

MASTERS OF COMPUTER APPLICATIONS (MCA)

Year	Semester	Course Code	Course Title	L	T	P	C
1	1	MCA-111	Professional Communication	2	1	0	3
		MMTH-112	Discrete Mathematics	2	1	0	3
		MCA 112	Computer Fundamentals and C Programming	2	1	2	4
		MCA 113	Database Management System	2	1	2	4
		MCA 114	Elective-I	3	1	0	4
			Total	11	5	4	18
	2	MCA 121	Digital Logic Design	3	1	0	4
		MCA 122	Data Structures Using 'C'	2	1	2	4
		MCA 123	Object Oriented Systems & C++	2	1	2	4
		MCA 124	Operating Systems	3	1	0	4
MCA 125		Elective-II	3	1	0	4	
		Total	13	5	4	20	
2	1	MCA-211	Computer Networks	3	1	0	4
		MCA-212	Design & Analysis Of Algorithms	2	1	2	4
		MCA-213	Software Engineering	3	1	0	4
		MCA-214	Internet & Java Programming	2	1	2	4
		MCA-215	Elective-III	3	1	0	4
			Total	13	5	4	20
	2	MCA-221	Web Technology	2	1	2	4
		MCA-222	Computer Organization	2	1	2	4
		MCA-223	CBNST(Computer Based Numerical and Statistical Techniques)	3	1	0	4
		MCA-224	Theory Of Computation	3	1	0	4
MCA-225		Elective-Iv	3	1	0	4	
		Total	13	5	4	20	
3	1	MCA-311	.Net Framework & C#	2	1	2	4
		MCA-312	Computer Graphics and Animation	2	1	2	4
		MCA-313	Client Server Computing	3	1	0	4
		MCA-314	Elective-IV	3	1	0	4
		MCA-315	Elective-V	3	1	0	4
			Total	13	5	4	20
	2	MCA-321	Project Work	-	-	40	20
		MCA-322	Comprehensive VIVA			4	2
		Total			44	22	

TOTAL CEDITS-120

LIST OF ELECTIVE SUBJECTS:

List of Departmental Electives

MCA-114

- ❖ (MCA-114-1)Accounting and Financial Management
- ❖ (MCA-114-2)Operation Research
- ❖ (MCA-114-4)-Computer Fundamental and Its Applications

MCA-125

- ❖ (MCA-125-1)Artificial Intelligence
- ❖ (MCA-125-2)E-Commerce
- ❖ SWYAM(Software Testing)

MCA-215

- ❖ (MCA-215-1)Advanced Database Management System
- ❖ (MCA-215-2)Cloud Computing
- ❖ SWYAM(Distributed System))
- ❖

MCA-225

- ❖ (MCA-225-1) Real Time Systems
- ❖ (MCA-225-2) Modelling and Simulation
- ❖ (MCA-225-3) Data Ware Housing & Data Mining
- ❖ SWYAM(Embedded System))

MCA-314

- ❖ (MCA-314-1) Network Security & Cryptography
- ❖ (MCA-314-2) Neural Network
- ❖ (MCA-314-3) Pattern Recognition

MCA-315

- ❖ (MCA-315-1) Mobile Computing
- ❖ (MCA-315-2) Compiler Design
- ❖ (MCA-315-3) Big Data

MCA IST SEM
Course Code-MCA-111
Course Name- Professional Communication

L	T	P	C
2	1	0	3

COURSE OBJECTIVE
Professional communication encompasses the students about written, oral, visual and digital communication within a workplace context. This discipline blends together pedagogical principles of rhetoric, technology, software, and learning theory to improve and deliver communication in a variety of settings ranging from technical writing to usability and digital media design.

UNITS	CONTENTS	Contact Hrs.
I	1 Basics of Technical Communication Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication.	7
II	Constituents of Technical Written Communication Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods -Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.	8
III	Forms of Technical Communication Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order, Claim and Adjustment Letters; Job application and Resumes. Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance. Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing.	9
IV	Presentation Strategies Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time- Dimension.	7
V	Value- Based Text Readings Following essays form the suggested text book with emphasis on Mechanics of writing, (i) The Aims of Science and the Humanities by M.E. Prior (ii) The Language of Literature and Science by A.Huxley (iii) Man and Nature by J.Bronowski (iv) The Mother of the Sciences by A.J.Bahm (v) Science and Survival by Barry Commoner (vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior (vii) The Effect of Scientific Temper on Man by Bertrand Russell	9

REFERENCE BOOKS	
1 Improve Your Writing Chandra	V.N. Arora and Laxmi Chandra, Oxford Univ.

		Press, New Delhi
2	Technical Communication – Principles and Practices	Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press 2007, New Delhi
3	Effective Technical Communication	Barun K. Mitra, Oxford Univ. Press, 2006, New Delhi
4	Business Correspondence and Report Writing	Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., New Delhi.

Course Code- MMTH-112
Course Name- Discrete Mathematics

L	T	P	C
2	1	0	3

COURSE OBJECTIVE
Discrete mathematics is mathematics that deals with discrete objects. In this course we will be concerned with objects such as integers, propositions, sets, relations and functions, which are all discrete.

UNITS	CONTENTS	Contact Hrs.
I	Set Theory: Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set identities. Relations & Functions: Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions. Notion of Proof: Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases.	7
II	Lattices: Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.	5
III	Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	6
IV	Propositional & Predicate Logic: Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic	6
V	Recurrence Relations: Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences. Combinatory: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.	6

REFERENCE BOOKS :		
1.	Discrete Mathematics and Its Applications	Kenneth H. Rosen
2.	Discrete Mathematics	Norman L. Biggs
3.	Discrete Mathematics By	Katson Publications

Course Code- MCA-112

Course Name- Computer Fundamentals and C Programming

L	T	P	C
2	1	2	4

COURSE OBJECTIVE

This fundamental course will enable the students to learn the concepts of Computers and Programming Language and design principles along with understanding of C Language. And the fundamental computers so they can have the deep knowledge of computer.

UNITS	CONTENTS	Contact Hrs.
I	Definition of computer. Classification of computers. Write and Execute the first program; Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic, Number Systems and conversion methods Standard I/O in "C".	5
II	Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,	4
III	Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.	6
IV	Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structures: Purpose and usage of structures, declaring structures, assigning of structures, Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, Dynamic memory allocation, defining and using stacks and linked lists Sequential search, Sorting arrays, Strings, Text files.	6
V	, The Standard C Preprocessor: Defining and calling macros, utilizing conditional compilation, passing values to the compiler, The Standard C Library: Input/output : fopen, fread, etc, string handling functions, Math functions : log, sin, alike Other Standard C functions.	4

PRACTICALS

1	Write C program to find largest of three integers.
2	Write C program to check whether the given string is palindrome or not.

3	Write C program to find whether the given integer is (i) a prime number (ii) an Armstrong number.
4	Write C program for Pascal triangle.
5	Write C program to find sum and average of n integer using linear array.
6	Write C program to perform addition, multiplication, transpose on matrices.
7	Write C program to perform following operations by using user defined functions: (i) Concatenation (ii) Reverse (iii) String Matching
8	Write C program to interchange two values using (i) Call by value. (ii) Call by reference.
9	Write C program to display the mark sheet of a student using structure.
10	Write C program to perform following operations on data files: (i) read from data file. (ii) write to data file.

REFERENCE BOOKS :		
1.	Computer Science- A Structured Programming Approach Using C	Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
2.	Let us 'C'	yashwant kanteekar
3	Problem Solving and Program Design in C	Jeri R. Hanly, Elliot B. Koffman Pearson Addison-Wesley, 2006.
4	Computer fundamentals	P.K sinha

Course Code- MCA-113

Course Name- Database Management System

L	T	P	C
2	1	2	4

COURSE OBJECTIVE

Objective of this subject is to educate students with fundamental concepts of Data Base Management System, Data Models, and Different Data Base Languages. A database management system is important because it manages data efficiently and allows users to perform multiple tasks with ease.

UNITS	CONTENTS	Contact Hrs.
I	<p>Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.</p> <p>Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.</p>	6
II	<p>Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.</p> <p>Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.</p>	6
III	<p>Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design</p>	4
IV	<p>Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.</p>	4
V	<p>Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database</p>	5

PRACTICALS

1	Create Table, SQL for Insertion, Deletion, Update and Retrival using aggregating functions.
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2	Write Programs in PL/SQL, Understanding the concept of Cursors.
3	Write Program for Join, Union & intersection etc.
4	Creating Views, Writing Assertions, Triggers.
5	Creating Forms, Reports etc.
6	Writing codes for generating read and update operator in a transaction using different situations.
7	Implement of 2PL concerning central algorithm
8	Developing code for understanding of distributed transaction processing. Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software's students may use power builder / SQL Server / DB2 etc. for implementation.

REFERENCE BOOKS :		
1.	"An Introduction To Database System"	Date C J, Addison Wesley
2.	"Database Concepts"	Korth, Silbertz, Sudarshan, McGraw Hill
3.	"Fundamentals Of Database Systems"	Elmasri, Navathe, Addison Wesley
4.	"Database Systems"	Beynon Davies, Palgrave Macmillan
5.	"Database Management System"	Majumdar & Bhattacharya, TMH

Departmental Elective-I

Course Code- MCA-114-1

Course Name- Accounting and Financial Management

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

Financial accounting (or financial accountancy) is the field of accounting concerned with the summary, analysis and reporting of financial transactions pertaining to a business.

UNITS	CONTENTS	Contact Hrs.
I	Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards.	10
II	Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill	10
III	Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis ;	10
IV	Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis	10

REFERENCE BOOKS :

1.	<i>Financial Accounting: A Managerial Perspective</i>	Narayanswami(PHI, 2 nd Edition).
2.	<i>Financial Accounting for Management</i>	Mukherjee(TMh, 1 st Edition).
3.	<i>Financial Accounting for Management</i>	Ramchandran & Kakani(TMh, 2 nd Edition).
4.	<i>Accounting and Finance for Managers</i>	Ghosh T P(Taxman, 1 st Edition).
5.	<i>An Introduction to Accountancy</i>	Maheshwari S.N & Maheshwari S K(Vikas, 9 th Edition)

Departmental Elective-I
Course Code- MCA-114-2
Course Name- Operation Research

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
Environmental ethics is the part of environmental philosophy which considers extending the traditional boundaries of ethics from solely including humans to including the non-human world. It exerts influence on a large range of disciplines including environmental law, environmental sociology, Eco theology, ecological economics, ecology and environmental geography.

UNITS	CONTENTS	CONTACT Hrs
I	Linear Programming: Simplex Method Revised simplex method, Duality in Linear programming, Application of Linear Programming to Economic and Industrial Problems.	9
II	Function: Types, Composition of function, Recursively defined function	7
III	Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph.	8
IV	Mathematical Induction: Piano's axioms, Mathematical Induction, DisCete Numeric Functions and Generating functions Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behavior of functions	8
V	Algebraic Structures: Properties, Semi group, Monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.	8

REFERENCE BOOKS :		
1.	Operations Research	Taha, Macmillan.
2.	Introduction to Operations Research	B.E. Gillet, McGraw-Hill.
3.	Optimization Theory and Applications	S.S.Rao, Wiley Eastern.
4.	Linear programming	G.Hadley, Addison-Wesley.
5.	Operations Research	K. Swarup, P.K. Gupta & M. Mohan, S. Chand & Sons, 2003

Departmental Elective-I
Course Code- MCA-114-4
Course Name- COMPUTER FUNDAMENTAL AND ITS APPLICATIONS

L	T	P	CR
2	1	2	4

RATIONALE
This fundamental course will enable the students to learn the concepts of Computers and its applications so they can have the deep knowledge of computer.

UNITS	CONTENTS
I	Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display) Introduction to any Operating System [Unix, Linux, Windows]
III	Documentation Using MS-Word - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template..
IV	Electronic Spread Sheet using MS-Excel - Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel-Sorting, Filtering, Table, Validation, Goal Seek, Scenario.
V	Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect

PRACTICALS	
1	Create a telephone directory. <ul style="list-style-type: none"> • The heading should be 16-point Arial Font in bold • The rest of the document should use 10-point font size

	<ul style="list-style-type: none"> • Other headings should use 10-point Courier New Font. • The footer should show the page number as well as the date last updated. <p>Create the following one page documents.</p> <ul style="list-style-type: none"> • Compose a note inviting friends to a get-together at your house, including a list of things to bring with them. • Design a certificate in landscape orientation with a border around the document. <p>Create the following document: A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.</p> <p>Convert following text to a table, using comma as delimiter</p> <p>Type the following as shown (do not bold).</p> <p>Color, Style, Item Blue, A980, Van Red, X023, Car Green, YL724, Truck</p> <p>Name, Age, Sex Bob, 23, M Linda, 46, F Tom, 29, M</p>
2	<p>Design a time-table form for your college.</p> <ul style="list-style-type: none"> • The first line should mention the name of the college in 16-point Arial Font and should • Be bold. • The second line should give the course name/teacher's name and the department in 14-point Arial. • Leave a gap of 12-points. • The rest of the document should use 10-point Times New Roman font. • The footer should contain your specifications as the designer and date of creation.
3	<p>Convert following text to a table, using comma as delimiter</p> <p>Type the following as shown (do not bold).</p> <p>Color, Style, Item Blue, A980, Van Red, X023, Car Green, YL724, Truck</p> <p>Name, Age, Sex Bob, 23, M Linda, 46, F Tom, 29, M</p>
4	<p>The term wise marks for APS class of 20 students are stored in 3 separate sheets named term1, term2 and term3. Create 4th worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The thE worksheet should contain college name as the first line. Make it bold, italic and center it.</p>
5	<p>Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-i) Copy/Paste ii) Embedding iii) Linking</p>
6	<p>Create five Power point slides. Each slide should support different format. In these slides explain areas of applications of IT. Make slide transition time as 10 seconds.</p>
7	<p>Create five Power Point slides to give advantages/disadvantages of computer, application of computers and logical structure of computer.</p>
8	<p>Create five Power Point slides detailing the process of internal assessment. It should be a self-running demo</p>

REFERENCE BOOKS :		
1.	Introduction to Essential tools	Sushila Madan,JBA,2009.
2.	Computer Fundamentals	Anita Goel, Pearson, 2012

MCA -IInd SEM

Course Code- MCA-121
Course Name- Digital Logic Design

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
Understanding of principle, operation and analysis of digital electronics.

UNITS	CONTENTS	Contact hrs
I	Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes, Floating point representation Gate-level minimization: The map method up to five variable, don't care conditions, POS Simplification, NAND and NOR implementation, Quine McClusky method (Tabular method).	9
II	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder, subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	7
III	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure, Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.	9
IV	Memory and programmable logic: RAM, ROM, PLA, PAL, Design at the register transfer level: ASMs, design example, design with multiplexers	7
V	Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	8

REFERENCE BOOKS :		
1.	“DigitalDesign”, Education	M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson
2.	“Switching Circuit & Logic Design”	Hill & Peterson, Wiley.

Course Code- MCA-122
Course Name- Data Structures Using ‘C’

L	T	P	C
2	1	2	4

COURSE OBJECTIVE
Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of ‘C’ language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.

UNITS	CONTENTS	Hours.
I	<p>Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off</p> <p>Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices, and Vectors.</p> <p>Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.</p> <p>Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion. Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.</p>	40
II	<p>Queues: Array and linked representation and implementation of queues, Operations on Queue: Ceate, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue.</p> <p>Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.</p>	
III	<p>Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary trees, Huffman algorithm.</p> <p>Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. 15</p>	
IV	<p>Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.</p> <p>Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST,</p>	

	Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.	
V	<p>Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.</p> <p>File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.</p>	

PRACTICALS	
1	Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
2	Searching programs: Linear Search, Binary Search
3	Array implementation of Stack, Queue, Circular Queue, Linked List.
4	Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
5	Implementation of Binary tree.
6	Program for Tree Traversals (preorder, inorder, postorder).
7	Program for graph traversal (BFS, DFS).
8	Program for minimum cost spanning tree, shortest path.

REFERENCE BOOKS :		
1.	Data Structures using C and C++	Y. Langsam, M. Augenstein and A. Tannenbaum, Pearson Education Asia, 2nd Edition, 2002.
2.	Mehta Fundamentals of Data Structures in C++	Ellis Horowitz, S. Sahni, D, Galgotia Book Source, New Delhi.
3.	Data Structures	S. Lipschutz, Mc-Graw Hill International Editions, 1986.
4.	An introduction to data structures with Applications,	Jean-Paul Tremblay, Paul. G. Soresan, Tata Mc-Graw Hill International Editions, 2nd edition 1984.
5.	Data structures via C++	A. Michael Berman, Oxford University Press, 2002.

Course Code- MCA-123
Course Name- Object Oriented Programming & C++

L	T	P	C
2	1	2	4

COURSE OBJECTIVE

Object-oriented programming, or OOP, is an approach to problem solving where all computations are carried out using objects.

UNITS	CONTENTS	Contact Hrs.
I	Object Modeling Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, A sample object model, Multiple Inheritance, Meta data, candidate keys, constraints.	8
II	Dynamic Modeling Events and States, Operations and Methods, Nested state Diagrams, Concurrency, Relation of Object and Dynamic Models, advanced dynamic model concepts, a sample dynamic model.	7
III	Functional Modeling Functional Models, Data flow Diagrams, Specifying Operations, Constraints, a sample functional model.	9
IV	Programming in C++ Classes and objects in C++, Functions, Constructors, Destructors, Inheritance, Functions overloading, Operator Overloading, I/O Operations. Real life applications, Extended Classes, Pointer, Virtual functions, Polymorphisms, Working with files, Class templates, Function templates.	7
V	Programming in C++ Classes and objects in C++, Functions, Constructors, Destructors, Inheritance, Functions overloading, Operator Overloading, I/O Operations. Real life applications, Extended Classes, Pointer, Virtual functions, Polymorphisms, Working with files, Class templates, Function templates.	9

PRACTICALS

1	Program illustrating overloading of various operators.
2	Program illustrating use of Friend, Inline, Static Member functions, default arguments.

3	Program illustrating use of destructor and various types of constructor.
4	Program illustrating various forms of Inheritance.
5	Creating Forms, Reports etc.
6	Program illustrating use of virtual functions, virtual Base Class.
7	Program illustrating how exception handling is done.

REFERENCE BOOKS :

1.	“C++ Programming Language”	Bjarne Stroustrup, Addison Wesley
2.	“Object Oriented Programming with C++”	E. Balagurusamy , TMH, 2001
3.	“Object Oriented Analysis and Design with application	Booch Grady 3/e”, Pearson
4.	“ C++ Primer Reading”	Lipman, Stanley B, Jonsce Lajole, , AWL, 1999

Course Code- MCA-124
Course Name- Operating Systems

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems. In particular, the course will consider inherent functionality and processing of program execution. The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software.

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.	8
II	Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling Criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.	7
III	Process Synchronization and Deadlocks: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.	8
IV	Storage management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.	8

V	Security & Case Study: Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, EnCryption. Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security	9
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REFERENCE BOOKS :		
1.	“Operating System Concepts”	Abraham Siberschatz and Peter Baer Galvin, Fifth Edition, Addison-Wesley
2.	“Operating Systems, Concepts and Design	Milan Milankovic, McGraw-Hill.
3.	"Operating Systems"	Harvey M Deital, Addison Wesley.
4.	“Linux: The Complete Reference”	Richard Peterson, Osborne McGraw-Hill

Departmental Elective-II

Course Code- MCA-125-1

Course Name- Artificial Intelligence

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
Understanding the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.	08
II	Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.	08
III	Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.	08
IV	Machine Learning: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,	07
V	Pattern Recognition: Introduction, Design principles of pattern recognition system, Statistical Pattern recognition. Parameter estimation methods - Principle Component	09

REFERENCE BOOKS :		
1.	“Artificial Intelligence – A Modern Approach”	Stuart Russell, Peter Norvig,, Pearson Education
2.	“Artificial Intelligence”	Elaine Rich and Kevin Knight, Tata Mcgraw-hill Education Pvt. Ltd.
3.	“Introduction to Artificial Intelligence”	E.Charniak and D McDermott, Pearson Education
4.	“Artificial Intelligence and Expert Systems”	Dan W. Patterson, Prentice Hall of India.

Departmental Elective-II

Course Code- MCA-125-2

Course Name- E-Commerce

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

The objectives of the course are to introduce the concept of electronic commerce, and to understand how electronic commerce is affecting business enterprises, governments, consumers and people in general. In addition, we will study the development of websites using relevant software tools.

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Electronic Commerce - Technology and Prospects, Definition of E-Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business. Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, and FRAME RELAY).	9
II	Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	9
IV	Encryption: Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.	7

V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, Credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	7
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REFERENCE BOOKS :		
1	“Frontiers of Electronic Commerce”, Addison Wesley.	Ravi Kalakota, Andrew Winston
2	, “E-Commerce the cutting edge of Business”, TMH	Bajaj and Nag
3	“Electronic commerce”, Firewall Media, New Delhi	P. Loshin, John Vacca,

Departmental Elective-II
Course Code- MCA-125-3
Course Name- Image Processing

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
The goal of the subject is to familiarize students with the concepts and implementation issues of how the image is processed digitally using the various image processing operations namely, image enhancement techniques (like contrast stretching, smoothing etc.), image restoration techniques, feature extraction etc. Students will gain an understanding of how to compress the image so that the number of bits required storing the image gets reduced.

UNITS	CONTENTS	Contact Hrs.
I	Image digital representation. Elements of visual perception. Sampling and quantization. Image processing system elements.	11
II	Fourier transforms. Extension to 2-D, DCT, Walsh transform, Hadamard transforms. Enhancement and segmentation. Point and region dependent techniques.	11
III	Image encoding: Fidelity Criteria. Transform compression. KL, Fourier, DCT, Spatial compression, Run length coding. Huffman and contour coding.	09
IV	Restoration Models: Constrained & unconstrained, Inverse filtering, Least squares filtering, Recursive filtering.	09

REFERENCE BOOKS :		
1.	Digital Image Processing	Rafael C. Gonzalvez and Richard E. Woods.2 nd Edition, Published by: Pearson Education.
2.	Digital Image Processing and Computer Vision	R.J. Schalkoff., Published by: John Wiley and Sons, NY.
3.	Fundamentals of Digital Image Processing	A.K. Jain., Published by Prentice Hall, Upper Saddle River, NJ.

MCA-IIIrd SEM

Course Code- MCA-211
Course Name- Computer Networks

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. It is important to understand the function of computer networks. Knowledge about hardware and software requirements of networks is essential. The emphasis of the course is towards the various components and software required to make a network operational.

UNITS	CONTENTS	Contact Hrs.
I	Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer-transmission, switching methods, Integrated services digital networks, terminal handling.	7
II	Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols-Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Link Layer- elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control	8
III	Network Layer: Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, IPv6.	9
IV	Transport Layer: Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.	8

V	Application Layer: Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.	8
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REFERENCE BOOKS :		
1	“Data and Computer Communication”	W. Stallings, , Macmillan Press
2.	“Computer Networks & Internet”	Comer, PHI.
3.	“Internetworking with TCP/IP”	Comer PHI.
4.	“Data Communication and Networking”	Forouzan, , TMH

Course Code- MCA-212
Course Name- Design & Analysis of Algorithms

L	T	P	C
2	1	2	4

COURSE OBJECTIVE
This subject will enable the students to have awareness about Basic Design and Analysis techniques of Algorithms, Sorting Techniques , Data Structures etc.

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort Medians and order statistics	8
II	Elementary Data Structure: Stacks, Queues, Linked list, Binary Search Tree, Hash Table Advanced Data Structure: Red Black Trees, Splay Trees, Augmenting Data Structure Binomial Heap, BTree, Fibonacci Heap, and Data Structure for Disjoint Sets Union-find Algorithm, Dictionaries and priority Queues, mergeable heaps, concatenable queues	8
III	Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis	7
IV	Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal’s Algorithms, Prim’s Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem	9

V	Randomized Algorithms, String Matching, NP-Hard and NP-Completeness Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & the FFT, Number Theoretic Algorithms, Computational Geometry	8
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PRACTICALS	
1	Creation of a binary search tree and insertion & deletion into it.
2	Creation of a Red Black tree and all the associated operations on it.
3	Implementing an AVL tree and all the associated operations on it.
4	Multiplication of two matrices using Strassen's Matrix Multiplication method.
5	Solving Knapsack problem.
6	Implementing shortest path algorithms (Dijkstra's and Bellman Ford Algorithm).
7	Finding the minimum cost Spanning Tree in a connected graph.
8	Solving 8 Queen's problem.
9	Finding the number of connected components in a Graph.

REFERENCE BOOKS :		
1.	Introduction to Algorithms	T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI, 3rd Edition 2009.
2.	Introduction to Design and Analysis	Sarabasse & A.V. Gelder Computer Algorithm ,Publisher–Pearson 3rd Edition 1999.
3.	"Data Structures and algorithm in C++",	Adam Drozdek Third Edition, Cengage Learning, 2012.
4.	Data Structures, "Algorithms and applications in C++"	SartajSahni, Second Edition, Universities Press, 2011.

Course Code- MCA-213
Course Name- Software Engineering

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have awareness about software engineering, various matrices, planning about software, cost estimation, software design etc.

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.	6
II	Software Requirement Specification: Analysis Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control. Software-Design: Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach, functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Fourth generation techniques, Functional independence, Software Architecture, Transaction and Transform Mapping, Component – level Design, Forth Generation Techniques	8
III	Coding: Top-Down and Bottom –Up programming, structured programming, information hiding, programming style and internal documentation.	9

	Testing: Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification & validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.	
IV	Software Project Management: The Management spectrum- (The people, the product, the process, the project), cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.	8
V	Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM. CASE (Computer Aided Software Engineering): CASE and its Scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.	9

REFERENCE BOOKS :		
1.	“Software Engineering: A Practitioner’s Approach	Pressman, Roger S. Ed. Boston: McGraw Hill, 2001
2.	“Software Engineering	Jalote, Pankaj Ed.2”, New Delhi: Narosa 2002
3.	“Software Engineering”	Schaum’s Series, TMH

Course Code- MCA-214
Course Name- Internet & Java Programming

L	T	P	C
2	1	2	4

COURSE OBJECTIVE
This subject aims to introduce students to the Java programming language. Upon successful completion of this subject, the students should be able to Create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism; use data types, arrays and other data collections; implement error-handling techniques using exception handling, Create and event-driven GUI using Swing components; and implement I/O functionality to read from and write to text files.

UNITS	CONTENTS	Contact Hrs.
I	Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.	7
II	Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.	10
III	Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts,	7

	Windows, Dialog Boxes, Inner frame. JDBC: The connectivity Model, JDBC/ODBC Bridge, (java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.	
IV	Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),Introduction to RMI (Remote Method Invocation): A simple client-server application using RMI.	8
V	Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).	8

PRACTICALS	
1	Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.
2	Write programs to Create packages and multiple threads in Java.
3	Write programs in Java for event handling Mouse and Keyboard events.
4	Using Layout Manager Create different applications.
5	Write programs in Java to Create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.
6	. Using Java Create Applets.
7	Use Java Language for Client Server Interaction with stream socket connections.
8	Write a program in java to read data from disk file.

REFERENCE BOOKS :		
1.	“The Complete Reference Internet”	Margaret Levine Young,, Tata Mcgraw-hill Education Pvt. Ltd.
2.	“Object Oriented Programming in JAVA”	Thampi, Wiley Dreamtech Publication.
3.	“Programming in JAVA”	E.Balagurusamy, Tata Mcgraw-hill Education Pvt. Ltd.
4.	“Inside Servlets”	Dustin R. Callway,, Addison Wesley
5.	“Java Enterprise Edition”	Mark Wutica,, QUE.

Departmental Elective-III

Course Code- MCA-215-1

Course Name- Advanced Database Management System

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

Objective of this subject is to have a clear understanding of query Processing and optimization along with to have an idea of latest advancement in the domain of DBMS.

UNITS	CONTENTS	CONTACT Hrs
I	Query Processing, Optimization & Database Tuning: Algorithms For Executing Query Operations, Heuristics For Query Optimizations, Estimations Of Query Processing Cost, Join Strategies For Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue In RDBMS.	9

II	Extended Relational Model & Object Oriented Database System: New Data Types, User Defined Abstract Data Types, Structured Types, Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model And Expert Database System.	8
III	Distributed Database System: Structure Of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing In R * System, Concurrency Control In Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection And Resolution, Commit Protocols.	8
IV	Enhanced Data Model For Advanced Applications: Database Operating System, Introduction To Temporal Database Concepts, Spatial And Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues In Real Time Database Design.	8
V	Introduction To Expert Database And Fuzzy Database System: Expert Data Bases: Use of Rules of Deduction in Databases, Recursive Rules. Fuzzy Data Bases: Fuzzy Set & Fuzzy Logic, Use Of Fuzzy Techniques to Define Inexact and Incomplete Databases.	7

REFERENCE BOOKS :

1.	“Database Management System”	Majumdar & Bhattacharya, TMH.
2.	“ Database Concepts”	Korth, Silbertz, Sudarshan,, McGraw Hill.
3.	Elmasri, Navathe, “Fundamentals Of Database Systems”	Elmasri, Navathe, Addison Wesley.
4.	“Database Management System”	Ramakrishnan, Gehrke, McGraw Hill.

Departmental Elective-III

Course Code- MCA-215-2

Course Name- Information Storage & Management

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have awareness Storage Technology , Storage Systems Architecture, Networked Storage etc

UNITS	CONTENTS	CONTACT Hrs
I	Introduction to Storage Technology Data proliferation and the varying value of data with time & usage, Sources of data and states of data Ceation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of 12 storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and	9

	Regulations.	
II	Storage Systems Architecture Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.	8
III	Introduction to Networked Storage JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.	8
IV	Introduction to Information Availability Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.	8
V	Managing & Monitoring Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.	7

REFERENCE BOOKS :

1.	Information Storage and Management Storing, Managing, and Protecting Digital Information	by EMC, Hopkinton and Massachusetts, Wiley, ISBN: 9788126521470
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. Departmental Elective-III

Course Code- MCA-215-3
Course Name- Cloud Computing

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge Vision of Cloud Computing , Cloud Computing Architecture , Cloud Management & Virtualization Technology etc.

UNITS	CONTENTS	CONTACT Hrs
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I	Introduction: Historical development ,Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments .Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CM and ERP ,Social networking .	9
II	Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance; Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.	8
III	Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Concepts of Map reduce , Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute ,storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN) and Virtual SAN(VSAN) and their benefits .	8
IV	Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Security Architecture.	8
V	Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third Party Cloud Services .Case study : Google App Engine, Microsoft Azure , Hadoop , Amazon , Aneka.	7

REFERENCE BOOKS :

1.	” Mastering Cloud Computing “	Buyya, Selvi ,TMH Pub
2.	“Cloud Computing”	Kumar Saurabh, Wiley Pub
3.	“Cloud Security “	Krutz , Vines, Wiley Pub

MCA- IVth SEM
Course Code- MCA-221
Course Name- Web Technology

L	T	P	C
2	1	2	4

COURSE OBJECTIVE:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.

UNITS	CONTENTS	Contact Hours
I	Introduction: Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing.	8
II	Web Page Designing: HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III	Scripting: Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API	8
IV	Server Site Programming: Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servlets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V	PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC	8

REFERENCE BOOKS		
1.	Collaborative Web Development	Burdman, Jessica
2.	Web Technology and Design	Xavier, C
3.	Programming in JAVA	Balagurusamy E
4.	Java Server Pages	Hans Bergsten

Course Code- MCA-222
Course Name- Computer Organization

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge about number System , Basic Organization of computer , Memory Organization , I/O Organization etc.

UNITS	CONTENTS	Contact Hrs.
I	Representation of Information and Basic Building Blocks Introduction to Computer, Computer hardware generation, Number System, Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, De-multiplexer, Carry look ahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation. ALU- chip, Faster Algorithm and Implementation (multiplication & Division)	9
II	(Basic Organization) Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & miCo programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers	7
III	(Memory Organization) Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.	9
IV	(I/O Organization) Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.	7
V	(Process Organization) Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn's and Feng's Classification, Parallel Architectural classification.	8

PRACTICALS	
1	Study and Bread Board Realization of Logic Gates. K-Map, Flip-Flop equation, realization of characteristic and excitation table of various Flip Flops.
2	Implementation of Half Adder, Full Adder and Subtractor
3	Implementation of Ripple Counters and Registers.
4	Implementation of Decoder and Encoder circuits.
5	Implementation of Multiplexer and D-Multiplexer circuits

REFERENCE BOOKS :		
1	Computer Organization and Architecture,	William Stallings, 4th Edition, Prentice Hall of India Private Limited, 2001
2	” Computer Architecture and Organization”	Subrata Ghosal, Pearson 2011
3	“Digital Computer Electronics: An Introduction to MiCocomputers”,	Malvino, McGraw Hill,

Course Code- MCA-223
Course Name- Computer Based Numerical & Statistical Techniques

L	T	P	C
3	1	0	4

COURSE OBJECTIVE:

This subject will enable the students to have knowledge about Floating point Arithmetic, Iterative Methods , interpolation, Numerical Differentiation and Integration etc.

UNITS	CONTENTS	Contact Hrs.
I	Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation	9
II	Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.	7
III	Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence	7
IV	Interpolation and approximation: Finite Differences, Difference tables Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation Approximation of function by Taylor's series and Chebyshev polynomial	9
V	Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule Euler- Maclaurin Formula Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.	8

REFERENCE BOOKS :		
1	"Computer Oriented Numerical Methods"	Rajaraman V., PHI
2	"Applied Numerical Analyses"	Gerald & Wheatley, AW
3	., "Numerical Methods for Scientific and Engineering Computations"	. Jain, Iyengar and Jain,
4	"Numerical methods in Engineering and Science"	Grewal B. S., Khanna Publishers, Delhi

Course Code- MCA-224
Course Name- Theory of Computation

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

The theory of computation is the branch that deals with how efficiently problems can be solved on a model of computation, using an algorithm. The field is divided into three major branches: automata theory and language, computability theory, and computational complexity theory.

UNITS	CONTENTS	Contact Hrs.
I	Automata and Language Theory: Overview of Theoretical Computer Science (including computationally intractable problems) , Introduction to System software including various phases / Modules in the design of a typical compiler , Chomsky Classification, Finite Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA),statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions, Closure properties of Regular Language, Non-Regular Languages, Pumping Lemma. Myhill Nerode Theorem, Use of Regular expressions in the Design of scanner	9
II	Context Free Languages: Context Free Grammar (CFG), Parse Trees, Push Down Automata (deterministic and nondeterministic) (PDA), Equivalence of CFGs and PDAs, Closure properties of CFLs, Pumping Lemma, Parsing (including LL(1) , SLR and LR(1) Parsing Method	7
III	Turing Machines and Computability Theory: Definition of Turing Machine, Extensions of Turing machines, Non – deterministic Turing machines, Equivalence of various Turing Machine Formalisms, Church – Turing Thesis, Decidability, Halting Problem, Reducibility, Recursion Theorem. [No. of Hr: 10]	7
IV	Complexity Theory: Time and Space measures, Hierarchy theorems, Complexity classes P, NP, space complexity , Savich theorem , L, NL, PSPACE complexity , Post correspondence problem, Probabilistic computation.	9

REFERENCE BOOKS :

1.	“Theory of Computation “	Dexter C. Kozen, Springer 2006.
2.	“Elements of the Theory of Computation”,	H. R. Lewis and C. H. Papadimi Triou, Pearson, 2nd Ed., 1997.
3.	“Theory of Computer Science Automata Language Computation”,	K. L. Mishra and N. Chandrasekharan, PHI, 3rd Ed., 2007.

Course Name- Real Time Systems

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge Introduction to Real Time Systems , Real Time Operating Systems , Real Time Databases Real Time Communication etc.

UNITS	CONTENTS	Contact Hrs.
I	Introduction to Real Time Systems, Priorities, Embedded Systems, Task, Classification & Requirements, Deadlines, Soft, Hard.	7
II	Firm Real Time Systems, Introduction to Real Time Operating Systems, Task Management, Inter Process Communication, Case Studies of Maruti II, HART OS, VRTX etc.	8
III	Characterizing Real Time Systems and Task, Task Assignment & Scheduling Theory, Fixed and Dynamic Priority Scheduling Uniprocessor (RM and EDF), Multiprocessor (Utilization Balancing, Next-fit for RM & Bin-Packing Assignment for EDF) Scheduling	8
IV	Programming Languages and Tools, Real Time Databases Real Time Communication, FDDI, Specification and Verification using Duration Calculus, Flow Control, Protocols for Real Time (VTCSMA, Window, IEEE 802.3, IEEE 802.4, IEEE 802.5, Stop and Go Protocol, Media Access Protocol),	9
V	Fault, Fault Classes, Fault Tolerant Real Time System, Clocks, Clock Synchronization, Issues in Real Time Software Design.	8

REFERENCE BOOKS :

1.	"Real Time Systems"	Krishna, C.M, McGraw Hill
2.	"Real Time Systems"	Jane W.S. Liu, Pearson Education Asia
3.	"Real Time Systems"	Jane W.S. Liu, Pearson Education Asia
4.	"Real Time System: Specification, Validation & Analysis"	Mathi & Joseph, PHI

Course Code- MCA-225-2
Course Name- Modeling and Simulation

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge about System Models, Probability concepts in simulation, some case studies in simulation etc.

UNITS	CONTENTS	Contact Hrs.
I	System Models: Concept Environment, Continues and disCete systems, Types of Models; Subsystems, System Analysis, System design; System simulation: Technique, method types.	13
II	Probability concepts in simulation: Stochastic variables and probability functions; Discrete system simulation; fixed time step v/s event-to-event model, Generation of Random numbers, Monte Carlo Computation V/S Stochastic simulation. Unit-III Simulation of Queuing system, Simulation of single and two server queue, Network Model of a project.	14
III	Case study: Simulation of an autopilot, Telephone system & Inventory system. Introduction to GPSS.	13

REFERENCE BOOKS :		
1.	“System Simulation with Digital Computers”	Narsingh Deo, PHI
2.	“System Simulation”	G.Gordon ,PHI

Departmental Elective-IV**Course Code- MCA-225-3****Course Name- Data Ware Housing & Data Mining**

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge about DATA Warehousing, Business Analysis, Knowledge Discovery, Multimedia Data-Mining, Multimedia-Databases.

UNITS	CONTENTS	Contact Hrs.
I	Dss-Uses, definition, Operational Database. Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing, Multi-Dimensional Database Structures. Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.	08
II	DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Warehouse Database, Mapping the Data Warehouse to a Multiprocessor architecture. DBMS Schemas for Decision Support, Data Extraction, Cleanup & Transformation Tools. Metadata	09
III	Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing (OLAP).Patterns & Models. Statistics. Artificial Intelligence.	07
IV	Knowledge Discovery, Data Mining. Introduction to Data-Mining. Techniques of Data-Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Introduction. Selecting& Using the Right Technique.	08
V	Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Web Data-Mining, Mining and Meta-Data. Data Visualization & Overall Perspective. Data Visualization. Applications of Data-Mining.	08

REFERENCE BOOKS :

1.	“Data Warehousing, Data-Mining & OLAP	Berson, TMH
2.	“Decision Support and Data Warehousing System”	Mallach, TMH
3.	“Data-Mining Technologies,	Bhavani Thura-is-ingham, CC Press
4.	“Fundamental of Database System”	Navathe, Pearson Education

MCA-Vth SEM
Course Code-MCA-311
Course Name- Data Ware Housing & Data Mining

L	T	P	C
2	1	2	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge The .NET framework , C# Basics, Advanced Features Using C# etc.

UNITS	CONTENTS	Contact Hrs.
I	The .NET framework: Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classes.	08
II	C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.	09
III	C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.	09
IV	Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.	07
V	Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, Case Study (Messenger Application)	08

PRACTICALS

1	The use of sequence, conditional and iteration construct.
2	Various operators like logical, arithmetical, relational, etc.
3	Overloading of various operators.
4	Use of destructor and various types of constructor.
5	Use of Fried, Inline, and Static Member functions, default arguments.
6	Various forms of Inheritance.
7	Use of virtual functions, virtual Base Class, delegates.
8	File operation.
9	Simple web application using ASP Net.
10	Use of Active X controls.

REFERENCE BOOKS :

1.	“C# with .NET Frame Work”	Shibi Panikkar and Kumar Sanjeev, Firewall Media.
2.	“C#: The Complete Reference”	Shildt, TMH
3.	“Understanding the .Net Framework”	TonyBaer, Jan D. Narkiewicz, Kent Tegels, Chandu Thota, Neil Whitlow,(SPD)
4.	“Programming with C#”	Balagurusamy, TMH

Course Code-MCA-312
Course Name- Computer Graphics and Animation

L	T	P	C
2	1	2	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge Graphics Primitives , Line Drawing Algorithms , Conics, Curves and Surfaces , Transformation and Animation etc.

UNITS	CONTENTS	Contact Hrs.
I	<p>Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display, Plotters, Printers.</p> <p>Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.</p> <p>Input Techniques: Positioning techniques, Positioning Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging, Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points, defining a boundary rectangle, multiple selections, Menu selection.</p>	7
II	<p>Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.</p> <p>Line Drawing Algorithms: DDA algorithms, Bresenham's Line algorithm.</p> <p>Segment & Display files: Segments, Functions for segmenting the display file, Posting and unposting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file Structure.</p> <p>Graphics Operations: Clipping: Point Clipping, Line Clipping. Polygon Clipping.</p> <p>Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.</p>	9
III	<p>Conics, Curves and Surfaces: Quadric surfaces: Sphere, Ellipsoid, and Torus. Super quadrics: Super ellipse, super eclipse. Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.</p>	8
IV	<p>Transformation: 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, And Transformation between coordinate systems.</p> <p>3 D Graphics: 3 D Display Methods, 3 D modeling, 3 D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal</p>	7
V	<p>Animation: Introduction to Animation, Principles of Animation, Types of Animation, Types of Animation Systems: Scripting, Procedural, Representational, Stochastic, etc.</p> <p>Animation Tools: Hardware –SGI, PC's, Amiga etc.</p> <p>Software: Adobe Photoshop, Animation studio, Wave front etc.</p> <p>Gif Animator: Microsoft GIF Animation, GIF Construction, GIF animation etc.</p> <p>GKS: GKS Standards, GKS Primitives – Polyline, Polymarker, and Fill area, Text, GKS Workstation and Metafiles.</p>	9

PRACTICALS

1	Write a program to draw a line using DDA algorithm.
2	Write a program for implementing Bresenham's algorithm for line generation.
3	Write a program for generation of circle.
4	Write a program to demonstrate Cohen-Sutherland line clipping method.
5	Write a program to implement Sutherland-Hodgeman polygon clipping algorithm.
6	Write a program to rotate a triangle. (By asking the user to input the coordinates of the Triangle and the angle of rotation).
7	Write a program to perform one point perspective projection of an object.
8	Write a program to implement Depth-Buffer method to display the visible surfaces of a given polyhedron.
9	Write a program to implement 3-D rotation of an object.
10	Write a program to draw polyline using any algorithm.

REFERENCE BOOKS :		
1.	"Computer Graphics"	Donald Hearn and M. Pauline Baker, PHI
2.	"Computer Graphics: A Programming Approach"	Steven Harrington, TMH
3.	"Computer Graphics"	Prajapati A. K, PPM Ed 2
4.	"Computer Graphics"	Foley James D, AW Ed 2
5.	"Principle of Interactive Computer Graphics"	Newman and Sproul, McGraw Hill

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge about Client/Server Computing , Components of Client/Server application , Data Storage , Client/Server System Development etc.

UNITS	CONTENTS	Contact Hrs.
I	Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.	8
II	Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request BrokerArchitecture (CORBA).The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.	9
III	Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.	8
IV	Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues.	8
V	Client/Server System Development: Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training. The future of client server Computing Enabling Technologies, The transformational system.	7

REFERENCE BOOKS :

1	.Client/Server Computing	patrick smith &steave guengerich(2nd Edition)
2.	”Database management System”	Majumdar & Bhattacharya, TMH
3.	“Database Concepts”	Koth, Silbertz, Sudarshan, Mcgraw Hill
	“Fundamentals of Data Base System”,	Elmasri, Navathe, S.B, Addison Wesley

Course Name- Network Security & Cryptography

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge about Cryptography, Conventional Encryption Algorithms , Hash Functions and Network & System Security etc.

UNITS	CONTENTS	Contact Hrs.
I	Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, And Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.	08
II	Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.	09
III	Public Key Encryption: Public-Key Cryptography: Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primarily, The Chinese Remainder Theorem.	08
IV	Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.	07
V	Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.	08

REFERENCE BOOKS :		
1.	“Cryptography and Network Security: Principals and Practice”	William Stallings,, Pearson Education.
2.	Cryptography and Network Security	Behrouz A. Frouzan, TMH
3.	“Applied Cryptography”	Bruce Schiener, John Wiley & Sons
4.	” Network Security and Cryptography”,	Bernard Menezes Cengage Learning.
5.	“Cryptography and Network Security”	Atul Kahate, TMH

Departmental Elective-V
Course Code-MCA-314-2
Course Name- Neural Networks

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge about Neural network, Supervised learning, Unsupervised learning etc, To teach the mathematical concepts and various types of neural networks along with their applications such as in discriminators, classifiers, computation, etc along With the training algorithms

UNITS	CONTENTS	Contact Hrs.
I	Introduction: Neural network, Human brain, biological and artificial Neurons, model of Neuron Knowledge representation, Artificial intelligence and Neural network, Network architecture, Basic Approach of the working of ANN – training, Learning and generalization.	8
II	Supervised learning: Single- layer networks, perception-linear separability, limitations of multi layer network architecture, back propagation algorithm (BPA) and other training algorithms, applications of adaptive multi-layer network architecture, recurrent network, feed-forward networks, radial- basis-function(RBF) networks	9
III	Unsupervised learning: Winner-takes-all networks, Hamming networks, maxnet, simple competitive learning vector-quantization, counter-propagation network, adaptive resonance theory, Kohonen’s self organizing maps, principal component analysis.	7
IV	Associated models: Hopfield networks, brain-in-a-box network, Boltzman machine.	8
V	Optimization methods: Hopfield networks for-TSP, solution of simultaneous linear equations, Iterated gradient descent, simulated annealing, genetic algorithm.	8

REFERENCE BOOKS :		
1.	An Introduction to Neural Networks	J.A. Anderson, MIT
2.	Neural Network Design	Hagen Demuth Beale, Cengage Learning
3.	Neural Network Principles	R.L. Harvey, PHI
4.	Neural Network and Fuzzy Sets	Kosko, PHI

Departmental Elective-V
Course Code-MCA-314-3

Course Name- Pattern Reorganization

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have knowledge about Basics of pattern recognition , Statistical Patten Recognition , Parameter estimation methods etc.

UNITS	CONTENTS	CONTACT Hrs.
I	Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	11
II	Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminate functions	09
III	Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.	10
IV	Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification. Unit - V Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	10

REFERENCE BOOKS :

1.	“Pattern Classification”	Richard O. Duda, Peter E. Hart and David G. Stork, 2nd Edition, John Wiley, 2006
2.	“Pattern Recognition and Machine Learning”	C. M. Bishop 3. S. Theodoridis and K. Koutroumbas, Springer, 2009.

Departmental Elective-VI
Course Code-MCA-315-1

Course Name- Mobile Computing

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This course helps the students in understanding of Issues in Mobile Computing, Data Management Issues, Location Management, Transaction Management etc.

UNITS	CONTENTS	Contact Hrs.
I	Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.	8
II	Data Management Issues: Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multi hopping, Adaptive Clustering for Mobile Network, Multi cluster Architecture.	8
III	Location Management, Location Based Services, Automatically Locating Mobile Uses, Locating and Organizing Services, Issues and Future Directions, Mobile IP, Comparison of TCP and Wireless.	8
IV	Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research Directions, Security Fault Tolerance for Mobile N/W.	8
V	What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV)	8

REFERENCE BOOKS :

1.	“Mobile Computing”,	Shambhu Upadhyaya, Abhijeet Chaudhary, Kevin Kwiat, Mark Weises, Kluwer Academic Publishers
2.	“Principles of Mobile Computing”	UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, Springer International Edition

Departmental Elective-VI**Course Code-MCA-315-2****Course Name- Compiler Design**

L	T	P	C
3	1	0	4

COURSE OBJECTIVE

This subject will enable the students to have Compilers and Translators, Lexical Analysis , Run Time Memory Management, Code Optimization and Code Generation etc.

UNITS	CONTENTS	Contact Hrs.
I	Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler	7
II	Programming Languages: High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission. Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions , Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer	8
III	The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG. Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.	9
IV	Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.	8
V	Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection	8

REFERENCE BOOKS :

1.	“Principles of Compiler Design”	Alfred V Aho , Jeffrey D. Ullman, Narosa
2.	“Compiler: principle, Techniques and Tools”	A.V. Aho, R. Sethi and J.D Ullman, AW
3.	“Compiler Design in C”	H.C. Holub Prentice Hall Inc.

4.	“Modern Implementation in C: Basic Design”	Computer	Apple, Cambridge press
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Departmental Elective-VI
Course Code-MCA-315-3

Course Name- Big Data

L	T	P	C
3	1	0	4

COURSE OBJECTIVE
This subject will enable the students to have knowledge Vision of Cloud Computing , Cloud Computing Architecture , Cloud Management & Virtualization Technology etc.

UNITS	CONTENTS	Contact Hrs.
I	What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data ,Credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, bigdata technologies, introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing analytics ,inter and trans firewall analytics	8
II	NOSQL DATA MANAGEMENT :Introduction to No SQL , aggregate data models, aggregates ,key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models ,sharding , master slave replication , peer-peer replication , sharding and replication , consistency , relaxing consistency , version stamps , map reduce , partitioning and combining , composing map-reduce calculations	8
III	BASICS OF HADOOP :Data format , analyzing data with Hadoop , scaling out , Hadoop streaming , Hadoop pipes design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , compression , serialization , Avro file-based data structures	8
IV	MAP REDUCE APPLICATIONS : Map Reduce workflows , unit tests with MRUnit , test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , Map Reduce types , input formats , output formats	8
V	HADOOP RELATED TOOLS: Hbase, data model and implementations, Hbase clients ,Hbase examples – praxis. Cassandra, cassandra data model , cassandra examples , cassandra clients , Hadoop integration. Pig , Grunt , pig data model , Pig Latin , developing and testing Pig Latin scripts. Hive , data types and file formats , Hive QL data definition , Hive QL data manipulation – Hive QL queries	8

REFERENCE BOOKS :		
1.	"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's	Michael Minelli, Michelle Chambers, and AmbigaDhiraj, Wiley, 2013.

	Businesses"	
2.	, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence"	P. J. Sadalage and M. Fowler Addison-Wesley Professional, 2012.
3.	"Hadoop: The Definitive Guide"	Tom White, Third Edition, O'Reilley, 2012.
4.	"Hadoop Operations"	Eric Sammer, O'Reilley, 2012.
5.	"Programming Hive", O'Reilley	E. Capriolo, D. Wampler, and J. Rutherglen, 2012.

MCA-VI SEM

Course Code: MCA-321
Course Name: PROJECT WORK

L	T	P	C
0	0	40	20

COURSE OBJECTIVE:

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the college. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.

Course Code: MCA-322
Course Name: COMPREHENSIVE VIVA

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

A viva-voce for every student for his/her academic and General Proficiency for the Profession shall be carried out by a committee comprising of three members including Principal/Director, Head of Department, and an External Examiner appointed by the University. The evaluation will be made in the light of various parameters including Academic Performance, Industrial project, Extra Curricular Activities, Educational tours / visits / Membership of Professional Societies, Contribution in NSS Social Welfare Floor Relief / draught relief / Adult Literacy mission / Literacy Mission / Blood Donation / any other Social Service, other achievements in the Institution and the performance in viva voce before the committee.