actions, Managing Sessions using JSP, JSP with beans JSP. Java Database Connectivity: working with Connection, Statement and Result Set, Data Manipulation using JDBC, Data navigation

UNIT-VI

Servlets - Introduction Servlets vs CGI, Servlets API Overview, Servlets Life Cycle, Coding Writing & running simple Servlets, Generic Servlets, HTTP Servlet, Servlets Config, Servlets Contest Writing Servlets to handle Get & Post methods.

Text Books:

1. JAVA The Complete Reference*: Herbert Schildt;*; Seventh Edition, Tata McGraw- Hill Publishing Company Limited 2007.
2. A programmer's Guide to Java SCJP Certification: A Comprehensive Primer: *Khalid A. Mughal and Rolf W.Rasmussen*, Third Edition.
3. Java Fundamentals: A Comprehensive Introduction: *Herbert Schildt and Dale Skrien*; Tata McGraw- Hill Education Private Ltd., 2013.

Reference Books:

1. Core JAVA Volume-II Advanced Features: *Cay S. Horstmann and Gary Cornell;* Eighth Edition; Prentice Hall, Sun Microsystems Press, 2008.
2. Java Programming: A Practical Approach: *C Xavier;* Tata McGraw- Hill Education Private Ltd., 2011
3. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP622 **Course: Object Oriented Programming-2 Lab**

L: 0 Hrs., P: 4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To apply the object based programming techniques using objects and classes.
2. To apply the Specialized Java programming concepts like Multithreading, Exception handling, Streams, Generic and Collection classes
3. To apply the Java Server side concepts like JSP and Servlets.

Course Outcomes

On the successful completion of this course student will be able to:

1. Develop programs using object based programming techniques using objects and classes.
2. Develop programs using Specialized Java programming concepts like Multithreading, Exception handling, Streams, Generic and Collection classes
3. Develop programs using Java Server side concepts like JSP and Servlets.

Syllabus

Minimum 8 practicals based on theory subject.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER –III, M.C.A. (Master in Computer Application)

Course Code: MCT623 **Course: Computer Networks**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To enumerate the layers of the OSI model and TCP/IP and understand the function(s) of each layer.
2. To acquire in-depth knowledge of error detection and correction, flow control technique, multiple access control techniques along with switching, and routing.
3. To study various protocols used in transport layer and application layer.

Course Outcomes

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

1. Learn the layered architecture of computer networks.
2. Analyze simple protocols and can independently study literature concerning computer networks.
3. Learn the conflicting issues and resolution techniques in data transmission.

Syllabus

Unit-I

Computer Network Basics: Introduction, Protocol Standards, Basic Concepts, Network Software. Reference Model: ISO- OSI and TCP/IP Model, Networking Devices

Unit-II

Physical Layer: Transmission of Digital Media, Transmission Media, Transmission Impairment, Multiplexing, Multiplexing Application: The telephone System, DSL, FTTC.

Unit-III

Data Link Layer: Design Issues in Data Link Layer, Error Detection & Correction, Elementary data link protocols, Sliding window protocol, **MAC Sublayer**: Channel Allocation problem, Multiple Access protocol, Ethernet and Types, Switching in Data Link Layer.

Unit-IV

Network Layer: Network Layer Design Issues, Routing Algorithm, Congestion Control Algorithms, Internetworking, The Network layer in the Internet

Unit-V

Transport Layer:

The transport service, elements of transport protocols, A Simple transport protocol, The Internet Transport Protocol TCP, UDP.

Unit-VI

Application Layer: Client Server Model, DNS, FTP, SMTP, HTTP, WWW, Multimedia.

Text Books:

1. Computer Networks: *Andrew Tanenbaum, PHI Publication* Fourth Edition

Reference Books:

1. Data Communications and networks: *Forouzan, TMH.*
2. Computer Network A system approach: *Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann Publishers, 5th Edition*
3. Data & Computer Communication: William *Stallings, PHI Publication*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-01 **Course: Mobile Application Development Lab**

L: 0 Hrs., P: 4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To know about various platforms and tools available for developing mobile applications.
2. To realize the differences between the development of conventional applications and mobile applications.
3. To learn programming skills in Android SDK

Course Outcomes

On the successful completion of this course student will be able to:

1. Understand Android O.S & SDK.
2. Work with Android Studio for creating Android applications.
3. Create real life Android applications and deploy them.

Syllabus

To create a small Android based application.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-02 **Course: Linux System Administration & Maintenance lab**

L: 0 Hrs., P: 4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To know the role and responsibilities of a Linux system administrator.
2. To install and configure the Linux operating system.
3. To manage resources and security of a computer running Linux at a basic level.
4. To manage network services on a Linux system.

Course Outcomes

On the successful completion of this course student will be able to:

1. Install, maintain and support Linux servers in the corporate world.
2. Maintain typical applications on Linux servers.
3. Configure and manage networks in Linux environments.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Getting started in LINUX.
- Linux Data Management
- Introduction to Linux System Administration
- User Accounts Management
- Security
- TCP / IP Network Management

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-03 **Course: Ethical Hacking lab**

L: 0 Hrs., P: 4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn the basics of Ethical Hacking.
2. To identify and analyze the stages an ethical hacker requires to take in order to compromise a target system.
3. To identify tools and techniques to carry out a penetration testing.

Course Outcomes

On the successful completion of this course student will be able to:

1. Discover existing security vulnerabilities in software and networks and recommend solutions.
2. Critically evaluate security techniques used to protect system and user data.
3. Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.
4. Demonstrate the ability to attack and defend a network.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Ethical Hacking Basics
- Foot printing and Scanning
- Enumeration
- System Hacking
- Trojans and Backdoors
- Web Application Vulnerabilities
- SQL Injection
- Linux and Automated Assessment Tools

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-04 **Course: System Programming Lab**

L: 0 Hrs., P: 4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn the process of writing system programming from code writing to compilation and linking.
2. To learn how to handle tools like Lex and Yacc

Course Outcomes

At the end of the course student will be able to:

1. Implement system programs using C language.
2. Use tools like Lex & Yacc.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- System Programs using C.
- Using tools Like LEX & YACC.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT624-01 **Course: Development Frameworks & Virtual Machines**

L: 4 Hrs.,P: 0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. Understand and apply a framework to a design.
2. Design virtual machines to run applications in a virtual infrastructure.
3. Recognize and analyze best-practice recommendations.

Course Outcomes

At the end of this course student will be able to:

1. Develop web services using different technologies.
2. Analyze the intricacies of server, storage, network, desktop and application virtualizations.
3. Design new models for virtualization.
4. Design and develop cloud applications on virtual machine platforms.
5. Familiarize the memories and cache subsystem

Syllabus

UNIT I

Java Server Pages -Servlet ,Features of Java Servlet ,Servlet API , Servlet Life Cycle ,Creating a Servlet ,Session Handling in Servlets ,Java Server Pages , JSP Technology ,Architecture of a JSP Page ,Life Cycle of a JSP Page ,JSP Basic Tags and Implicit Objects, Working with Action Tags in JSP ,Expression Language, JSP Tag Library, Introduction-XML Tag Library, Internationalization Tag Library ,SQL Tag Library , Functions Tag Library ,Java Server Faces , Features and Architecture of JSF ,JSF Elements ,JSF Request Processing Life Cycle , JSF Tag Libraries and UI components

UNIT II

Remote Method Invocation -Java mail - EJB Architecture - Session Bean - stateless session bean - stateful session bean - Message Driven Bean - Transaction Management - Entity Bean -Java persistence API - Entity life cycle - entity relationship

UNIT III

Hibernate - Architecture - HQL - Object relation mapping - Seam framework - Java EE Connector Architecture (JCA) - life cycle and workflow management - comparing JDBC with JCA - Java EE Design patterns - Java web service - role of SOAP and WSDL - JAX_WS - JAXB - SAAJ – JAXR

UNIT IV

Struts - Architecture - Actions in struts - Interceptors - OGNL support - Integrating struts with Hibernate - Spring framework - architecture - Managing transaction - Security in J2EE - JAAS

UNIT V

Virtualization Technologies

Introduction, Virtual machines, Networking, Storage, Access Control, Resource Monitoring, Data Protection, Scalability, High Availability, Patch Management

REFERENCES :

1. Kogent Learning Solutions Inc , "Java Server Programming Java EE6(J2EE 1.6) Black Book", Dreamtech Press, 2010.
2. “Virtual Machines”, James E. Smith and Ravi Nair (Morgan Kaufmann), ISBN 1558609105, April 2005.
3. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -III, M.C.A. (Master in Computer Application)

Course Code: MCT624-02 **Course: Advanced Computer Architecture**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits:4**

Course Objectives

1. To study fundamentals of quantitative and memory hierarchy designs.
2. To study different techniques of parallelism.
3. To study Vector, SIMD, and GPU Architectures.

Course Outcomes

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

1. Synthesize the concept of quantitative designs.
2. Conceptualize the optimization techniques to improve cache performance.
3. Conceptualize the different architectures of processors for parallelism.

Syllabus

UNIT-I

Fundamentals of Quantitative Design and Analysis

Classes of Computers, Defining Computer Architecture, Dependability, Measuring, Reporting, and Summarizing Performance, Quantitative Principles of Computer Design

UNIT-II

Memory Hierarchy Design

Ten Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Protection: virtual Memory and Virtual Machines, Crosscutting Issues

UNIT-III

Instruction-Level Parallelism and Its Exploitation

Instruction-Level Parallelism: Concepts and Challenges, Reducing Branch Costs with Advanced Branch Prediction, Overcoming Data Hazards with Dynamic Scheduling, Dynamic Scheduling, Advanced Techniques for Instruction Delivery and Speculation, Multithreading

UNIT-IV

Data-Level Parallelism in Vector, SIMD, and GPU Architectures

Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units, Detecting and Enhancing Loop-Level Parallelism

UNIT-V

Thread-Level Parallelism

Centralized Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors Contents, Distributed Shared-Memory and Directory-Based Coherence, Synchronization, Models of Memory Consistency

UNIT-VI

Warehouse-Scale Computers to Exploit Request-Level and Data-Level Parallelism

Programming Models and Workloads for Warehouse-Scale Computers, Computer Architecture of Warehouse-Scale Computers, Physical Infrastructure and Costs of Warehouse-Scale Computers

Text Books:

1. Computer Architecture A Quantitative Approach: John L. Hennessey, David A. Patterson 5th ed.

Reference Books:

1. Advanced Computer Architecture (Parallelism, Scalability, Programmability): Hwang, K McGraw Hill.
2. Parallel Computer: V. Rajaranam & C.S.R.Murthy, PHI.
3. Related *IEEE/ASME/ASCE/EBSCO* Papers.

SYLLABUS OF SEMESTER - III, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT624-03 **Course: Image Processing**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits : 4**

Course Objectives:

1. To learn the fundamental concepts and applications of digital image processing.
2. To learn the concepts of and how to perform Intensity transformations and spatial filtering.
1. To understand the concepts of and how to perform Image segmentation, restoration and reconstruction, color image processing, image compression and watermarking.

Course Outcomes:

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

1. Acquire and relate the fundamental concepts of a digital image processing system.
2. Understand and apply different image Filtering Models, segmentation algorithms and image compression standards for Computer vision & image analysis.
3. Understand and demonstrate the role of Image restoration, reconstruction, representation and description Techniques.

Syllabus

UNIT-I

Introduction – Fundamental steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals –** A Simple Image Formation Model, Image Sampling and Quantization, Basic relationship between pixels, Neighbors of pixel, Adjacency, Connectivity, Regions, Boundaries: Labeling of connected components, Distance measure, Application of image processing.

UNIT-II

Intensity Transformations and Spatial Filtering-Some Basic Intensity Transformation Functions, Histogram equalization and histogram matching, Fundamentals of Spatial Filtering, Introduction to Smoothing and Sharpening Spatial Filters.

Filtering in the Frequency Domain-Discrete Fourier Transform (DFT), The Basics of Filtering in the Frequency Domain,

Image Smoothing Using Frequency Domain Filters: Ideal Lowpass Filters, Butterworth Lowpass Filters, Gaussian Lowpass Filters,

Image Sharpening Using Frequency Domain Filters: Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters.

UNIT-III

Image Restoration and Reconstruction - Degradation model, Restoration in the Presence of Noise Only—Spatial domain, Periodic Noise Reduction by Frequency Domain, Inverse filtering, Weiner filtering, Geometric Mean Filter.

Color image processing- Color Models, Pseudo Color Image Processing,

UNIT-IV

Image Compression –Coding Redundancy, Spatial and Temporal Redundancy, Fidelity Criteria, Image Compression Models, Huffman Coding, LZW Coding, Lossy Compression, Digital Image Watermarking.

UNIT-V

Image Segmentation–Detection of Discontinuities, Edge Linking and Boundary Detection,

Thresholding: Foundation, Basic Global Thresholding,

Region Based Segmentation: Region Growing, Region Splitting and Merging.

UNIT-VI

Representation and Description –

Representation Schemes like Chain Coding, Polygonal Approximation Approaches, Signatures, Boundary Segments, Skeletons, Boundary Descriptors, Regional Descriptors.

Text Books:

1. Digital Image Processing: R.C.Gonzalez & R.E. Woods, Addison Wesley Pub.
2. Fundamentals of Digital Image Processing: A.K.Jain, PHI Pub.
3. Fundamentals of Electronic Image Processing: A.R.Weeks.

Reference Books:

1. Digital Image Processing: S.Sridhar, Oxford Uni. Press.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER - III, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT624-04 **Course: Introduction to Real Time Operating Systems**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives:

1. To get familiar with the principles and design methods of real-time operating systems.
2. To learn how to address the fundamental problems of real-time operating systems.
3. To study various scheduling techniques of real-time operating systems.
4. To learn about resource allocation and resource access control.

Course Outcomes:

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

1. Clearly differentiate the issues that arise in designing real-time systems; analyze a variety of real-time scheduling techniques, prove correctness of the resulting schedule; implement basic scheduling algorithms.
2. Apply real-time scheduling theory to the design and implementation of a real-world system.

Syllabus

UNIT-I

Real time applications: Hard and soft real time systems, timing constraints, A Reference model of Real-time systems, temporal parameters, precedence constraints & dependencies, scheduling Hierarchy, Commonly used approaches to scheduling, cyclic and priority drive approaches, Optimality of EDF and LST.

UNIT-II

Clock Driven Scheduling : Static timer driven scheduler, Cyclic Executives, Improving Average Response times of Aperiodic Jobs, Scheduling Sporadic jobs, Practical Considerations, Pros and Cons of Clock Driven Scheduling.

UNIT-III

Priority-driven scheduling of periodic tasks: Fixed priority vs Dynamic Priority schemes, Maximum schedulable Utilization, Optimality of the RM and DM algorithms, As Schedulable Test for Fixed Priority Tasks, Practical Factors.

UNIT-IV

Scheduling Apriodic and Sporadic Jobs in Priority - driven scheduling: Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair-Queuing Servers, Scheduling of Sporadic Jobs

UNIT-V

Resources and resource access control: Non-preemptive critical sections, basic priority-inheritance, ceiling protocol, multiprocessor scheduling, predictability and validation of dynamic multiprocessor systems flexible applications, tasks with temporal distance constraints.

UNIT-VI

Real time Operating systems: Overview, Time Services and Scheduling Mechanisms, Basic Operating System Functions, Processor Reserves and Resource Kernel, Open System Architecture, Capabilities of Commercial RTOS.

Text Books:

1. Real-Time Systems: Jane W.S. Liu, Pearson Education Asia Pub.

Reference Books:

1. Real time Systems: C.M. Krishna & Kang G. Shin, McGraw Hills.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -III, M.C.A. (Master in Computer Application)

Course Code: MCT624-05 **Course: Pattern Recognition**

L: 4 Hrs, P: 0 Hrs, per week **Total Credits: 4**

Course Objectives

1. To learn Pattern recognition basics to gain knowledge about statistical decision theory, classification and clustering.
2. To understand how to generate pattern features using various transforms based on data.
3. To emphasize on different algorithms of artificial neural networks and various transformation techniques.

Course Outcomes

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

1. Understand the basics of pattern recognition.
2. Analyze & study different pattern recognition technique.
3. Apply the pattern recognition theories to real time applications of interest.
4. Understand different algorithms of artificial neural networks and various transformation techniques.

Syllabus:

UNIT-I

Applications of pattern recognition, statistical decision theory, probability of events, Random variables, moments of random variables, Estimation of parameters, Minimum Risk Estimators.

UNIT-II

Bay's Theorem, conditionally independent features. Decision boundaries, Estimation of error rates, characteristics curves.

UNIT-III

Histograms, Kernel and window estimators, Nearest Neighbor classification techniques, Adaptive Decision boundaries

UNIT-IV

Artificial Neural Networks: Biological Motivation and Back-Propagation
Non-Metric Methods: Recognition with Strings, String Matching.

UNIT-V

Introduction to Clustering, hierarchical clustering, partition clustering, fuzzy c-means clustering.

UNIT VI - Problem of dimensionality, Principal component analysis, Hidden Markov models, Support vector machines, Expectation Maximization, Applications of Pattern Recognition.

Text Books:

1. Pattern Classification : *Richard O.Duda, Peter E.Hart, David G.Shork, John Wiley & Sons* 200, 2nd Edition
2. Pattern Recognition and Image Analysis: *Earl Gose, Richard Johnsonbough , Steve Jost,* Prentice Hall of India
3. Pattern Recognition and Image Processing : *Sing Tze bow; Marcel Dekker*

Reference Books:

1. Pattern Recognition and Machine Learning: *C.M. Bishop*
2. Related *IEEE/ASME/ASCE/EBSCO* Papers.

SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUP601-01 **Course: Business Correspondence & Report Writing**

L: 0 Hrs., P: 2 Hrs., Per week **Total Credits:2**

Course Objectives

1. To understand the purpose and context of any communication situation.
2. To evaluate information from various sources.
3. To analyze information for its validity that effectively responds to the purpose and context.

Course Outcomes

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

1. Effectively perform Business Correspondence.
2. Learn the basics of Report Writing.
3. Proficient in writing Technical Proposals.

Syllabus

- Business Correspondence
- Report Writing
- Technical Proposals
- Job-Related Communication
- Mechanics of Writing
- Drafting Skills

Reference

- Business Correspondence and Report Writing,3e-By R C Sharma Krishna Mohan

SYLLABUS OF SEMESTER -III, M.C.A. (Master in Computer Application)

Course Code: HUP601-02 Course: Constitution of India & Human Rights

L: 0 Hrs., P: 2 Hrs., Per week Total Credits: 2

Course Objectives

1. To provide basic information about Indian constitution.
2. To identify individual role and ethical responsibility towards society.
3. To understand human rights and its implications

Course Outcomes

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

1. Gain general knowledge and legal literacy
2. Understand state and central policies, fundamental duties
3. Learn the Electoral Process & special provisions.
4. Get awareness about basic human rights in India

Syllabus

Unit -I:

Indian Constitutional Philosophy

- Features of the Constitution and Preamble
- Fundamental Rights and Fundamental Duties
- Directive Principles of State Policy

Unit- II

Union and State Executive, Legislature and Judiciary

- Union Parliament and State Legislature: Powers and Functions
- President, Prime Minister and Council of Ministers
- State Governor, Chief Minister and Council of Ministers
- The Supreme Court and High Court: Powers and Functions

Unit-III

Concept and Development of Human Rights

- Meaning Scope and Development of Human Rights
- United Nations and Human Rights –UNHCR
- UDHR 1948, ICCPR 1996 and ICESCR 1966

Unit-IV

Human Rights in India

- Protection of Human Rights Act, 1993 (NHRC and SHRC)
- First, Second and Third Generation Human Rights
- Judicial Activism and Human Rights
- Human rights of marginalized communities: Issues and challenges.

References

1. Durga Das Basu, Introduction to the Constitution of India, Prentice –Hall of India Pvt. Ltd. New Delhi
2. SubashKashyap,Indian Constitution, National Book Trust
3. J.A. Siwach,Dynamics of Indian Government & Politics
4. D.C. Gupta,Indian Government and Politics
5. H.M.Sreevai,Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. V.N.Shukla, Constitution of India (Eastern Book Co)
7. J.C. Johari, Indian Government and Politics
8. Hans J. Raj Indian Government and Politics
9. M.V. Pylee,Indian Constitution
10. Durga Das Basu, Human Rights in Constitutional Law, Prentice –Hall of India Pvt. Ltd.. New Delhi
11. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
12. S.K. Kapoor, Human Rights

SYLLABUS OF SEMESTER - IV, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT625 **Course: Compiler Construction**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits:4**

Course Objectives

1. To teach students the basic techniques that underlies the practice of Compiler Construction.
2. To understand the design tradeoffs involved in each phase of compilation: lexical analysis, parsing, intermediate form, and code generation.
3. To learn introduction to Compiler Construction and to understand the concepts of scanning, parsing and code generation.
4. To identify application areas where we need a syntax-directed analysis of symbolic expressions and languages as well as their translation into a lower-level description.

Course Outcomes

At the end of the course student will be able to:

1. Students understand concepts and principles of compiler design.
2. Basic understanding of grammars and language definition.
3. Know the various phases of designing a compiler.

Syllabus

UNIT-I

Introduction Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer.

UNIT-II

Syntax Analysis - Specification of syntax of programming languages using CFG, Top-down parser, design of LL(1) parser, bottom up parsing technique, LR parsing, Design of SLR, CLR,LALR parsers.

UNIT-III

Syntax directed translation - Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations- postfix, syntax tree, TAC, translation of expressions, controls structures, declarations, procedure calls, Array reference.

UNIT-IV

Introduction to Lex and YACC - Lex-A scanner Generator, Structure of Lex specification file, Lex Regular Expressions, Lex Source Definition Program, Left Context Sensitivity: Start Conditions and sample program for use of start conditions. YACC-A Parser generator, Structure of YACC specification file, YACC Grammar Rules, YACC sample program.
Storage allocation & Error Handling- Run time storage administration stack allocation, symbol table management, Error detection and recovery- lexical, syntactic, semantic.

UNIT-V

Code optimization - Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common subexpression.

UNIT-VI

Code generation – Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Text Books:

1. Compilers Principles Techniques and Tools: A.V.Aho, Sethi, Ullman, Pearson education.
2. Principles of Compiler Design: Alfred V. Aho& Jeffery D. Ullman, Narosa Pub. House

Reference:

1. Related IEEE/ASME/ASCE/EBSCO Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT626 **Course: Internet & Web Technologies**

L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To understand the current industrial data modeling and representation concepts
2. To learn server side programming skills with market leading technologies along with relevant programming language.
3. To learn different technologies involved in MEAN stack.
4. To understand the latest authentication & authorization protocols.

Course Outcomes

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

1. Understand the importance and usage of different data models and schemas.
2. Grasp essential knowledge for creation of web applications using server side programming.
3. To understand different technologies involved in MEAN stack.
4. To grasp various authentication & authorization protocols on web arena.

Syllabus

UNIT - I

Data modeling and representation–Introduction of XML, XMLDTD validation, Introduction to JSON,JSON Schema, JSON Format, Thrift Language Reference, Thrift Protocol stack, type system.

UNIT – II

C# - .NET languages overview, C# Language basics, Variables, Datatypes, Strings, Types, Objects, Namespaces, Enumerations, C# Preprocessor Directives, Delegates, Events, Exception Handling, Defining Classes.

UNIT – III

Server Side Programming with ASP.NET : DotNet Framework Introduction, ASP .NET file Types, Page Class, WebControls, Validation Controls, Master Pages, web.config, State Management techniques, User Controls, ADO.NET Connectivity, Caching.

UNIT – IV

MEAN Stack : Introduction to MEAN,Getting started with Node.js,Node modules,Introduction to Express, the application-request-response objects, Implementing the MVC pattern.

UNIT –V

MEAN stack (Contd): Introduction to MongoDB, keyfeatures, databases, collections, MongoDB CRUD operations, Introduction to AngularJS, AngularJS modules, Two-way data binding, AngularJS Directives.

UNIT – VI

Authentication and Authorization protocols:OAuth model, Relationship to other standards, using Tokens, SAML architecture, SAML components, SAML Assertions, Architecting an Identity Federation.

Text Books:

1. Asp.Net Complete Reference – *Mathew McDonald.*
2. Beginning AngularJS, Andrew Grant – *Apress.*.
3. Professional C# - *Simon Robinson Christian Nagel, Wrox.*
4. Thrift: The Missing Guide – *Diwakar Gupta*
5. Mean Web Development - *Amos Q. Haviv, PACKT Publishing.*
6. Getting Started with OAuth 2.0-*Ryan Boyd, O'Reilly.*

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCP626 **Course: Internet and Web Technologies Lab**

L:0 Hrs, P: 4 Hrs, per week **Total Credits: 2**

Course Objectives

1. To understand different webdata modeling approaches using XML, JSON, Thrift.
2. To understand a server side programming implementation in web technologies.
3. To learn latest full stack implementations

Course Outcomes

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

4. Implement basics of XML, JSON and Thrift.
5. Learn server side scripting techniques using ASP.NET
6. Do the practical implementation of MEAN stack.

Syllabus

At least 8 practicals based on theory contents

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT627-01 **Course: Elective-I-Introduction to Object Oriented Programming**

L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To study and understand the basic object oriented features
2. To understand the class/ member concept and their implementation
3. To study and understand the concept of constructors, destructors and inheritance
4. To study and understand various operator overloading and streams paradigm

Course Outcomes

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

1. Conceptualize object oriented features and their implementation.
2. Implement classes and member concepts.
3. Develop programs using constructors, destructors and inheritance
4. Implement operator overloading and streams paradigm

Syllabus

UNIT - I

OOPs Features: Data encapsulation, Inheritance, Data abstraction, Polymorphism and Difference between OOPS and POP, Benefits of OOP, Applications of OOP, reference variables, scope resolution operator.

UNIT II

Functions: Function Prototyping, Call by reference, Return by reference, Inline functions, default arguments, const arguments, function overloading.

UNIT III

Class and Members: Concept of a class, Access control of members of a class, Instantiating a class, Static and Non-static data members and member functions, Friend Function, Array Of objects.

UNIT IV

Constructors and Destructors: Default constructor, Parameterized constructor, copy constructor, Constructor overloading, Dynamic Constructors, Destructors.

UNIT V

Inheritance: Deriving a class from another class, Different types of Inheritance, Access control of members under derivation, Different ways of class derivation, Virtual Base Classes and abstract Classes. Virtual Functions.

UNIT VI

Operator overloading and Streams: Overloading unary and Binary Operators, Rules for Overloading Operators. Streams: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted console I/O Operations, Managing output with manipulators, File Handling Basics.

Text Books:

1. Object Oriented Programming Using C++ by E. Balaguruswamy.
2. The C++ programming Language by Stroustrup B *Apress –Addison Wesley*.
3. Mastering C++ by K.Venugopal, Raj Buyya, T.Ravishankar.

Reference Books:

1. The Complete Reference by Herbert Schild – *Tata McGraw Hill.*
2. Related *IEEE/ASME/ASCE/EBSCO* Papers.

SYLLABUS OF SEMESTER - IV, MCA (Master in Computer Application)

Course Code: MCT628-01 **Course: Software Documentation**

L: 2 Hrs., P:0 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn various software documentation techniques of the considered system.
2. To understand various guidelines for successful software documentation

Course Outcomes

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

1. To be able to design and construct various software documentation techniques of the considered system.
2. To be able to create successful software documentation using various documentation guidelines.

Syllabus

Task Orientation, Principle of Software Documentation, Definition of task orientation, forms of software documentation, tutorial documentation, procedural documentation, reference documentation, processes of documentations.

Writing to teach tutorials, writing to guide procedures, writing to support reference.

Analyzing users, planning and writing documents, getting useful reviews, conducting usability tests, editing and fine tuning.

Designing for task orientation, laying out pages and screens, getting the language right, using graphics effectively and designing indexes.

Reference Books:

1. Writing software documentation: Thomas Barker, Pearson publisher.

SYLLABUS OF SEMESTER -IV, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT628-02 **Course: Multimedia & its Application**

L: 2 Hrs.,P: 0 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To identify a range of concepts, techniques and tools for creating and editing the interactive multimedia applications.
2. To identify both theoretical and practical aspects in designing multimedia systems surrounding the emergence of multimedia technologies using contemporary hardware and software technologies.

Course Outcomes

On the successful completion of this course student will be able to:

1. Define multimedia to potential clients.
2. Learn basics of product design & authoring tools and to develop projects for WWW & deliver them through different methods.

Syllabus

UNIT - I

Introduction to Multimedia: Objectives, History of Multimedia, Its market, Content copyright, Resources for multimedia developers, Types of produces, Evaluation, Hardware Architecture,OS and Software, Multimedia Architecture, Software library, Drivers.

UNIT - II

Text and Graphics: Elements of Text, Text Data files, Using text in Multimedia Application, Hypertext, Elements of Graphics, Graphics files and Application formats, Using graphics in Application.

Digital Audio and Video: Characteristics, Digital Audio systems MIDI, Audio file formats, Using Audio in Multimedia Applications, Background as video, Characteristics of digital video, digital video data sizing , Video capture and playback systems, computer animation.

UNIT - III

Product design and Authoring tools: Building blocks, classes of products, Content strategies, story boarding, Multimedia tool selection, Tool feature, categories of Authoring tools, selecting the right authoring paradigm, Basics of video/audio editing tools: Gimp, Blender, Inkscape.

Designing for the World Wide Web & Delivering: Developing for the Web using -Text, Images, Sound ,Animation, and Video, Testing, Preparing for Delivery, Delivering on CD-ROM, Delivering on DVD, Wrapping It Up, Delivering on the World Wide Web.

Text Book :

1. Multimedia Technology and Applications – David Hillman-Galgotia Publications pvt. Ltd, 1998.

Reference Book :

1. Multimedia making it work by Tay Vaughan TMH, 1997
2. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: HUT602-01 **Course: Human Resource Management**
L: 4 Hrs., P: 0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To explore the perspectives in human resource management
2. To identify employees' related problems and their solutions.
3. To study the importance of training, performance evaluation and control process

Course Outcomes

On successful completion of the course students will be able to:
1. Understand the origin and evolution of HRM.
2. Understand the training & executive development.
3. Understand the interest & welfare of employees.
4. Understand the concept of performance evaluation and control process.

Syllabus

UNIT I
PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT
Evolution of human resource management – The importance of the human factor – Challenges – Inclusive growth and affirmative action - Role of human resource manager – Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

UNIT II
THE CONCEPT OF BEST FIT EMPLOYEE
Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand - Internal and External sources - Recruitment - Selection – induction – Socialization benefits.

UNIT III
TRAINING AND EXECUTIVE DEVELOPMENT
Types of training methods – purpose - benefits- resistance - Executive development programmes – Common practices - Benefits – Self development – Knowledge management.

UNIT IV
SUSTAINING EMPLOYEE INTEREST
Compensation plan – Reward – Motivation – Application of theories of motivation – Career management – Development of mentor – Protégé relationships.

UNIT V
PERFORMANCE EVALUATION
Method of performance evaluation – Feedback – Industry practices – Promotion – Demotion - Transfer and Separation – Implication of job change

UNIT VI
CONTROL PROCESS
The control process – Importance – Methods – Requirement of effective control systems grievances – Causes – Implications – Redressal methods.

REFERENCES :

1. Dessler, "Human Resource Management", Pearson Education Limited, 2007.
2. Decenzo and Robbins, "Human Resource Management", 8th Edition, Wiley, 2007.
3. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy, "Managing Human Resource", PHI Learning, 2012.
4. Bernadin, "Human Resource Management", 8th edition, Tata Mcgraw Hill, 2012.
5. Wayne Cascio, "Managing Human Resource", McGraw Hill, 2007.

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: HUT602-02 **Course: Organizational Behavior**
L: 4 Hrs., P: Hrs., Per week **Total Credits: 4**

Course Objectives

1.To provide basic knowledge of key approaches and Models relating to Organizational Behavior.
2.To identify specific steps mangers can take to motivate the employees.
3.To understands ways of acting effectively and finding ways for controlling human behavior.
4.To apply different concepts relating to managing of conflicts, change, time and stress.

Course Outcomes

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

1. Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
2. Assess the potential effects of organizational level factors on organizational behavior.
3. Critically evaluate the potential effects of important developments in the external environment on organizational behavior.
4. Analyze organizational behavioral issues in the context of organization behavior theories, Models and concepts.

Syllabus

UNIT-I

Fundamentals of Organizational Behaviour

Nature, Scope, Definition and Goals of Organizational Behaviour; Fundamental Concepts of Organizational Behaviour; Models of Organizational Behaviour; Emerging aspects of Organizational Behaviour: Meaning Cultural Diversity, Managing the Perception Process

UNIT-II

Perception, Attitude, Values and Motivation

Concept, Nature, Process, Importance, Management Behavioural aspect of Perception. Effects of employee attitudes; Personal and Organizational Values; Job Satisfaction; Nature and Importance of Motivation; Achievement Motive; Theories of Work Motivation: Maslow's Need Hierarchy Theory McGregcrs's Theory 'X' and Theory 'Y'

UNIT-III

Personality

Definition of Personality, Determinants of Personality; Theories of Personality- Trait and Type Theories, The Big Five Traites, Mytes-Briggs Indicator; Locus of Control, SType A and Type B Assessment of Personality

UNIT-IV

Work Stress

Meaning and definition of Stress, Symptoms of Stress; Sources of Stress: Individual Level, Group Level, Organizational Level; Stressors, Extra Organizational Stressors; Effect of Stress – Burnouts; Stress Management – Individual Strategies, Organizational Strategies; Employee Counselling

UNIT-V

Group Behaviour and Leadership

Nature of Group, Types of Groups; Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of Effective Leaders

UNIT-VI

Conflict in Organizations

Nature of Conflict, Process of Conflict; Levels of Conflict – Intrapersonal, Interpersonal; Sources of Conflict; Effect of Conflict; Conflict Resolution, Meaning and types of Grievances & Process of Grievances Handling.

Text Books

1. Organizational Behavior Text, Cases and Games- By K.Aswathappa, Himalaya Publishing House, Mumbai, Sixth Edition (2005)
2. Organizational Behavior Human Behavior at Work By J.W. Newstrom, Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition (2007)
3. Organizational Behavior – By Fred Luthans

Reference Books

1. Organizational Behavior – By Super Robbins
2. Organizational Behavior – Anjali Ghanekar
3. Organizational Behavior Fundamentals, Realities and Challenges By Detra Nelson, James Campbel Quick Thomson Publications
4. Organizational Behavior through Indian Philosophy, By N.M.Mishra, Hikalaya Publication
5. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-01 **Course: Advanced Databases**

L: 4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To understand various database architectures.
2. To get familiar with the concepts of data storage structures.
3. To learn various types of advanced databases and their issues.

Course Outcomes

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

1. Examine types of database architectures.
2. Learn to implement different storage structures for different business applications.
3. Grasp deeper understanding of advanced databases.

Syllabus

UNIT-I

Introduction: Database System Architectures: Centralized and Client-Server Architectures
Server System Architectures: Transaction Servers, Data Servers, Cloud-Based Servers.
Parallel Databases: Introduction, Speedup and Scale up, I/O Parallelism, Interquery & Intraquery parallelism, Interoperational & Intraoperational parallelism.
Cloud Based Databases: Data storage systems on cloud, Data Representation, Partitioning and Retrieving, Transactions and Replication, Challenges.

UNIT-II

Data Storage for Modern High-Performance Business Applications: Implementing a Relational Database, Implementing a Key/Value Store, Implementing a Document Database, Implementing a Document Database, Implementing a Column-Family Database, Implementing a Graph Database.

UNIT-III

Object-Based Databases: Overview, Complex Data Types, Structures Types and Inheritance in SQL Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, implementing O-R features, Object-Relational Mapping, Object-Oriented versus Object Relational Databases.

UNIT-IV

Temporal Databases: Time in Databases: Time Specification in SQL, Temporal Query Languages.
Mobility and Personal Databases: A Model of Mobile Computing, Routing and Query Processing, Broadcast Data, Disconnectivity and Consistency
Case studies on Temporal & Mobile Databases

UNIT-V

NoSQL Databases: Introduction, Differences from Relational Databases, Basic Schema and data types, Types of NoSQL Databases, Concepts of replication, distribution, sharding, and resilience, Use of NoSQL in Industry.

UNIT-VI

Spatial and Geographic Data: Representation of Geometric Information, Design Databases, Applications of Geographic Data, Representation of Geographic Data, Spatial Queries, Indexing of Spatial Data Multimedia Databases, Mobility and Personal Databases.

Text Books:

1. Database Systems Concepts:*Silberschatz,Korth,Sudarshan,McGraw-Hill(6th Edition)*
2. Data Access for Highly-Scalable Solutions: Using SQL, NoSQL, and Polyglot Persistence Microsoft MSDN.

Reference Books:

1. Fundamentals of Database Systems *: R. Elmasri, S.B. Navathe, Pearson Education (4th Edition)*
2. Modern Database Management:*McFadden, Prescott and Hoffer(10th Edition)*
3. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-02 **Course:Introduction to Internet of Things**
L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives:

1. To understand the vision and purpose of IoT.
2. To learn Data and Knowledge Management using Devices in IoT Technology.
3. To understand State of the Art – IoT Architecture.
4. To get familiar with real world IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes

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

1. Understand the vision of IoT from a global context and its Market perspective.
2. Analyze and study different H/W devices, Gateways and Data Management in IoT.
3. Built state of the art architecture in IoT.
4. Conceptualize applications of IoT in industrial and commercial building automation and real world design constraints.

Syllabus:

UNIT-I

Introduction to Internet of Things: IoT basics, Connected devices evolution, Introduction to communication mechanisms in IoT, Challenges with IoT, Applications of IoT.

UNIT-II

Hardware in IoT: Introduction to RFID, Types of RFID, Simple and programmable Beacons, Various sensors prominently used in mobile devices.

UNIT-III

Communication in IoT: Physical layer protocols used in IoT communication. IP Protocols used in communication such as HTTP based protocols - CoAP and MQTT, Specific aspects of protocols covering IoT communication.

UNIT-IV

Sensor networks and M2M Architecture: High level M2M requirements, ETSI M2M services architecture, ZigBee network and its architecture. 6LoWPAN related standards.

UNIT-V

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints-** Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-VI

Applications of IoT: Case Studies of IoT Applications: IoT in Cities/Transportation, IoT in the Home, IoT in Retail, IoT in Healthcare and IoT in Sports.

Text Books:

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing

Reference Books:

1. The Internet of Things: Key Applications and Protocol By: Olivier Hersent; David Boswarthick; Omar Elloumi, Publisher: John Wiley & Sons
2. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons
3. Related *IEEE/ASME/ASCE/EBSCO* Papers.

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-03 **Course: Operation Research**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To acquaint with the applications of operations research to formulate and optimize business and industry related problems.
2. To realize the need for mathematical tools to take decisions in a complex environment.
3. To improve the analytical thinking, algorithmic approach and modeling abilities related to programming, networking, queuing models.

Course Outcomes

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

1. Demonstrate the models of Operation research.
2. Implement the tools of decision making and network scheduling.
3. Solve the real life problems of Inventory control and queuing theory.

Syllabus

UNIT -I

Introduction to Operation Research (OR): Origin and Development of OR, Nature of OR, Characteristics of OR, Classification of Problems in OR, Models in OR, Phases of OR, Uses and Limitations of OR, Methodologies in OR, Applications in OR. Linear Programming – Concept of Linear Programming Model, Mathematical Formulation of the Problem, Graphical solution Methods. Linear Programming Methods - Simplex Methods, Big M methods, Dual Simplex Method, Two Phase Methods. Duality Rules, Formulation of Dual Problem.

UNIT -II

Transportation Problem: Mathematical Model for Transportation Problem, Types of Transportation Problem. North-West Corner Rule, Least Cost Cell Method, Vogel Approximation Method, MODI Method. Assignment Problem – Zero-One programming model for Assignment Problem, Types of assignment Problem, Hungarian Method, Branch and Bound Technique for Assignment Problem. Travelling Salesman Problem.

UNIT -III

Decision Theory : Introduction, Decision under Certainty, Decision under Risk, Decision under Uncertainty, Decision Tree. Game Theory – Terminologies of Game Theory, Two person Zero-Sum Games, The Maximin-Minimax Principle, Saddle Point, Game of Mixed Strategies, Dominance Property ,Graphical Solution of 2xn and mx2 Games.

UNIT -IV

Network Scheduling By CPM/PERT : Introduction, Basic Concept, Constraints in Network, Critical Path Methods (CPM), PERT Network, PERT calculations, PERTvs.CPM., Project Cost, Crashing Algorithm, Resource Allocation and Scheduling Concept of MOST,GERT,LOB and Precedence Planning.

UNIT-V

Inventory Control : Introduction, Inventory Control, Selective Control Techniques, Types of Inventory, Economic Lot Size Problem, Problem of EOQ without and with shortage(Purchase and Manufacturing Models) , Inventory Control with Price Breaks.

UNIT-VI

Queuing Theory : Introduction, Terminologies of Queuing System, Operating Characteristics of Queuing System, Poisson Process and Exponential Distribution, Classification of Queues, Definition of Transient and Steady States, Poisson Queues(M/M/1:∞/FCFS) and (M/M/N:∞/FCFS) models , Non-Poisson Queuing System(M/Ek/1: ∞/FCFS), Cost-Profit Models in Queuing, Queuing Control.

Text Books:

1. Operation Research : Kanti Swarup, P.K.Gupta, Man Mohan ,Sultan Chand.
2. Operation Research :R. Panneerselvam ,PHI.
3. Operation Research : Hira and Gupta.,S. Chand.

Reference Books:

1. Introduction to Operation Research:*Billy Gillett, Tata McGrawHill*
2. Operation Research Theory & Application: *Sharma J,K, MacMillan.*
3. Operation Research :*Hemdy Taha, IEEE.*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-04 **Course: Computer Graphics & its Applications**

L: 4 Hrs., P: 0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To acquaint with the applications of operations research to formulate and optimize business and industry related problems.
2. Realize the need for mathematical tools to take decisions in a complex environment.
3. To improve the analytical thinking, algorithmic approach and modeling abilities related to programming, networking, queuing models.

Course Outcomes

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

1. Specify, design and implement 2D and 3D computer graphics algorithms.
2. Implement 2D and 3D transformations, projection and viewing.
3. Demonstrate advanced computer graphics including modeling, curves & surfaces, etc.

Syllabus

UNIT-I

Scan Conversion-Geometry & Line generation, Points, Lines, Planes, Pixels and Frame buffers, Types of Display Devices, Line algorithms-DDA line generation algorithm, Bresenham's Line generation Algorithm, Circle generation-DDA circle generation algorithm, Midpoint circle generation algorithm, Bresenham's circle generation algorithm, Antialiasing.

UNIT-II

Polygons, Segments, 2D Transformations-Graphics primitives, Display files, Polygon generation, Polygon filling, 2D transformations Segment tables, Operations on Segments.

UNIT-III

Windows and Clipping-Clipping Window, Viewport, Viewing Transformations, Line clipping-Cohen Sutherland algorithm, Midpoint subdivision algorithm, Cyrus Beck Line Clipping Algorithm. Polygon Clipping-Sutherland Hodgman Polygon clipping algorithm.

UNIT-IV

3D Transformations and 3D Projections-3D Graphics, 3D primitives, Projections: Parallel, Perspective, viewing transformations, viewing parameters.

UNIT-V

Hidden lines and Surfaces-Hidden Surfaces and Line removal.: Backface removal algorithm, Z-buffer algorithm, A-buffer Algorithm, Warnock's algorithm, Painters Algorithm, scan line algorithm, Hidden line methods.

UNIT-VI

Curve generation and Raster graphics-Curves and Surfaces, Cubic Bezier and cubic B-Spline curves, Raster Graphics Architecture, Standard Graphics Pipeline. Introduction to Image File format Standards.

Text Books:

1. Computer Graphics: Steven Harrington, TMH.
2. Procedural Elements for Computer Graphics : *David F. Rogers , McGraw-Hill.*
3. Multimedia System Design: *Prabhat. K .Andleigh and Kiran Thakrar, PHI publication.*

Reference Books:

1. Principles of Interactive Computer Graphics: *Newman & Sproul, McGraw-Hill.*
2. Mathematical Elements for Computer Graphics: *David F Rogers & Adams, McGraw-Hill.*
3. Multimedia making it works: *Vaughan, Tata McGraw-Hill.*
4. Computer Graphics : *Hearn Baker [PHI]*
5. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT629-05 **Course: High Performance Computing**

L: 4 Hrs.,P: 0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To understand fundamental concepts and techniques in parallel computation structuring and design.
2. To study various architectures of high - performance computing systems.
3. To demonstrate the principles of Parallel Algorithm Design.

Course Outcomes

At the end of this course student will be able to:

1. Investigate modern design structures of pipelined and multiprocessors systems.
2. Understand the algorithms using parallel programming principle.
3. Design architectures to perform parallel processing

Syllabus

Unit I

Modern Processors

Stored-program computer architecture – General-purpose cache-based microprocessor architecture – Memory hierarchies - Multicore processors - Multithread processors - Vector processors - Basic optimization techniques for
serial code - Common sense optimizations - Simple measures - large impact - Role of compilers.

Unit-II

Parallel Computers

Data access optimization - Balance analysis and lightspeed estimates - Storage order - Taxonomy of parallel computing paradigms - Shared memory computers - Distributed memory computers - Hierarchical systems –Networks - Basics of parallelization- Parallelism – Parallel scalability

Unit III

Introduction to Parallel Computing

Motivating parallelism - Scope of parallel computing - Parallel programming platforms: Implict parallelism trends in microprocessor architectures - Limitations - Dichotomy - Physical organizations - Communication costs - Routingmechanisms for interconnected networks- Impact of process.

Unit IV

Principles of Parallel Algorithm Design

Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.

Unit V

Sorting and Graph Algorithms

Dense matrix Algorithm: Matrix-vector multiplication - Martix- matrix multiplication- Issues in sorting on parallel computing - Sorting networks - Bubble sorts and its variants - Quick sort - Graph algorithms - Definition and representation - Prims algorithm - Dijkstra's algorithm - All pairs shortest path - Transitive closure – Connected components.

Unit VI

Shared-Memory Parallel Programming with OpenMP

Short introduction to OpenMP, Advanced OpenMP: Wavefront parallelization, Profiling OpenMP programs Performance pitfalls, Case study:OpenMP-parallel Jacobi algorithm & Parallel sparse matrix-vector multiply,

References

1. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall, 2010.
2. Ananth Grama and George Karypis, Introduction to parallel computing, Addison-Wesley 2009.
3. John Levesque and Gene Wagenbreth, High Performance Computing: Programming and Applications,Chapman & Hall, 2010.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCP629-01 **Course: Programming in Python Lab**

L: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn basic concepts of Python programming
2. To explore the advantages of Python programming over other programming languages.
3. To implement GUI using Python Programming.

Course Outcomes

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

1. Use basic concepts in programming
2. Construct and execute basic programs in Python
3. Design and implement basic algorithms in Python
4. Use external libraries with Python

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introductory programming concepts.
- Interactive programming.
- Procedural programming
- OOPs programming.
- GUI

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCP629-02	**Course: Web Development Lab**
L: 0 Hrs., P:4 Hrs., Per week	**Total Credits:2**

Course Objectives

1. To explore the DotNet Framework.
2. To implement real life problems using DotNet Framework.
3. To analysis and interpret the solutions of the problems.

Course Outcomes

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

1. Evaluate programs implemented using DotNet Framework.
2. Debug windows, web, WCF based programs using DotNet Framework.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introduction to DotNet Framework.
- Implementation of windows, web, WCF based programs using DotNet Framework.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT720-01 **Course: Elective –II- Artificial Intelligence**

L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To study various search, heuristic techniques for solving AI problems.
2. To learn various knowledge representation techniques.
3. To understand various reasoning and learning techniques.
4. To discuss the learned concepts for designing and solving AI related problems.

Course Outcomes:

At the end of the course students will be able to

1. Identify and specify a problem definition for a given real world problem domain.
2. Apply and analyze both deterministic and non-deterministic Artificial Intelligence search techniques to a well defined problem domain.
3. Formulate a problem description for CSP, Understand and apply knowledge representation, reasoning, machine learning techniques and Uncertainty methods to solve real-world problems.

Syllabus

UNIT-I

Introduction To Artificial Intelligence: Definition and Concepts, History, Overview, Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem-solving agents, Problem Formulation, Uninformed Search Strategies

UNIT-II

Search and Exploration: A* search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Local Search algorithms, Hill-climbing, Simulated Annealing, Genetic Algorithms, Online search

UNIT-III

Constraint Satisfaction Problems: Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs.

Adversarial Search: Games, The minimax algorithm, Alpha- Beta pruning.

UNIT-IV

Knowledge and Reasoning : Knowledge Based Agents, Logic, Propositional Logic, Inference, Equivalence, Validity and satisfiability, Resolution, Forward and Backward Chaining, Local search algorithms.

First Order Logic: Syntax and Semantics of FOL, Inference in FOL, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

UNIT-V

Learning and Uncertainty:

Rote Learning, learning by taking advice, learning in problem solving, learning from examples: Induction, Explanation based learning, Discovery, Analogy. Basic Probability Notations, Axioms of Probability, Baye's Rule and its use.

UNIT-VI

Applications of Artificial Intelligence: Introduction to Neural networks-supervised, unsupervised learning algorithms, Introduction to Deep Learning, Introduction to **Robotics,** Case studies.

Text Books:

1. Artificial Intelligence: A Modern Approach: Stuart Russel and Peter Norving, Prentice Hall
2. Artificial Intelligence: E.Rich and Knight, Tata McGraw Hill.

Reference Books/links:

1. Artificial Intelligence: E. Charniack and D. Mcdermott, Addison Wesley.
2. Introduction to Knowledge Systems: Mark Stefik, Morgan Kaufmann.
3. https://www.coursera.org/learn/gcp-big-data-ml-fundamentals
4. https://www.coursera.org/learn/natural-language-processing
5. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER –V, M.C.A. (Master In Computer Application)

Course Code: MCT720-02 **Course: Elective –II-Data Mining**
L: 4 Hrs., P:0 Hrs., Per week **Total Credits: 4**

Course Objectives

1. To learn basics of Data Mining.
2. To understand the data used in Data Mining.
3. To learn Data Mining as a cutting edge business intelligence method and use Data Mining techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.
4. To describe and demonstrate basic data mining algorithms, methods, and tools.

Course Outcomes

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

1. Conceptualize need and utility of Data Mining.
2. Familiarize with the concepts of various types of data used in Data Mining.
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes.
4. Conceptualize latest technologies & techniques in Data Mining.

Syllabus

UNIT –I

Data Mining: Introduction, Importance of Data Mining, Kinds of Data and Patterns to be Mined, Technologies used in Data Mining, Data Mining Applications, Major issues in Data Mining.

UNIT -II

Getting to Know Your Data: Data Objects and Attribute Types**,** Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

Data Preprocessing: Data Preprocessing: An overview, Data Cleaning, Data Integration , Data Reduction, Data Transformation and Data Discretization.

UNIT –III

Mining Frequent Patterns, associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods, Pattern Evaluation Methods.

Advanced Pattern Mining: Pattern Mining in Multilevel and Multidimensional Space, Constraint-Based Frequent Pattern Mining.

Introduction: Mining High-Dimensional Data and Colossal Patterns, Mining Compressed Patterns, Pattern Exploration and Application

UNIT –IV

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule Based Classification, Model Evaluation & Selection, Techniques to Improve Classification Accuracy.

Advanced Methods: Bayesian Belief Networks, Classification by Backpropogation, **Introduction:** Support Vector Machines, Classification using Frequent Patterns, Lazy Learners, Other Classification Methods.

UNIT-V

Cluster Analysis: Cluster Analysis basic concepts, **Partitioning Methods:** k-Means and k-Medoids, **Hierarchical Methods:** BIRCH, CHAMELEON, Probabilistic Hierarchical Clustering, **Density-Based Methods:** DBSCAN, OPTICS, DENCLUE, **Grid-Based Methods:** STING, CLIQUE, Evaluation of Clustering.

UNIT-VI

Data Mining Trends and Research Frontiers: Mining Complex Data Types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Books:

1. Data Mining- Concepts and Techniques: Jiawei Han, Micheline Kamber Morgan Kaufmann Publishers, Third Edition.
2. Mining of Massive Datasets: Anand Rajaraman, Jeff Ullman, Jure Leskovec.

Reference Books:

1. Advances In Knowledge Discovery And Data Mining,: Usama M.Fayyad, Gregory Piatetsky – Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, The M.I.T Press, 1996.
2. The Data Warehouse Life Cycle Toolkit: Ralph Kimball, John Wiley & Sons Inc., 1998.

SYLLABUS OF SEMESTER –V, M.C.A. (Master in Computer Application)

Course Code: MCP720-01 **Course: Artificial Intelligence Lab**

L: 0 Hrs. P: 4 Hrs. Per week **Total Credits: 2**

Course Objectives

1. To learn various AI search algorithms.
2. To learn the fundamentals of knowledge representation, inference and theorem proving.
2. To learn how to build simple knowledge based systems.

Course Outcome

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

1. Use key logic-based techniques in a variety of research problems.
2. Communicate scientific knowledge at different levels of abstraction.
3. Build knowledge based systems.

Syllabus

Minimum 8 practical implemented using Tensor flow/Torch Tools.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER –V, M.C.A. (Master in Computer Application)

Course Code: MCP720-02 **Course: Data Mining Lab**

L: 0 Hrs. P: 4 Hrs. Per week **Total Credits: 2**

Course Objectives

1. To learn various tools used in Data Mining.
2. To implement real life problems of Data Mining.

Course Outcome

On successful completion of the course students will be able to:
1. Identify various live scenarios of Data Miming
2. Analyze and implement various concepts of Data Mining in Weka/Orange tool

Syllabus

Minimum 8 practical implemented using Weka/Orange Tool.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT721 **Courses: Elective-III- Introduction to Web Development**

L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To understand the basics of HTTP protocol & HTML language syntax.
2. To learn the CSS, JavaScript & usage for basic web development.
3. To learn the client side frameworks with market leading technologies.

Course Outcomes

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

1. To get the basic knowledge of HTTP and markup code creation using HTML/HTML5 tags.
2. To apply the formatting and dynamic interaction techniques on the webpages.
3. To use the current industrial client side frameworks for web development.

Syllabus

UNIT- I

Introduction to Web: History of the Web, Protocols Governing the Web, Web Architecture, Hypertext Transfer Protocol, Webservers and Clients, URL and its anatomy, Request and Response message formats, HTTP Status codes.

UNIT- II

HTML : HTML Basics, Elements, Attributes, Basic Tags, Advanced Tags, HTML Forms, Form elements, Frames. **HTML5 :**Canvas, Audio and Video elements, Local Storage, Graphics, Geolocation.

UNIT- III

CSS: Advantages of CSS, Types, Selectors, Multicolumn Layouts, Web Fonts, Colors and Opacity, Transformations, Viewport, Responsive websites using Media Queries.

UNIT- IV

Javascript : History of Javascript, Variables, Literals, Operators, Functions, Objects, Valildating User Input with Javascript, Introduction to JSON, JSON Objects, JSON Schema, AJAX

UNIT- V

Client side Frameworks : JQuery Introduction, JQuery Syntax, JQuery Selectors, JQuery Events, JQuery Effects; Introduction to MVC Framework, Introduction to AngularJS, AngularJS modules, Two-way data binding, AngularJS Directives.

UNIT- VI

MEAN Stack: Introduction to MEAN, Introduction to MongoDB, key features, databases, collections, MongoDB CRUD operations, Getting started with Node.js, Node modules.

Text Books:

1. Beginning HTML, XHTML, CSS, and JavaScript– *Jon Duckett(Wrox)*
2. Getting MEAN with Mongo, Express, Angular, and Node - *Simon Holmes (Manning).*

Reference Books:

1. PHP, MySQL, Javascript& HTML5 All-in-one for Dummies - *Steven Suehring, Janet Valade* (*Wiley*)
2. HTML5, JavaScript, and jQuery 24-Hour Trainer - *Dane Cameron (Wrox)*
3. Mean Web Development - *Amos Q. Haviv, PACKT Publishing.*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code : MCP721-01 **Course : Technical Seminar**

L: 0 Hrs., P:2 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn how to evaluate research papers.
2. To learn what makes papers good.
3. To learn how papers are refereed and published.

Course Outcomes

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

1. Critically evaluate a well defined set of research subjects.
2. Summarize the findings concisely in a paper of scientific quality

Syllabus

The students will have to perform the following tasks:-

1. Every student selects a topic of current trends and the same should be approved by a committee of faculty mentors.
2. Every student must write a short review of the topic and present it to fellow students and faculty members (discuss the topic–expose the flaws–analyze the issues) every week.
3. Every student should re-submit and present the review article including issues/comments/ conclusions which had arisen during the previous discussion.
4. Every student should submit a final paper as per his/her topic along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.

SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCP721-02 **Course: Mini Project**

L: 0 Hrs., P:2 Hrs., Per week **Total Credits: 2**

Course Objectives:

1. To learn application of knowledge and techniques learnt in theoretical classes for developing the s/w for real problems.
2. To gain deeper understanding of specific functional areas.
3. To learn professional approach towards documentation, report writing and presentation skills.

Course Outcomes

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

1. Get much practical exposure of coding the projects.
2. Understand basics of the project creation process and flow.
3. Avoid the coding pitfalls.

Syllabus

Mini Project based on subjects studied till current semester using latest tools and technologies.

SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: MCT722-01 Course: Distributed Database Management Systems

L: 4 Hrs., P:0 Hrs., Per week Total Credits: 4

Course Objectives

1. To understand the need for distributed database technology to tackle deficiencies of the centralized database systems.
2. To get familiar with the currently available models, technologies and approaches to build distributed database systems and services.
3. To learn basic principles and implementation techniques of distributed database systems.

Course Outcomes

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

1. Learn basic concepts of Distributed DBMS and analyze various complexities & dimensions of its architecture and design issues.
2. Acquire various concepts of transaction management, fragmentation, replication and allocation related to Distributed DBMS.
3. Understand concurrency control techniques and distributed object management.

Syllabus

UNIT-I

Introduction: Distributed data processing, Definition and Concepts, Advantages and disadvantages of DDBMS, Transparencies in a distributed DBMS, Problem areas, Overview of RDBMS and Computer Network Concepts.

UNIT-II

Distributed Database Management System Architecture and Database Design: Distributed DBMS architecture, Global directory issues, Alternative design strategies, Distributed design issues, Fragmentation, Data allocation.

UNIT-III

Query Processing: Overview of query processing- Problem, Objectives, Complexity of relational algebra, Characterization of processors, Layers, Query decomposition, Localization of distributed data.

UNIT-IV

Optimizing Distributed Queries and Transaction Management: Query optimization, Centralized and Distributed query optimization, Algorithms.

Transaction Concepts- Model, Definition, Properties, Characterization, Goals of transaction management, Types of transactions, Distributed execution monitor.

UNIT-V

Distributed Concurrency Control: Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Two-Phase Locking, Timestamp-Based Concurrency Control, Optimistic Concurrency Control, Deadlock Management- Detection, Prevention, Avoidance.

UNIT-VI

Distributed Object Management: Object Concepts and Object Models, Object Distribution Design, Architectural Issues, Object Management, Object Storage, Object Query Processing, Object DBMSs Transaction Management.

Text Books:

1. Principles of Distributed Database Systems: M.T. Ozsu and P. Valduriez, Prentice-Hall.
2. Distributed Databases Principles and Systems: S. Ceri and G. Pelagatti, McGraw Hill.

Reference Book:

1. Advances in Object-Oriented Database Systems: A. Dogac, M.T. Ozsu, A. Billiris, and T. Sellis, Springer-Verlag.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-02 **Course: Distributed Systems**

L: 4 Hrs, P: 0 Hrs, Per Week **Total Credits: 4**

Course Objectives

1. To understand the differences between concurrent, networked and distributed systems.
2. To understand the concept of resource allocation and distributed deadlock detection and avoidance techniques.
3. To study and analyze the commit and voting protocols for the fault tolerance.
4. To study the importance of implemented modules through case studies.

Course Outcomes

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

1. The architectures and components of distributed computing environment.
2. The correlation between the various distributed algorithms and recent programming aspects.
1. The importance of the resource management, recovery and fault tolerance issues in distributed systems.
2. The implementation of distributed computation services using case studies.

Syllabus

UNIT I:

Introduction: Examples of Distributed System, Resource Sharing and the Web-Challenges, case study on World Wide Web

System Models: Introduction, Architectural Models, Fundamental Models, Remote Invocation: Remote Procedure Call.

UNIT II:

Distributed Operating Systems: Introduction, Issues, Inherent Limitation, Clock Synchronization, Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection.

Distributed File Systems: Architecture, Mechanisms, Design Issues, Case Study: Sun Network File System.

UNIT III:

Distributed Shared Memory: Architecture, Algorithms, Memory Coherence: Protocols, Design Issues.

Distributed Scheduling: Issues, Components, Load Distributing Algorithms, Load Sharing Algorithms.

UNIT IV:

Distributed Deadlock Detection: Issues, Centralized Deadlock, Detection Algorithms, Distributed Deadlock, Detection Algorithms.

Distributed Mutual Exclusion-Non-Token based Algorithms, Token based Algorithms, consensus and related problems

UNIT V:

Recovery: Introduction, Basic Concepts, Classification of Failures, Backward Error Recovery: Basic Approaches, Recovery in Concurrent Systems.

Fault Tolerance: Introduction, Issues, Commit Protocols, Non-Blocking Commit Protocols, Voting Protocols, Dynamic Voting Protocols.

Agreement Protocols: The System model, Classification of Agreement Problems, Solution to the Byzentine agreement problem.

UNIT VI:

Designing Distributed System: Google Case Study: Introducing the Case Study: Google- Overall architecture and Design Paradigm, Communication Paradigm, Data Storage and Coordination Services, Distributed Computation Services.

Text Books:

1. Distributed Systems Concepts and Design: *George Coulouris, Jean Dellimore and Tim KIndberg, Pearson Education,5th Edition.*
2. Advanced Concepts in Operating Systems: *Mukesh Singhal and N.G.Shivaratri, McGraw-Hill*.
3. Distributed Operating Systems: *Pradeep K. Sinha, PHI,2005*

References Books:

1. Distributed Computing-Principles,Algorithms and Systems: *Ajay D.Kshemkalyani and Mukesh Singhal Cambridge University Press.*
2. Distributed Algorithms, *Nancy A.Lynch, Morgan Kaufmann Publishers*.
3. Grid Computing: *Joshy Joseph and Craig Fellenstein , IBM Press*.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-03 **Course: Big Data & Analytics**

L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To understand the complexity and volume of Big Data and their challenges.
2. To analyze the various approaches of data collection for Big Data analytics.
3. To explore the Hadoop architecture and ecosystem tools.
4. To study modern technical tools based on MongoDB and Apache Spark.

Course Outcomes

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

1. Identify the various sources of Big Data.
2. Demonstrate the applications using Hadoop architecture and ecosystem tools.
3. Design and build MongoDB based Big data Applications and learn MongoDB query language.
4. Design and build APIs for large-scale data processing.

Syllabus

UNIT I:

Introduction to Big Data: Big data definition, Big Deal about Big Data under 8V, Big Data Sources, Industries using Big Data, Big Data challenges, Big data applications.

UNIT II:

Big Data Collection: Strategies, Types of Data Sources, Structured Vs Unstructured data, ELT vs ETL ,storage infrastructure requirements , Collection methods, Log files, Sensors.

UNIT III:

Hadoop Architeture: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization. Hadoop Architecture- NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers.

UNIT IV:

Hadoop Ecosystem: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN. Hadoop tools -Avro, Flume, Hive, HBase , PIG, Zookeeper and Mahut. Sqoop, Oozie.

UNIT V:

Data Base for the Modern Web: Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language.

UNIT VI:

Apache Spark APIs for large-scale data processing: Overview, Linking with Spark, Initializing Spark, Resilient Distributed Datasets (RDDs), External Datasets, RDD Operations, Passing Functions to Spark, Working with Key-Value Pairs, Shuffle operations, RDD Persistence, Removing Data, Shared Variables, Deploying to a Cluster.

Text Books:

1. Chris Eaton, Dirk derooset al. , "Understanding Big data ", McGraw Hill, 2012.
2. Bart Baesens," Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014.
3. MongoDB in Action, Kyle Banker, Piter Bakkum , Shaun Verch, Dream tech Press .
4. Learning Spark: Lightning-Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, O Reilly, 2015.

References Books:

1. BIG Data and Analytics , Sima Acharya, Subhashini Chhellappan, Willey .
2. HADOOP: The definitive Guide, Tom White, O Reilly 2012.
3. Spark in Action, Petar Zecevic, Marko Bonaci, Manning Publications Company, 2016.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-04 **Course: Information Retrieval**

L:4 Hrs, P: 0 Hrs, Per week **Total Credits: 4**

Course Objectives

1. To understand the basic concepts of Information Retrieval Systems like Boolean retrieval, vocabulary and dictionaries.
2. To emphasize on different index construction and compression techniques, different score computing techniques.
3. To Analyze and study evaluation in IR, Probabilistic Information retrieval techniques, classification techniques and Latent Semantic Index.
4. To understand Web basics for IR and Link Analysis.

Course Outcomes

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

1. Understand the basics of Information Retrieval Systems.
2. Learning different index construction and compression techniques, different score computing techniques.
3. Analyze and study evaluation in IR, Probabilistic Information retrieval techniques, Classification technique and Latent Semantic Index.
4. Understand web basics for IR and Link Analysis.

Syllabus:

UNIT-I

Boolean Retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries. **The term vocabulary and postings lists:** Document delineation and character sequence decoding. **Determining the vocabulary of terms:** Tokenization, Dropping common terms: stop words, Stemming and lemmatization

UNIT-II

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction. **Introduction to index construction and index compression**: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression

UNIT-III

Scoring, term weighting and the vector space model: Term frequency and weighting, Inverse document frequency**,** The vector space model for scoring, **Computing scores in a complete search system:** Efficient scoring and ranking, Components of an information retrieval system.

UNIT-IV

Evaluation in information retrieval: Information retrieval system evaluation. Evaluation of unranked retrieval sets, **A broader perspective: System quality and user utility:** System issues, User utility.

UNIT-V

Probabilistic information retrieval: Review of basic probability theory, The Probability Ranking Principle, The Binary Independence Model. **Text classification and Naïve Bayes:** The text classification problem, Naive Bayes text classification. **Feature selection:** Mutual information, ***c*** Chi2 Feature selection

UNIT-VI

Matrix decompositions and latent semantic indexing: Linear algebra review, Term-document matrices and singular value decompositions, Latent semantic indexing. **Web search basics:** Web characteristics, Search user experience. **Web crawling and indexes:** Overview, Crawling. **Link analysis:** The Web as a graph, PageRank

Text Books:

1.An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge University Press, Cambridge, England, 2009

2. Information Retrieval: Implementing and evaluating search engines: Stefan Büttcher, Charles L. A.Clarke, Gordon V. Cormack, MIT Press, 2010

Reference Books:

1. Information Retrieval: Algorithms and Heuristics: David A. Grossman, Ophir Frieder, Springer.
2. Information Retrieval: Data Structures and Algorithms by Frakes, Pearson.
3. Related *IEEE/ASME/ASCE/EBSCO* Papers

SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: HUT701-1 **Course: Presentation & Interview Skills**

L: 2 Hrs., P:0 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To understand how to prepare for an interview.
2. To learn the differences between different types of interviews and interview questions.
3. To learn how to successfully answer questions in an interview situation.

Course Outcomes

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

1. Build credibility & confidence as a speaker.
2. Explore different techniques for preparing & delivering presentation well.
3. Learn how to prepare & face interviews and earn success.

Syllabus

- Presentation Structure.
- Presentation design.
- Slide design.
- Preparing your presentation.
- Delivering your presentation.
- Different types of Interview
- Dress for success
- How to prepare for the Interview
- Interview questions & answers
- Before the Interview
- During the Interview
- After the Interview

SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP 722-01 **Course: API Level Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn the basics of API level Programming.
2. To implement real life problems using API level Programming

Course Outcomes

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

1. Learn the basics of API level Programming
2. Implement API's in Procedural as well as Object oriented languages.
3. Develop a digitally enabled business using API.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introduction to API Level Programming.
- API Environments
- API Parameters
- API in Procedural Languages
- API in OO Languages
- API libraries & frameworks
- Web APIs
- Building an efficient & agile digitally enabled business using API
- RESTful web APIs & Amazon API

Reference Books:

1. API for Dummies: Clans T. Jenson,By John Wiley & Sons,Inc.

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP 722-02 **Course: R Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To learn the basics of R Programming.
2. To implement real life problems using R Programming.

Course Outcomes

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

1. Apply Predictictive Analytics to predict outcomes.
2. Explore data manipulation using R.
3. Apply Data Visualization to create fancy plots

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Basics of R programming
- Control structures & functions
- Vectors & matrices
- Reading and Writing Data
- Data Mining & Predictive Analysis using R
- Data Visualization
- Debugging Tools
- Simulation
- R Profiler.

Reference Book

1. W. N. Venables, D. M. Smith, An Introduction to R, R-core team, 2015.
2. R Programming- By Tutorials Point

Note: Introduce one activity/assignment based on a paper published by any reputed journal as Teachers assessment.

SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP 722-03 **Course: Big Data & Analytics Lab**

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week **Total Credits: 2**

Course Objectives

1. To understand and apply technologies for Big Data.
2. To perform data analytics on different types of data like structured, semi-structured and unstructured data.
3. To study modern technical tools based on MongoDB and Apache Spark.

Course Outcomes

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

1. Demonstrate the applications using Hadoop architecture and ecosystem tools.
2. Design and build MongoDB based Big data Applications and learn MongoDB query language.
3. Design and build APIs for large-scale data processing.

Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Simple program using Map Reduce Frame-work
- HDFS command set for distributed file systems
- Data Ingestion using Flume/Avro
- Simple program using Pig Scripting
- Simple program using Hive
- Basic CRUD operations in MongoDB
- Load and Inspect Data in RDD using Apache Spark
- Mini Project by integrating any of above topics

SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT723 **Course: Business Intelligence**

L:2 Hrs, P: 0 Hrs, Per week **Total Credits: 2**

Course Objectives

1. To get familiar with the basics of Business Intelligence and its components.
2. To understand technology and processes associated with Business Intelligence framework.
3. To understand Data Warehouse implementation methodology and project life cycle.
4. To learn various open source tools used in Business Intelligence.

Course Outcomes

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

1. Differentiate between Transaction Processing and Analytical applications and understand the need of Business Intelligence.
2. Apply technology and processes associated with Business Intelligence framework.
3. Model and analyze multidimensional data.
4. Design an enterprise dashboard that depicts the key performance indicators which helps in decision making.

Syllabus:

UNIT -I

Introduction to Business Intelligence: Evolution of BI, BI value chain, introduction to business analytics, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, **BI Infrastructure Components** - BI Process, BI Technology, BI Roles & Responsibilities.

UNIT- II

Basics of Data Integration: Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, data integration technologies, Introduction to data quality, data profiling concepts and applications.

UNIT-III

Multi-Dimensional Data Modeling: Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi-dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs.

Basics of Enterprise Reporting: Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, Study of open source BI tools.

Text books:

1. Fundamentals of Business Analytics: *RNPrasad and S Acharya* ; Wiley India, 2011.
2. Business Intelligence: A Managerial Approach: *Ephraim Turban et.al;* 2nd Edition, Prentice Hall, 2010.

Reference Books:

1. Business intelligence for the enterprise by Mike Biere
2. Business intelligence roadmap by Larissa Terpeluk Moss, Shaku Atre.
3. Related *IEEE/ASME/ASCE/EBSCO* Paper

SYLLABUS OF SEMESTER -VI, M.C.A. (Master in Computer Application)

Course Code: MCP723 **Course: Project Work-Full Time**

L:0 Hrs, P: 20 Hrs, Per Semester **Total Credits: 20**

Course Objectives

1. To get familiar with the basics of project planning, designing and development.
2. To understand technology and processes associated in software industries.

Course Outcomes

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

1. Implement comprehensive project planning, designing and development process.
2. Acquire and understand Software industry needs.

Syllabus:

A full time project work to be carried out under the supervision of one external guide from industry and one internal guide as appointed by project coordinator.