

VIDYASAGAR UNIVERSITY

MIDNAPORE - 721102

2006

MCA SEMESTER – I

Course Code	Paper	Teaching Scheme (Per Week)			Examination Scheme (Marks)			Total (Marks)
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/1101	Introduction to Programming and Data Structure	4	1	0	25	5	70	100
CS/MCA/1102	Organizational Structure	2	0	0	12	3	35	50
CS/MCA/1103	Basic Electronics & Digital Logic	3	1	0	25	5	70	100
CS/MCA/1104	Foundation in Mathematics and Logic	3	1	0	25	5	70	100
CS/MCA/1105	English for Communication	2	0	0	12	3	35	50
CS/MCA/1106	ComputerBasedNumerical&Statistical Method	3	1	0	25	5	70	100
CS/MCA/1191	Programming & Data Structure Lab	0	0	6	30	20	50	100
CS/MCA/1192	Basic Electronics & Digital Logic lab	0	0	6	30	20	50	100
CS/MCA/1193 Gr. 'A'	General Seminar & Report Writing Lab	0	0	3	25	10	15	50
CS/MCA/1193 Gr. 'B'	Numerical & Statistical Lab	0	0	3	25	10	15	50

<u>MCA SEMESTER – II</u>

Course Code	Paper	Teaching Scheme (Per Week)		Examination Scheme (Marks)			Total (Marks)	
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/1201	The Design & Analysis of Algorithm	3	0	0	25	5	70	100
CS/MCA/1202	Accounting & Financial Management	3	1	0	25	5	70	100
CS/MCA/1203	Computer Architecture & Organization	3	1	0	25	5	70	100
CS/MCA/1204	Microprocessor based Systems	3	1	0	25	5	70	100
CS/MCA/1205	System Programming	3	1	0	25	5	70	100
CS/MCA/1291	Algorithm Lab	0	0	6	30	20	50	100
CS/MCA/1292 Gr. 'A'	System Programming Lab	0	0	6	15	10	25	50
CS/MCA/1292 Gr. 'B'	Accounting & Financial Management Lab	0	0	6	15	10	25	50
CS/MCA/1294	Microprocessor Lab	0	0	6	30	20	50	100

MCA SEMESTER – III

Course Code	Paper	Teaching Scheme (Per Week)		Examination Scheme (Marks)			Total (Marks)	
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/2301	Database Management System	3	1	0	25	5	70	100
CS/MCA/2302	Theory of Formal Language & Automata	3	0	0	25	5	70	100
CS/MCA/2303	Object-oriented Programming Technique	3	1	0	25	5	70	100
CS/MCA/2304	Computer Based Optimization Technique	3	1	0	25	5	70	100
CS/MCA/2305	Operating System	3	1	0	25	5	70	100
CS/MCA/2391	Object Oriented Programming Lab	0	0	6	30	20	50	100
CS/MCA/2392 Gr. 'A'	Operating system Lab	0	0	6	15	10	25	50
CS/MCA/2392 Gr. 'B'	DBMS Lab	0	0	6	15	10	25	50
CS/MCA/2393	Educational Tour, Industrial Visit Reporting & Seminar	0	0	6	20	30	50	100

Course Code	Paper	Teaching			Examination			Total
		Sche	eme		Scheme			(Marks)
		(Per	Weel	s)	(Marl			
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/2401	Graphics &	3	1	0	25	5	70	100
	Multimedia							
CS/MCA/2402	Artificial Intelligence	3	1	0	25	5	70	100
CS/MCA/2403	Compiler Construction	3	1	0	25	5	70	100
CS/MCA/2404	Computer Networks	3	1	0	25	5	70	100
CS/MCA/2405	Management Support	3	1	0	25	5	70	100
	System							
CS/MCA/2491	Graphics &	0	0	3	15	10	25	50
	Multimedia Lab							
CS/MCA/2492	AI Lab	0	0	3	15	10	25	50
CS/MCA/2493	Compiler Lab	0	0	6	30	20	50	100
CS/MCA/2494	Network Lab	0	0	6	30	20	50	100

MCA SEMESTER – IV

MCA SEMESTER – V

Course Code	Paper	Teaching			Examination			Total
		Sche	eme		Scheme			(Marks)
		(Per	Weel	K)	(Marl			
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/3501	Advanced Topics	3	1	0	25	5	70	100
CS/MCA/3502	Software Engineering	3	1	0	25	5	70	100
CS/MCA/3503	Elective-I	3	1	0	25	5	70	100
CS/MCA/3504	Elective-II	3	1	0	25	5	70	100
CS/MCA/3591	Advanced Topics Lab	0	0	6	30	20	50	100
CS/MCA/3592	Project based on SE	0	0	6	30	20	50	100
	Approach							
CS/MCA/3593	Grand Viva Voce	0	0	0	0	0	100	100
CS/MCA/3594	Seminar	0	0	0	50	0	50	100

- ELECTIVE-I: 1. Image Processing 2. Pattern Recognition
 - 3. Soft Computing
 - 4. Human Computer Interaction
 - 5. Internet Technology
 - 6. Advanced Unix

ELECTIVE –II:

- 1. Advanced Networking
- 2. Mobile Computing
- 3. Natural Language Processing
- 4. Bioinformatics and Perl
- 5. Distributed system & Parallel Processing
- 6. Embedded System
- 7. CAD for VLSI Design

MCA SEMESTER – VI

Course Code	Paper	Teaching Scheme (Per Week)		Examination Scheme (Marks)			Total (Marks)	
		Th.	Tu.	Pr.	Int.	Att.	Ext.	
CS/MCA/3601	Project & thesis	0	0	0	100	0	200	300
CS/MCA/3602	Project Seminar & Viva	0	0	0	0	0	100	100
CS/MCA/3603	Group Discussion	0	0	0	0	0	100	100

Detailed Syllabus Outline

MCA SEMESTER – I

CS/MCA/1101 Introduction to Programming & Data Structure [65L]

Introduction to Computer [2L]: What is Computer? Computer Hardware and Software, Stages of Development (Computer Hardware)-First to Fifth Generation Computers, Types of Computer, Input Devices-Keyboard, Mouse, Storage Device-Floppy Disk, Hard Disk, Output Device-Monitor, Printer, Stages of Development (Computer Software)-First-generation Language-4 GLs

Introduction to Programming [2L]: Machine code, Assembly Language(Introduction), Problem analysis, Flow charts, Algorithms, Pseudo-code.

Fundamentals of C Language [4L]: Overview of C, Characters used in C, Identifier, Key Words, Variables, Variables Declaration, Basic Data Types, Additional Data Types, Operators and Expression- (Arithmetic, Relational, Logical, Increment and Decrement, Assignment, Conditional, Bit-wise), Additional Operator –(sizeof, comma, etc), Structure of a c Program.

Managing input and output functions and statement [2L]: Formatted Input/Output Functions, Escape Sequences, Character Input/ Output Functions.

Control Statement in C[2L]: if-else statement, Nested if Statement, switch Statement.

Loop Control in C[3L]: for loop, Nested for loop, while loop, do-while loop, goto, break, continue, exit(), etc.

Array [2L] : One Dimensional Array, Two Dimensional array.

Handling of character Strings [2L]: String Handling Functions in c, Reading / Writing Strings, Additional String Handling Functions, Operations with Characters.

Functions [4L]: Define and accessing Functions, Passing arguments, Function prototypes, Recursion, Use of Library functions, Storage Class in C-(auto, static, extern, register).

Structures and unions [2L]: structure variables and array, structure with in structure, union, Bit Field.

Pointers [4L]: Pointers Declaration, Expression using pointers, pointers as function arguments, pointer arithmetic, pointers with arrays, Dynamic memory allocation, dynamic memory allocation for an array, pointers with string, pointers with structure, pointers with functions,

File management in C[4L]: Types of file, file processing, Random file accessing, errors during file processing.

Overview of Pre-processor statements, Program through Command Line Arguments.

Introduction to Data Structure:[2L] Overview of C language, Time and Space analysis of Algorithms - Order Notations.

Linear Data Structures [6L] - Sequential representations - Arrays and Lists, Stacks, Queues and Dequeues, strings, Application. Link Representation - Linear linked lists, circularly linked lists. Doubly linked lists, application.

Recursion [4L]: - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.

Non-linear Data Structure [8L]: Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

Hashing [2L]: - Hashing Functions, collision Resolution Techniques.

Sorting and Searching Algorithms [6L]- Bubble sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and Radix Sort. Searching Techniques: Sequential Search, Binary Search.

File Structures [4L] - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.

Books:

- 1. Programming with C, Gottfried, TMH
- 2. C The Complete Reference, Schildt, TMH
- 3. Practical C Programming,3rd Ed,Oualline,SPD/O'REILLY
- 4. A First Course in programming with C, Jeyapoovan, VIKAS
- 5. The C answer Book, Tondo, 2^{nd} Ed, PHI
- 6. C Programming Made Easy, Raja Ram, SCITECH
- 7. Projects Using C, Varalaxmi, SCITECH
- 8. Mastering Algorithms With C,Loudan, SPD/O'REILLY

CS/MCA/1102 Organizational Structure

[30L]

Organization behavior:

- 1. Concept of organization & organization behavior
 - i) Organization Concept, components, nature, types and importance
 - ii) Organizational behavior: Concept, nature and models
- 2. Theories of organization:
 - i) Classical theories Administrative theory, Scientific management theory- division of labour, lines of authority, span of control, authority and responsibility, efficiency of management
 - ii) Neo Classical theory Human relations movement, elements, individual and workgroups.
- 3. Organizational structure:

Elements, functions and determinants of organizational structure, formal and informal organization Line and staff functions, organizational culture.

- 4. Motivation: Definition importance and behavior motivation- Theories of motivation morale.
- 5. Leadership Purpose and need styles- theories
- 6. Decision making Levels of decisions Automatic memory cognitive decisions in organizations decisions models : probability and expected value, pay off matrix, decision trees .

Books:

CS/MCA/1103 Basic Electronics & Digital Logic [60L]

Basic Electronics [25L]

Introduction to electronics and electronic systems, Semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, Transistor biasing. Small signal transistor amplifiers, Operational amplifiers, Feedback and Oscillators, Digital circuit and combinational logic, Sequential logic and flip-flops, ADC & DAC, Data acquisition systems, Memory systems,

Digital Logic [35L]

Data and number systems, Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, EBDIC, Gray, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic

Boolean algebra, Venn diagram, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method and Quine Mc Clauskey method

Combinational circuits- adder, subtractor, encoder, decoder, comparator, multiplexer, demultiplexer, parity generator, etc

Design of combinational circuits-Programming logic devices and gate arrays

Sequential Circuits- Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology

Memory devices- ROM, RAM, EPROM, EEPROM, etc

Books:

- 1. Givone: Digital Principles & design ,TMH
- 2. Digital Electronics Dr. Saroj Rangnekar, ISTE/EXCEL BOOKS
- 3. Malvino:Digital Principles & application TMH
- 4. Jain :Modern Digital Electronics 2/e TMH
- 5. Marcovitz:Intro to logic Design Tata Mcgraw-hill
- 6. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill
- 7. Digital Technology- Virendra Kumar, New Age
- 8. Digital Logic Design- Morries Mano, PHI
- 9. Yarbrough- Digital Logic, Vikas
- 10. Salivahan- Digital Circuits and Design, Vikas

CS/MCA/1104 Foundation in Mathematics and Logic [60L]

Set Theory : [12L]

Introduction, Definition and Concepts, Representation of Sets, Finite Sets, Infinite Sets (Definition), Set Operations : Union, Intersection, Addition theorem, difference, Symmetric difference, D' Morgons Law, Subsets, Power Sets, Partitions Sets, Mathematical inductions, computing Principles, Permutations, Combinations. **Functions : [12L]** Introduction : Definitions and Concepts, One to One, Onto functions, Invertible functions, Mathematical Functions : Floor and ceiling functions, Integer and Absolute value functions, Remainder functions, Exponential functions, logarithmic functions,

Sequences and Series [6L]: Definitions, Deferent between sequences and series, To find nth term and sum of n terms, Recursive functions : Definition and Examples.

Boolean Algebra :[10L]

Introduction, Basic Definitions, Duality, Basic Theorems, Boolean Algebra And lattice, Representation Theorem, Sum-of-product form for sets, Sum-of-products form for Boolean Algebra.

Vectors and Matrices :[5L]

Vectors : Definition only, Metrics :- Definition and Concept, Matrix Addition, Multiplication, Scalar multiplication, Transpose of a Matrix, Square matrices, Invertible matrices, Inverse of a matrix, Determinants, Basic theorems of determinants, Boolean Matrix.

Graph Thoery:[15L] Definition, walks, paths, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning trees. Eccentricity of a vertex radius and diameter of a graph. Central Graphs. Centre(s) of a tree. Hamiltonian and Eulerian graphs, Planar graphs.

Books:

- 1. Liu C. L., "Introduction to combinatorial mathematics", McGraw Hill, 1968.
- 2. Mott J. L., Kandel A. and Baker T. P., "Discrete mathematics for Computer Scientists and Mathematicians", PH, 1986.
- 3. Rosen—Discrete Mathematics, 2/e,TMH
- 4. S.K. Mapa—Higher Algebra (Abstract & Modern)
- 5. Robert J. McElice , Robert B. Ash & Carol Ash, "Introduction to discrete Mathematics", Tata McGraw Hill
- 6. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI, 1980
- 7. Tremblay and Manohar, "Discrete mathematical structures with applications to computer science", McGraw Hill, 1975
- 8. Kolamn, Busby and Ross, "Discrete mathematical structures", 3/ed, PHI, 1996.
- 9. Fraleigh J. B., "A first course in abstract algebra Narosa", 1990
- 10. Smullyan R. M., "First Order Logic Springer Verlag", 1968

Reference:

- 1. Lipschutz-2000 Solved Problems in Discrete Mathematics, TMH
- 2. Balakrishnan—Graph Theory (Schaum),MH
- 3. Hararay—Graph Theory

<u>CS/MCA/1105</u> English for Communication [30L]

Objective:

This is a foundation course for first year MCA students designed to stimulate intellectual exercise and to develop communication skills. Firstly, it aims at imparting to students a broad spectrum of ideas and values, with special emphasis on their contemporary relevance, to guide them in becoming socially responsible citizens and balanced human beings. Parallel to this, the course will train learners in the art of communication through language exercises of both general and technical varieties.

For the fulfillment of the first objective, a selection of texts comprising essays, plays, stories and poems (both in original English and in translation from other including Indian languages) will be used. Wherever possible, texts will be supplemented by audio-visual materials. Texts illustrating some of the following themes will be used:

<u>Section A</u>. Evolution of Values and the Quality of life. The Operative Forces in Society. The Weaker Nations and the Weaker Sections. The Indian Psyche. Ethics of Science, Business and Politics. The Great Issues in the 21st Century. Science and Technology for Man and the Earth.

The second part of the course will be devoted to the development of the art of communication through oral (language laboratory) and written exercises as well as presentation techniques.

The broad areas are indicated below: <u>Section B</u>.Interactive Communication - Goals and Means . Techniques of Business Communication .Group Discussion and Formal Presentation .Effective Speaking - Pronunciation, Intonation, Choice of Words (Register) (Mostly in the language laboratory) .Effective Writing - Language, Style, Formal Devices and Modes

Books:

- 1. Business Correspondence & Report Writing, Sharma, TMH
- 2. Business Communication Strategies, Monipally, TMH
- 3. English for Technical communication,Laxminarayanan,Scitech
- 4. Business Communication, Kaul, PHI
- 5. Communication Skill for Effective Mgmt., Ghanekar, EPH

CS/MCA/1106 Computer Based Numerical & Statistical Method [60L]

(a) Numerical Computation :[30L]

Computer Arithmetic : Floating point numbers – Operations, Normalization's, and their consequences.

Iterative Methods : Zeros of a single transcendental equations and zeros of polynomials using bisection, method of false position, Newton-Raphson method etc. ; Convergence of solutions. Simultaneous linear equations ; Solutions of simultaneous linear equations – Gauss' elimination method and pivoting ; III-conditioned equations and refinement of solutions ; Gauss-Seidel iterative method .

Numerical differentiation & integration, Solutions of differential equations :

Runge-kutta methods ; Predictor-corrector methods ; Automatic error monitoring ; Stability of solutions .

Interpolations and Approximation : Polynomial interpolation – Newton, Lagranges etc. ; Difference tables ; Approximation of function by Taylor series and Chebycheff polynomials.

(b) Statistical Computation :[30L]

Theory of Sampling ; Population and sample ; Sampling survey methods and Estimation . Moments and Moment-Generating-Functions ; Statistical Inference ;

Testing of Hypothesis and Inference .

Linear correlation coefficient ; linear regression ; Non-linear regression ; multiple correlation and multi-regression .

Regression Analysis : Least Square fit ; Polynomial and curve fittings ; linear regression and nonlinear regression algorithms ; Multiple regression algorithms .

Time Series & Forecasting : Moving averages ; smoothening of curves ; Forecasting models and methods.

Statistical Quality Control Methods : Factor analysis, ANOVA, Tests of significance ; Chi-square test & F-test ; Applications to medicine, psychology, agriculture, etc.

Books:

- 1.Numerical Analysis, Shastri, PHI
- 2.Numerical Analysis, S. Ali Mollah
- 3. Numerical Analysis, James B. Scarbarough
- 4. .Numerical Methods for Mathematics ,Science & Engg., Mathews, PHI
- 5. Numerical Analysis, G.S. Rao, New Age International
- 6. Programmed Statistics (Questions Answers), G.S. Rao, New Age International
- 7.Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
- 8. Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
- 9. Numerical Methods, Arumugam, Scitech
- 10. Probability and Statisics for Engineers, Rao, Scitech
- 11.Numerical Methods in Computer Application, Wayse, EPH

CS/MCA/1191 Programming & Data Structure Lab

Laboratory Component : Suggested Assignments To be conducted on a 6-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below. Experiments should include but not limited to :

1. Familiarization of a computer and the environment and execution of sample programs

- 2. Expression evaluation
- 3. Conditionals and branching
- 4. Iteration
- 5. Functions
- 6. Recursion
- 7. Arrays
- 8. Structure
- 9. Link List
- 10.Data structures
 - a. Operations on queue Insert, Delete
 - b. Operations on stack Push, Pop, Peep, change
 - c. Polynomial addition, Polynomial multiplication
 - d. Sparse Matrices : Multiplication, addition.
 - e. Conversion of an Arithmetic Expression Written into Infix Notation to Expression in Postfix Notation. (Non-Recursive)
 - f. Counting of N! using stack concept (Non-Recursive and Recursive)

- g. Operations on lists Singly Linked List, Circularly Linked List, Doubly Linked List. (Insertion and Deletion Operations)
- h. Operations on Binary Tree (Traversal-Pre order, In order, Post order, Insertion and Deletion)
- i. Sort an array using Selection Sort
- j. Sort an array using Bubble Sort
- k. Sort an array using Merge Sort
- I. Sort an array using Quick Sort

CS/MCA/1192 Basic Electronics & Digital Logic lab

Laboratory Component : Basic Electronics

Suggested Experiments Familiarization of electronic equipments and components Studies on Logic gates Using studies on RC and CR networks Studies on Rectifiers and Zener diode regulation Studies on Op. Amp Applications Studies on Flip-Flops and Counters Design or a CE Amplifier Application of Timer 555 chip

List of Experiments: Digital Logic

- 1. Realization of NOT, OR, AND, XOR, XNOR gates using universal gates
- 2. A. Gray to Binary conversion & vice-versa.
- B. Code conversion between BCD and EXCESS-3
- A. ODD and even parity generation and checking.
 B. 4-bit comparator circuit
- 4. Design of combinational circuit to drive seven-segment display
- 5. Design of combinational circuits using multiplexer
- 6. A. Adder/Subtractor circuits using Full-Adder using IC and/ or logic gates. B. BCD Adder circuit using IC and/ or logic gates
- 7. Realization of RS, JK, and D flip flops using Universal logic gates
- 8. Realization of Asynchronous up/down counter
- 9. Realization of Synchronous Mod-N counter
- 10. Digital to Analog conversion

CS/MCA/1193(Gr. 'A') General Seminar & Report Writing Lab

Topics to be covered and number of hours required for it:

- 1. Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place (3 hours)
- 2. Conversion practice is done on given situation topics. The students are also made to listen to pre-recorded cassettes produced by British Council and also by the Universities of Oxford and Cambridge (6 hours)

- 3. Group Discussions:- The students are made to understand the difference between the language of conversion and group discussion. Strategies of such discussions are to teach to them. It is also helpful to use videocassettes produced by the U.G.C. on topics like group-discussion. After wards the class is divided into groups and the students have to discuss on given topics on current socio-economic-political-educational importance(12 hours)
- 4. Interview sessions-students are taught the do's and don'ts of facing a successful interview. They then have to face rigorous practices of mock-interviews. There simulations of real life interview sessions where students have to face an interview panel(12 hours)
- 5. Presentations: The secrets of an effective presentation are taught to the students. Then each and every student has to make lab presentations with the help of the Overhead projector/ using power point presentation and other audio-visual aids in the laboratory. They also have to face the question answer sessions at the end of their presentation (12 hours)
- 6. Classes are also allotted to prepare the students for competitive examinations like the T.O.E.F.L. by making the students listen to specially produced C.D. cassettes of such examinations (3 hours)

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

Text:

1. Sharma—Business Correspondence & Report Writing, TMH

2. Prasad—Group Discussion & Interview (With Audio Cassette), TMH

Reference:

1. Sashi Kumar-Spoken English (with Cassette), TMH

CS/MCA/1193(Gr. 'B') Numerical & Statistical Lab

MCA SEMESTER – II

<u>CS/MCA/1201 The Design & Analysis of Algorithm</u> [48L]

Models of computation [4L]: RAM,TM etc. time and space complexity

Asymptotic Notation [4L] Big-O, omega, theta etc.; finding time complexity of well known algorithms like- heapsort, search algorithm etc.

Algorithm Design techniques [2L]

Recursion- Definition, Use, Limitations, Examples: Hanoi problem. Tail Recursion

Divide and Conquer [4L] Basic method, use, Examples: Merge sort, Quick Sort, Binary Search

Dynamic Programming [4L]

Basic method, use, Examples: matrix-chain multiplication, All pair shortest paths, singlesource shortest path, Travelling Salesman problem

Branch and Bound [2L] : Basic method, use, Examples: The 15-puzzle problem

Backtracking [3L]

Basic method, use, Examples: Eight queens problem, Graph coloring problem, Hamiltonian problem

Greedy Method [5L]

Basic method, use, Examples: Knapsack problem, Job sequencing with deadlines, minimum spanning tree(Prim's and Kruskal's algorithms)

Lower Bound Theory [2L]

Bounds on sorting and sorting techniques using partial and total orders.

Disjoint Set Manipulation [2L]

Set manipulation algorithm like UNION-FIND, union by rank, Path compression.

Properties of graphs and graph traversal algorithms [3L]: BFS and DFS

Matrix manipulation algorithms [5L]

Different types of algorithms and solution of simultaneous equations, DFT & FFT algorithm; integer multiplication schemes

Notion of NP-completeness [5L]

P class, NP-hard class, NP-complete class, Circuit Satisfiability problem, Clique Decision Problem.

Approximation algorithms [3L]

Necessity of approximation scheme, performance guarantee, Polynomial time approximation schemes: 0/1 knapsack problem

Text Books:

- 1. A.Aho, J.Hopcroft and J.Ullman "The Design and Analysis of algorithms"
- 2. D.E.Knuth "The Art of Computer Programming", Vol. I & Vol.2
- 3. Horowitz Ellis, Sahani Sartaz, R. Sanguthevar "Fundamentals of Computer Algorithms".
- 4. Goodman: Introduction to Design and Analysis Of Algorithms TMH

Reference:

- 1. K.Mehlhorn , "Data Structures and algorithms- Vol. I & Vol. 2 "
- 2. S.Baase "Computer algorithms"
- 3. E.Horowitz and Shani "Fundamentals of Computer algorithms"
- 4. E.M.Reingold, J.Nievergelt and N.Deo- "Combinational algorithms- Theory and Practice", Prentice Hall , 1997
- 5. A.Borodin and I.Munro, "The computational complexity of Algebraic and Numeric problems"

CS/MCA/1202 Accounting & Financial Management 3-1-0 100

Principles of Accounting : Assets, Current assets; fixed assets; liabilities; current liabilities; other liabilities owners equity; trading account; accounting records and systems; control accounts and subsidiary ledgers; limitations.

Assets and Working capital; fixed assets and depreciation; assets acquisition; disposal replacement depreciation; intangible assets; inventory methods; sources of working capital; funds cash flows.

Interpreting Accounts and financial statements use of ratios in interpreting trading accounts and financial statements; limitations other methods.

Standards for control : Variable costs/fixed costs cost – volume – profit analysis; breakeven; marginal and full costing, contribution; standard costing; Analysis of variance; computer accounting and algorithms.

Budgeting/Forecasting : characteristics of budgets, definition, advantages, preparation; forecasting long term / short term.

Project Appraisal : Method of Capital Investment ; Decision making, discounted cash flows, internal ratio of return pay-back, rate of return; Sending analysis; Cost of capital.

<u>CS/MCA/1203</u> Computer Architecture & Organization [60L]

Concepts and Terminology: Digital computer components Hardware & Software and their dual nature, Role of Operating Systems (OS).

The ALU: ALU organization, Integer representation, Serial and Parallel Adders, is 1s and 2s complement arithmetic, Multiplication of signed binary numbers, Floating point number arithmetic, Overflow detection, Status flags.

Memory Unit: Memory classification, Bipolar and MOS storage cells. Organization of RAM, address decoding, Registers and stack, ROM and PROM-basic cell. Organization and erasing schemes, Magnetic memories-recording formats and methods. Disk and tape Units. Concept of memory map. Timing diagrams, T-States, Timing diagram Controlling arithmetic and logic instructions. Instruction sequencing with examples. Introduction to Micro-programming, Variations in Micro-programming configuration.

General Organization: Instruction work formats, Addressing modes registers, Von-Neumann concept, Interconnecting system components, Interfacing buses, Timing diagrams, Examples from popular machines.

Introduction to Multiprogramming and Multiprocessing; Introduction to pipelined operation and architecture.

Text books :

- 1 Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
- 2 Hamacher, "Computer Organisation",
- 3 Computer Organization and System Software, EXCEL BOOKS
- 4. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
- 5. Mano, M.M., "Computer System Architecture", PHI.
- 6. Burd- System Architecture, Vikas

<u>CS/MCA/1204</u> Microprocessor based Systems [60L]

Introduction to 8085A CPU architecture-register organization, addressing modes and their features. Software instruction set and Assembly Language Programming. Pin description and features.

Instruction cycle, machine cycle, Timing diagram.

Hardware Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO).

Interrupts and DMA.

Peripherals: 8279, 8255, 8251, 8253, 8237, 8259, A/D and D/A converters and interfacing of the same.

Typical applications of a microprocessor.

16 bit processors: 8086 and architecture, segmented memory has cycles, read/write cycle in min/max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features. Software instruction set (including specific instructions like string instructions, repeat, segment override, lock prefizers and their use) and Assembly Language programming with the same.

Brief overview of some other microprocessors (eg. 6800 Microprocessor).

References:

- 1. Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
- 2. Intel Corp: The 8085 / 8085A. Microprocessor Book Intel marketing communication, Wiley inter science publications, 1980.
- 3. An introduction to micro computers Vol. 2 some real Microprocessor Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
- 4. Advanced Microprocessors by Ray and Bhurchandi TMH
- 5. Intel Corp. Micro Controller Handbook Intel Publications, 1994.
- 6. Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
- 7. Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987
- 8. The Intel Microprocessors: 8086/8088, 80186, 80286, 80386 & 80486, Bary B. Brey, Prentice Hall, India 1996.

[60L]

CS/MCA/1205 System Programming

Machine structure, Machine language [3L],

Assembly language: Programmers model of a machine, example of a typical 16/32 bit processor, Addressing mode; Instruction set, use of assembly language for typical programs like table search, subroutines, symbolic and numeric manipulations, I/O software interrupt instruction usage [21L]

Assemblers: Definition; Assembler directives, Phase structure of assembler; pass structure of assembler; Design of two pass assembler; design of single pass assembler. [12L]

Macro language and the macro-processor: Macroinstructions, Features of a Macro Facility; Two Pass and single pass Algorithms; Implementation of Macro Calls within Macro. [12L]

Linker and Loaders: Relation and Linking Concepts; Design of a Linker; Different loader scheme – compiler – and – go loader, General loader, Absolute loader, Relocating loader, direct linking loaders, other loader schemes - Binders, Linking Loaders, Overlays, Dynamo binders etc. [12L]

Books:

- 1. Donovan : "System Programming"
- 2. D.M. Dhamdhere : "System Programming and Operating System"
- 3. A.K.Roy, K.M.Bhurchandi: "Advanced Microprocessor and Peripherals"
- 4. D.V.Hall : "Microprocessor"

CS/MCA/1291 Algorithm Lab

Laboratory: The laboratory component will emphasize two areas:

Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.

Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to a topic covered in class.

The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

CS/MCA/1292 Gr. 'A' System Programming Lab

CS/MCA/1292 Gr. 'B' Accounting & Financial Management Lab

CS/MCA/1293 Microprocessor Lab

List of Experiments:

1. Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.

2. a) Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical)

- b) Assignments based on above.
- 3. a) Familiarization with 8085 simulator on PC.
 - b) Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.
 - c) Assignments based on above
- 4. Programming using kit/simulator for
 - i) table look up
 - ii) Copying a block of memory
 - iii) Shifting a block of memory
 - iv) Packing and unpacking of BCD numbers
 - v) Addition of BCD numbers
 - vi) Binary to ASCII conversion

- vii) String Matching
- viii) Multiplication using Booth's Algorithm
- 5. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit eg, subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc
- 6. Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding 3
- 7. Interfacing with I/O modules:
 - a) ADC
 - b) Speed control of mini DC motor using DAC
 - c) Keyboard
 - d) Multi-digit Display with multiplexing
 - e) Stepper motor
- 8. Writing programs for 'Wait Loop (busy waiting)' and ISR for vectored interrupts (eg, counting number of pulses within specified time period)
- 9. Study of 8051 Micro controller kit and writing programs for the following tasks using the kit
 - a) Table look up
 - b) Basic arithmetic and logical operations
 - c) Interfacing of Keyboard and stepper motor
- 10. Familiarization with EPROM programming and Erasing

MCA SEMESTER – III

CS/MCA/2301 Database Management System [60L]

Introduction [4L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [6L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [6L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [12L]

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [15L]

Functional Dependency, Different anamolies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued dependencies, 4NF, 5NF

Internals of RDBMS [7L]

Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [10L]

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Text Books:

- 2. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
- 3. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
- 4. Ramakrishnan: Database Management System, McGraw-Hill
- 5. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
- 6. Jain: Advanced Database Management System CyberTech
- 7. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
- 8. Ullman JD., "Principles of Database Systems", Galgottia Publication.

Reference:

1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi

2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition

3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

CS/MCA/2302 Theory of Formal Language & Automata [60L]

Finite State Machines : Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and liner sequential machines.

Finite State Models : Basic definition, mathematical representation, Moore versus Mealy m/c, capability & limitations of FSM, state equivalence & minimization, machine equivalence, incompletely specified machines, merger graph & compatibility graph, merger table, Finite memory, definite, information loss less & inverse machines : testing table & testing graph. Structure of Sequential Machines : Concept of partitions, closed partitions, lattice of closed partitions, decomposition : serial & parallel.

Finite Automation : Preliminaries (strings, alphabets & languages, graphs & trees, set & relations), definition, recognition of a language by an automata - idea of grammar, DFA, NFA, equivalence of DFA and NFA, NFA with e-moves, regular sets & regular expressions : equivalence with finite automata, NFA from regular expressions, regular expressions from DFA, two way finite automata equivalence with one way, equivalence of Moore & Mealy machines, applications of finite automata.

Closure Properties of Regular Sets : Pumping lemma & its application, closure properties minimization of finite automata : minimization by distinguishable pair, Myhill-Nerode theorem.

Context Free Grammars : Introduction, definition, derivation trees, simplification, CNF & GNF.

Pushdown Automata : Definition, moves, Instantaneous Descriptions, language recognised by PDA, deterministic PDA, acceptance by final state & empty stack, equivalence of PDA and CFL.

Closure Properties of CFLs : Pumping lemma & its applications, ogden's lemma, closure properties, decision algorithms.

Introduction to Z. Regular language properties and their grammars. Context sensitive languages.

Text books :

1. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.

- 2. K.L.P Mishra & N. Chandrasekharan "Theory of Computer Science", PHI
- 3. Ash & Ash "Discrete Mathematics", TMH
- 4. Martin—Introduction
- 5. Lewis H. R. and Papadimitrou C. H., "Elements of the theory of Computation", P.H.I.
- 6. Kain, "Theory of Automata & Formal Language", McGraw Hill.

References :

- 1. Kohavi ZVI, "Switching & Finite Automata", 2nd Edn., Tata McGraw Hill.
- 2. Linz Peter, "An Introduction to Formal Languages and Automata", Narosa
- 3. "Introduction to Formal Languages", Tata McGraw Hill, 1983.

CS/MCA/2303 Object-oriented Programming Technique [60L]

Module I

Introduction [8 L]

Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language.

Object oriented analysis [4L]

Usecase diagram; Major and minor elements, Object, Class.

<u>Module II</u>

Object oriented design [15 L]

Relationships among objects, aggregation, links, relationships among classes- association, aggregation, using, instantiation, meta-class, grouping constructs.

Module III

Basic concepts of object oriented programming using Java [20 L]

Object, class, message passing, encapsulation, polymorphism, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages.

Module IV

Fundamentals of Object Oriented design in UML [13 L]

Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, statechart diagram, activity diagram, implementation diagram, UML extensibility- model constraints and comments, Note, Stereotype.

Text Books :

- 1. Ali Bahrami, "Object Oriented System Development" Mc Graw Hill.
- 2. Rambaugh, James Michael, Blaha "Object Oriented Modelling and Design" Prentice Hall India/ Pearson Education
- 3. Bruce, Foundations of Object Oriented Languages, PHI
- 4. Patrick Naughton, Herbert Schildt "The complete reference-Java2" TMH
- 5. Priestley "Practical Object Oriented Design using UML" TMH
- 6. Jana, C++ & Object Oriented Programming, PHI
- 7. Alhir, learning UML, SPD/O'Reily

Reference Books:

- 1. Page Jones, Meiler "Fundamentals of object oriented design in UML"
- 2. Roff: UML: A Beginner's Guide TMH
- 3. Rajaram: Object Oriented Programming and C++, New Age International
- 4. Mahapatra: Introduction to System Dynamic Modelling, Universities Press
- 5. Muller : Instant UML, Shroff Publishers / Wrox
- 6. Srimathi, Object Oriented Analysis & Design Using UML, Scitech
- 7. Alhir : UML in a Nutshell, Shroff Publishers / O'reilly
- 8. Olshevsky : Revolutionary guide to Object Oriented Programming using C++, Shroff / Wrox

CS/MCA/2304 Computer Based Optimization Technique [60L]

Prerequisite : Probability and Statistics, Mathematical foundation in computer science, Computer programming and problem solving.

Liner Programming : Mathematical model, Assumptions of linear programming, Principles of simplex method, Revised simplex method, Applications, Duality Dual Simplex method, Sensitivity analysis.

Special Types of Linear Programming Problems : Transportation and Assignment problems.

Integer Programming : Introduction, Cutting plane method, Branch and bound technique, Binary linear programming, Assignment and Travelling salesman problem.

Queuing Theory : Characteristics of queuing systems ; steady state M/M/I, M/M/I/K, M/M/C queuing models.

Dynamic Programming : Deterministic and probabilistic dynamic programming.

Non-linear Programming : The Kuhn Tuaker conditions. Quadratic programming, Convex programming.

Project Scheduling and Project Evaluation : Diagram representation, Critical path calculations, Construction of time chart and resource labeling, Probability and cost

consideration in project scheduling, Project Scheduling, Project control. Evaluation techniques.

Replacement methods : Introduction, Replacement policies for items whose efficiency deteriorates with time, Replacement policies for items that fail completely.

Sequencing Models : Classification of self-problems, Processing of jobs through two machines, three machines, Processing of two jobs through machines.

Deterministic & Non deterministic Inventory Models : Infinite delivery rate with no back orders, Infinite delivery rate with back orders, Finite delivery rate with back orders. Single and multi period models.

Network Analysis-shortest Paths, Maximal Flow including PERT-CPM. Integer programming concepts, formulation, solution and applications.

Game Theory-Introduction, Decisions under risk, Decisions under uncertainty

Text:

1. Hamdy A. Taha, "Operations Research", Fifth edn., Macmillan Publishing Company, 1992.

- 2. V.K. Kapoor-- Operations Research
- 3. Kanti Swaroop-- Operations Research
- 4. Hadley G., "Linear Programming", Narosa Publishers, 1987.
- 5. Hillier & Lieberman—Introduction to Operations Research, 7/e (with CD), TMH
- 6. Hiller F. and Leibermann G. J., "Operation Research", Holder Day Inc, 1974.

Reference:

1. Operations Research - Schaum outline series, MH

CS/MCA/2305 Operating System [60L]

Introduction [4L]

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure[3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management [17L]

Processes [3L]: Concept of processes, process scheduling, operations on processes, cooperating processes, inter-process communication.

Threads [2L]: overview, benefits of threads, user and kernel threads.

CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores. Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management [19L]

Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems [4L]: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Protection & Security [4L]

Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Text Books / References :

- 1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
- 2. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
- 3. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
- 4. Dhamdhere: Operating System TMH
- 5. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
- 6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

CS/MCA/2391 Object Oriented Programming Lab

- 1. Assignments on class, constructor, overloading, inheritance, overriding
- 2. Assignments on wrapper class, vectors, arrays
- 3. Assignments on developing interfaces- multiple inheritance, extending interfaces
- 4. Assignments on creating and accessing packages
- 5. Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming
- 6. Use of CASE tools

Note: Use Java and C++ as programming language.

CS/MCA/2392 Gr. 'A' Operating system Lab

Topic of Experiments:

- 1. **Shell programming [6P]:** creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
- 2. **Process [6P]:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
- 3. Signal [9P]: signal handling, sending signals, signal interface, signal sets.
- 4. **Semaphore [6P]:** programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
- 5. **POSIX Threads [9P]:** programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)
- 6. **Inter-process communication [9P]:** pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO)

CS/MCA/2392 Gr. 'B' DBMS Lab

Structured Query Language

1. Creating Database

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. Table and Record Handling

INSERT statement

- ➢ Using SELECT and INSERT together
- > DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements
 3. Retrieving Data from a Database
- The SELECT statement
- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- ▶ Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING

Clause

- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

4. Database Management

- Creating Views
- Creating Column Aliases
- Creating Database Users
- Using GRANT and REVOKE

Cursors in Oracle PL / SQL

Writing Oracle PL / SQL Stored Procedures

CS/MCA/2393 Educational Tour, Industrial Visit, Reporting & Seminar

A tour should be organized and students should give a seminar on that tour individually. They should submit a field report also.

MCA SEMESTER – IV

CS/MCA/2401 Graphics & Multimedia [45L]

Module I

Introduction to computer graphics & graphics systems [6L]

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion: [6L]

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II

2D transformation & viewing [8L]

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear;

Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D transformation & viewing [7L]

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Module III

Curves [3L]

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

Color & shading models [2L]

Light & color model; interpolative shading model; Texture;

Module IV

Multimedia [10L]

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia.; Image, video and audio standards.

Audio: digital audio, MIDI, processing sound, sampling, compression.

Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intra-frame compression.

Animation: types, techniques, key frame animation, utility, morphing.

Virtual Reality concepts.

Text Books:

- 1. Hearn, Baker "Computer Graphics (C version 2nd Ed.)" Pearson education
- 2. Z. Xiang, R. Plastock "Schaum's outlines Computer Graphics (2nd Ed.)" TMH
- 3. D. F. Rogers, J. A. Adams "Mathematical Elements for Computer Graphics (2nd Ed.)" TMH
- 4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
- 5. Sanhker, Multimedia A Practical Approach, Jaico
- 6. Buford J. K. "Multimedia Systems" Pearson Education
- 7. Andleigh & Thakrar, Multimedia, PHI
- 8. Mukherjee Arup, Introduction to Computer Graphics, Vikas

9. Hill, Computer Graphics using open GL, Pearson Education

Reference Books:

- 1. Foley, Vandam, Feiner, Hughes "Computer Graphics principles (2nd Ed.) Pearson Education.
- 2. W. M. Newman, R. F. Sproull "Principles of Interactive computer Graphics" TMH.
- 3. Elsom Cook "Principles of Interactive Multimedia" McGraw Hill

CS/MCA/2402 Artificial Intelligence

Overview of Artificial intelligence- Problems of AI, AI technique, Tic – Tac – Toe problem., Problem Space & search. Heuristic Search Techniques, Knowledge representation issues.Representing knowledge using rules.Symbolic reasoning under uncertainty. Statistical reasoning. Weak slot & filler structures. Strong slot & filler structures. Game planning – Minimax search procedure, adding alpha beta cut-off's, iterative deepening, Planning. Natural language processing, Understanding.Learning - induction & explanation based learning.

Basic knowledge of programming language like Prolog & Lisp.

Books:

1. Artificial Intelligence, Ritch & Knight, TMH

2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI

3.Logic & Prolog Programming, Saroj Kaushik, New Age International

4.Expert Systems, Giarranto, VIKAS

CS/MCA/2403 **Compiler Construction** [60L]

Classification of grammars. Context free grammars. Deterministic finite state automata (DFA) Non-DFA Scanners. Top down parsing, LL grammars. Bottom up parsing. Polishing expressions Operator precedence grammar. IR grammars. Comparison of parsing methods. Error handling.

Symbol table handling techniques. Organisation for non-block and block structured languages. Run time storage administration. Static and dynamic allocation. Intermediate forms of source program. Polish N-tuple and syntax trees. Semantic analysis and code generation. Code optimisation, folding, and redundant sub-expression evaluation. Optimisation within iterative loops.

Books: 1.Compiler Design, Aho & Ullman 2. Compiler Design in C, Holub, PHI

CS/MCA/2404 **Computer Networks**

[45L]

Module I Overview of data communication and Networking: [5L] [45L]

Introduction; Data communications: components, data representation(ASCII,ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level: [5L]

Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital)& transmission media (guided & non-guided); TDM, FDM, WDM; Circuit switching: time division & space division switch, TDM bus; Telephone network;

<u>Module II</u>

Data link layer: [6L]

Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium access sub layer: [5L]

Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet;

Module III

Network layer: [8L]

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address, subnetting; Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

Transport layer: [6L]

Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos.

Module IV

Application layer: [5L]

DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

Modern topics: [5L]

ISDN services & ATM ; DSL technology, Cable modem, Sonet. Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Text Books:

- 1. B. A. Forouzan "Data Communications and Networking (3rd Ed.) " TMH
- 2. A. S. Tanenbaum "Computer Networks (4th Ed.)" Pearson Education/PHI
- 3. W. Stallings "Data and Computer Communications (5th Ed.)" PHI/ Pearson Education
- 4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
- 5. Black, Data & Computer Communication, PHI

- 6. Miller, data Communication & Network, Vikas
- 7. Miller, Digital & Data Communication, Jaico
- 8. Shay, Understanding Data Communication & Network, Vikas

Reference Books:

- 1. Kurose and Rose " Computer Networking -A top down approach featuring the internet" Pearson Education
- 2. Leon, Garica, Widjaja "Communication Networks" TMH
- 3. Walrand "Communication Networks" TMH.
- 4. Comer "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" Pearson Education/PHI

CS/MCA/2405 Management Support System [45L]

Introduction to the concept of Decision Support System: Components of DSS: Dialogue Management; Data Management and Model Management for DSS; Examples of different types of DSS; Systems Analysis and Design for DSS; Models in the context of DSS; Algorithms and Heuristics; DSS Application in Different functions; Design of Interfaces in DSS; An overview of DSS generators; Group Decision in Support Systems (GDSS) and Decision Conferencing.

Introduction of Expert Systems in Management; Case Study on Expert System. Introduction to GIS; MSS based on GIS **[5L]**

Business Management:[20L]

Basics of management; Planning, scheduling, organizing, staffing, directing, controlling Managerial economics and financial management, productivity management

Human resource development and management, selection, training and role of IT

Introduction to management control systems: goals, strategies; Performance measures

Strategy: firm and its environment, strategies and resources, industry structure and analysis, corporate strategies and its evaluation, strategies for growth and diversification, strategic planning

Management Accounting:[20L]

Financial accounting, financial statements and analysis Conceptual framework of cost accounting Cost-volume profit (CVP) relationship, budgeting, cost accumulation system, variable and absorption costing system Financial accounting computer packages.

Books:

1.Essentials of Management, Koontz, TMH

2.Management:Text & Cases,Satya Raju,2nd Ed,PHI

3. BO and Principles of Management, A. Roy, TMH

- 4. Mgmt. Text & Cases, V.S. P. Rao & Harikrishna, EXCEL BOOKS
- 5.Mgmt. Concept & Strategies, Chandan, VIKAS

6.Management Science, Rao, Scitech

- 7.Principal & Practice of Mgmt.,Ghanekar, EPH
- 8. Principal & Practice of Mgmt, Amrita Singh, EPH

Reference:

- 1. Management Accounting, Khan & Jain, TMH
- 2. Management Accounting, M.E. Thukaram Rao, New Age International
- 3. Financial Accounting for Business Managers, Bhattacharyya, PHI
- 4. Management Accounting, I.M. Pande, VIKAS
- 5. Accounting and Financial management for MCA & MBA Students, Ramachandran, Scitech
- 6. Management Accounting for non-specialists, Atrill, PHI
- 7. Management Accounting, A.P. Rao, EPH

CS/MCA/2491	Graphics and Multimedia Lab
<u>CS/MCA/2492</u>	Al Lab
<u>CS/MCA/2493</u>	Compiler Lab
<u>CS/MCA/2494</u>	Network Lab

MCA SEMESTER – V

CS/MCA/3502

Software Engineering [60L]

The Product : Software, Software Myths, The process : Software engineering : A Layered Technology, Software Process Models, The linear sequential Model, The prototyping Model, The RAD Model, Evolutionary Software Process Models, Component – Based Development, Fourth Generation Techniques, Software process and project metrics : Software measurement Software project planning : Project planning objectives, Software scope, Decomposition Techniques, Empirical estimation models, The Make/Buy Decision., Risk analysis and Management : Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation, monitoring, and management, Safety risks and hazards, The RMMM Plan, Project scheduling and technique : Basic concept, Defining a task set for the software project, Defining a task Network, Scheduling, Earned value analysis. Software Quality Assurance : Quality Concepts, The Quality Movement, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, Mistake Proofing for Software, Introduction to ISO standard

Software Testing Technique : Software testing fundamentals, Test case design, White-box Testing, Basis path testing, Control structure testing, Black-box testing, Testing for

specialized environments, architectures and application, Object-Oriented Analysis : Introduction to UML Diagrams, Use Case Diagrams, Class Diagrams, Collaboration Diagrams, Implementation Diagrams

Electives:

Image Processing:

Computer Vision:

Sensor and Imaging: Imaging Optics, Radiometry of Imaging, Illumination sources and techniques, Camera Principles, Color Imaging, Single Sensor Color Imaging and Color Demosaicing, Range Images, 3D Imaging. Signal Representation: Vector Space and Unitary Trasnsforms, Multi-Resolutional Signal Representation, Wavelet Decomposition, Scale space and diffusion, Representation of color, Retinex Processing, Markov Random Field Modellings of Images. Non-linear Image Processing: Median and Order Statistics Filters, Rank-Ordered-Mean Filters and Signal Dependent Rank-Ordered-Mean Filters, Two Dimensional Teager Filters, Applications of non-linear filters in image enhancement, edge detections, noise removal etc.

Feature Estimation: Morphological Operations, Edge Detection, Edges in multichannel images, Texture Analysis, Optical flow based motion estimation, Reflectance based shape recovery, Depth from focus, Stereo matching and depth estimation. Image and Video Compression Standards: Lossy and lossless compression schemes: Transform Based, Sub-band Decomposition, Entropy Encoding, JPEG, JPEG2000, MPEG-1, MPEG-4, and MPEG-7. Object Analysis, Classification: Bayesian Classification, Fuzzy Classification, Neural Network Classifiers, Shape Reconstruction from volumetric data, Knowledge-based interpretation of images.

Fuzzy Logic:

Pattern Recognition:

Introduction to pattern recognition and applications to OCR, speech recognition, fingerprints, signatures etc. Commercial importance of applications. Introduction to Statistical, Neural and Structural Approaches. Statistical Pattern Recognition: Patterns and classification, discriminant functions, Bayes decision rule, nearest neighbour rule, probability of error. Linear discriminant functions: Perceptrons and training, LMSE approaches. Unsupervised learning and clustering. Feature extraction. Neural Approach: Introduction to artificial neural networks, feed forward networks, delta rule and back propagation, Hopfield networks and unsupervised learning, Adaptive resonance architectures, related techniques. Pattern recognition: Formal languages and grammars Pattern grammars and higher dimensional grammars, Parsing, automata realizations, stochastic grammars, Grammatical Inference, computational learning theory, Valiant"s framework.

Neural Network:

Motivation; limitations of symbolic approach to machine intelligence Perceptrons; training; convergence theorem; linear separability Multilayer perceptron; Backpropagation; Boltzmann

machine and simulated annealing Hopfield net; energy; stability; capacity; Application to optimization problems Unsupervised learning; Adaptive Resonance Theory; Kohonen network Capabilities of multilayer perceptrons; complexity issues; importance of Kolmogorov complexity; Probably Approximately Correct learning and neural networks Hybrid systems; importance of integrating symbolic and connectionist systems; connectionist expert systems

Soft Computing:

Human Computer Interaction:

Internet Technology:

Evolution of Internet, TCP/IP, Addressing and Routing, Internet Applications (FTP, TELNET, Email, http, WWW), Web pages and HTML, Forms, cgi scripts and clickable maps, Dynamic Web pages (JAVA applets, JAVA script, PERL), Emerging Trends (VOIP, VRML JAVA beans, ecommerce), Intranets and Extranets – security issues.

Advanced Networking:

- 1. High Speed LANs, ATM and Satellite Communication
 - Fiber Distributed Data Interface (FDDI)
 - Fast Ethernet, High Performance Parallel Interface (HIPPI) and Fiber Channel
 - ATM Design Goals, ATM Topology, ATM Protocol Architecture
 - Geosynchronous Satellites, Low-Orbit Satellites, Satellites versus Fiber, Satellite Networks.
- 2. Routing and Congestion Control.
 - Virtual Circuits and Datagrams
 - Routing Techniques, Congestion Control
- 3. Internetworking
 - Introduction and Issues that arise in Internetworking.
 - Different ways in which networks differ, Internetworking using Concatenated Virtual Circuits.
 - Connection less Internetworking, Tunneling, Internetwork Routing, Fragmentation, Firewalls.
- 4. TCP/IP
 - The IP Protocol, IP Addresses, Subnets, Subnet Masks.
 - The Transport Service, The TCP Protocol, Segment Header, Connection Management, UDP, Wireless TCP and UDP.
 - Socket Programming (UNIX Based), Concurrent & No concurrent Server (Single Process and multiprocess server concepts).
- 4. Network Security
 - Introduction, Traditional Cryptography, Fundamental Cryptographic
 - Principles, Secret-Key Algorithms, Public-Key Algorithms

Mobile Computing:

Natural Language Processing:

Speech & Natural Language Processing: Introduction; Brief Review of Regular Expressions and Automata; Finite State Transducers; Word level Morphology and Computational Phonology; Basic Text to Speech; Introduction to HMMs and Speech Recognition. Indian language case studies; Part of Speech Tagging; Parsing with CFGs; Probabilistic Parsing. Representation of Meaning; Semantic Analysis; Lexical Semantics; Word Sense; Disambiguation; Discourse understanding; Natural Language Generation

Bioinformatics:

Sequence similarity, homology, and alignment. Pairwise alignment: scoring model, dynamic programming algorithms, heuristic alignment, and pairwise alignment using Hidden Markov Models. Multiple alignment: scoring model, local alignment gapped and ungapped global alignment. Motif finding: motif models, finding occurrence of known sites, discovering new sites.

Gene Finding: predicting reading frames, maximal dependence decomposition. Analysis of DNA microarray data using hierarchical clustering, model-based clustering, expectation-maximization clustering, Bayesian model selection.

Distributed System and Parallel Processing:

Fundamental theoretical issues in designing parallel algorithms and architectures. Parallel computers based on interconnection networks such as hypercubes, shuffle-exchanges, trees, meshes and butterfly networks. Parallel algorithms for arithmetic, linear algebra, sorting, Fourier Transform, recurrence evaluation, and dense graph problems. Use of graph embedding techniques to compare different networks. Shared memory based parallel computers. Algorithms for list ranking, maximal independent set, arithmetic expression evaluation, convex hull problems and others. Message routing on multidimensional meshes, Butterfly networks, Hypercubes, Shuffle Exchange networks, Fat-trees and others. Simulation of shared memory on networks. Routing on expander-based networks. Limits to parallelizability and P-completeness. Thompson grid model for VLSI. Layouts for standard interconnection networks. Lower bound techniques for area and area time-squared tradeoffs. Area-Universal networks.

Embedded System:

Introduction and Hardware Environment Overview of embedded system, categories of embedded system, processor technology, design technology, applications : consumer electronics, control & industrial automation, network information appliances, wireless communications Hardware architecture : processor, memory, latches, buffers, ports, timers, counters, watchdog timers, UART, pulse width modulators, LCD controllers, keypad controllers, stepper motor controllers, analog-to-digital converters, real time clocks.

Communication Principles : Parallel, serial, wireless and layering, Protocols : 12C, CAN, FireWire, USB, PCI bus, ARM bus, IrDa, Bluetooth, IEEE 802.11, operating system, kernel architecture, embadded operating system, context switch, task synchronization, real time and mobile operating system, programming languages, development tools for host & target machines, embedded system development system, interrupt basics, interrupt handling.

VC++ Programming Introduction to MFC & windows, MFC fundamentals, processing messages, message boxes, menus, dialog boxes, common controls (Radio buttons, check boxes, scroll bars, buttons, cursor, icons, managing texts), properties sheet.

Project Studies Simple LED blinking program, device driver programming, serial communication programming for PC-to-PC communication, development of navigation system, protocol converter.

Books :

- 1. Programming for embedded system by Dr. Prasas, Vikas Gupta, Das & Verma, Pub, WILEY Dreamtech india Pvt.
- 2. Embadded System Design. by Frank Vashid & Tony Givergis, Pub, WILEY.
- 3. MFC Programming. by Herbert Schildt, Pub. TataMcGraw Hill.

Ref. Books :

- 1. An Embedded software primer by David E. Simon, Pub. Low Price Edition.
- 2. Programming Embedded Systems by Michael Barr, Pub. O'REILLY

CAD for VLSI Design:

Introduction: VLSI design flow, challenges. Verilog/VHDL: introduction and use in synthesis, modeling combinational and sequential logic, writing test benches. Logic synthesis: two-level and multilevel gate-level optimization tools, state assignment of finite state machines. Basic concepts of high-level synthesis: partitioning, scheduling, allocation and binding. Technology mapping. Testability issues: fault modeling and simulation, test generation, design for testability, built-in self-test. Testing SoC's. Basic concepts of verification. Physical design automation. Review of MOS/CMOS fabrication technology. VLSI design styles: full-custom, standard-cell, gate-array and FPGA. Physical design automation algorithms: floor-planning, placement, routing, compaction, design rule check, power and delay estimation, clock and power routing, etc. Special considerations for analog and mixed-signal designs.