VIDYASAGAR UNIVERSITY
MIDNAPORE – 721102
2014
MASTER OF COMPUTER APPLICATION (MCA)
NEW SYLLABUS

MCA SEMESTER – I

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/101	Introduction to Programming	3	1	0	30	70	100
CS/MCA/102	Discrete Mathematics	3	1	0	30	70	100
CS/MCA/103	Basic Electronics & Digital Logic	3	1	0	30	70	100
CS/MCA/104	Management Principles & Practices	3	1	0	30	70	100
CS/MCA/105	Probability & Statistics	3	1	0	30	70	100
CS/MCA/106	Programming Lab	0	1	5	30	70	100
CS/MCA/107	Basic Electronics & Digital Logic lab	0	1	5	30	70	100
CS/MCA/108	Communicative English Practice Lab	2	1	3	30	70	100

MCA SEMESTER – II

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/201	Data Structure	3	1	0	30	70	100
CS/MCA/202	Accounting & Financial Management	3	1	0	30	70	100
CS/MCA/203	Computer Architecture & Organization	3	1	0	30	70	100
CS/MCA/204	Microprocessor	3	1	0	30	70	100
CS/MCA/205	Computer Oriented Numerical Methods	3	1	0	30	70	100
CS/MCA/206	Data Structure Lab	0	1	5	30	70	100
CS/MCA/207	Microprocessor Lab	0	1	5	30	70	100
CS/MCA/208	Numerical Methods Lab	0	1	5	30	70	100

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MCA SEMESTER – III

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/301	Database Management System	3	1	0	30	70	100
CS/MCA/302	Theory of Computing	3	1	0	30	70	100
CS/MCA/303	Object-oriented Programming Technique using C++	3	1	0	30	70	100
CS/MCA/304	Design & Analysis of Algorithm	3	1	0	30	70	100
CS/MCA/305	Operating Systems	3	1	0	30	70	100
CS/MCA/306	Object Oriented Programming Lab	0	1	5	30	70	100
CS/MCA/307	Operating systems Lab	0	1	3	15	35	50
CS/MCA/308	DBMS Lab	0	1	5	30	70	100
CS/MCA/309	Seminar-I	0	0	0	0	50	50

MCA SEMESTER – IV

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/401	Graphics & Multimedia	3	1	0	30	70	100
CS/MCA/402	JAVA Programming	3	1	0	30	70	100
CS/MCA/403	Compiler Construction	3	1	0	30	70	100
CS/MCA/404	Computer Networks	3	1	0	30	70	100
CS/MCA/405	Operation Research and Optimization Technique	3	1	0	30	70	100
CS/MCA/406	Computer Graphics Lab	0	1	3	15	35	50
CS/MCA/407	JAVA Programming Lab	0	1	5	30	70	100
CS/MCA/408	Compiler Lab	0	1	3	15	35	50
CS/MCA/409	Network Lab	0	1	5	30	70	100

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MCA SEMESTER – V

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/501	Internet & Web Technology	3	1	0	30	70	100
CS/MCA/502	Software Engineering	3	1	0	30	70	100
CS/MCA/503	Artificial Intelligence	3	1	0	30	70	100
CS/MCA/504	Elective -I	3	1	0	30	70	100
CS/MCA/505	Elective-II	3	1	0	30	70	100
CS/MCA/506	Web Technology Lab	0	1	5	30	70	100
CS/MCA/507	AI Lab	0	1	5	30	70	100
CS/MCA/508	Grand Viva Voce	0	0	0	0	50	50
CS/MCA/509	Seminar-II	0	0	0	0	50	50

ELECTIVE-I	ELECTIVE-II
1. Image Processing	1. Mobile Computing
2. Pattern Recognition	2. Bioinformatics
3. Soft Computing	3. Distributed system
4. Human Computer Interaction	4. Environmental Sciences
5. Embedded System	5. Real time system
6. Parallel Processing	6. Machine Learning
7. Natural Language Processing	7. Cryptography & Steganography

MCA SEMESTER – VI

Course Code	Paper	Teaching Scheme (Per Week)			Total (Marks)		
		Th.	Tu.	Pr.	Int.	Ext.	Total
CS/MCA/601	Project	0	0	0	0	300	300
CS/MCA/602	Seminar	0	0	0	0	100	100
CS/MCA/603	Group Discussion	0	0	0	0	100	100

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Detailed Syllabus Outline

MCA SEMESTER – I

CS/MCA/101 Introduction to Programming

Introduction to 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 Machine code, Assembly Language (Introduction), Problem analysis, Flow charts, Algorithms, Pseudo-code.

Fundamentals of C Language: 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, Formatted Input/Output Functions, Escape Sequences, Character Input/ Output Functions.

Control Statement in C: if-else statement, Nested if Statement, switch Statement etc.

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

Array : One Dimensional Array, Two Dimensional array.

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

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

Structures and unions : structure variables and array, structure with in structure, union, Bit Field.

Pointers : 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: Types of file, file processing, Random file accessing, and errors during file processing. Overview of Pre-processor statements, Program through Command Line Arguments.

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,2nd 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

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CS/MCA/102 Discrete Mathematics

Set Theory :

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,

Functions :

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 : Definitions, Difference between sequences and series, to find n^{th} term and sum of n terms, Recursive functions : Definition and Examples.

Boolean algebra:

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. Proposional Logic, Tautology

Vectors and Matrices :

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: 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. Robert J. McElice , Robert B. Ash & Carol Ash, "Introduction to discrete Mathematics", Tata McGraw Hill
5. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI, 1980
6. Tremblay and Manohar, "Discrete mathematical structures with applications to computer science", McGraw Hill, 1975
7. Kolamn, Busby and Ross, "Discrete mathematical structures", 3/ed, PHI, 1996.
8. Lipschutz—2000 Solved Problems in Discrete Mathematics, TMH
9. Balakrishnan—Graph Theory (Schaum),MH
10. Hararay—Graph Theory

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CS/MCA/103 Basic Electronics & Digital Logic

Basic Electronics:

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:

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, de-multiplexer, 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:Introduction 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/104 Management Principles & Practices

Management: Definition, nature, importance, evolution of management thought, contribution made by Taylor, Fayol, Hawthrone experiments Maslow; Is managing a science or art? Functions of manager, ethics in managing and social responsibility of managers.

Planning & Control:

Why Management process starts with planning, steps in planning, types of planning, barriers to effective planning, operational plan, strategic planning, Mckinsey's 7's Approach, SWOT analysis, Controlling- concept, Planning- control relationship, process of control, human response to control, dimensions of control, MBO.

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Decision Making & Organizing:
Nature, process of decision making, decision making under Certainty and Uncertainty, decision-tree, group-aided decision, brain-storming. Organizing – concept, nature and process of organizing, authority and responsibility, delegation and empowerment, centralization and decentralization, concept of departmentation.

Staffing & Motivation:
Concept, Manpower planning, Job design, recruitment & selection, training and development, performance appraisal, motivation, motivators and satisfaction, motivating
towards organizing objectives, morale building.

Leadership & Communication:
Defining leadership and its role, should managers lead, leadership style, leadership development, Leadership behavior. Communication- Process, Bridging gap-using tools of communication, electronic media in Communication.

Books:

1. Koontz – Principles of Management (Tata McGrew Hill, 1st Edition 2008)
2. Robbins & Caulter – Management (Prentice Hall of India, 8th Edition)
3. L.M. Prasad – Principles & Practices of Management (Sultanchand & Sons , New Delhi)
4. Parag Diwan – Management Principles and Practices (Excel Books, New Delhi)
5. Stoner, Freeman, Gilbert. Jr. – Management (Prenlice Hall of India, 6th Edition)
6. Koontz, weihrich – Essentials of Management (TMH, 5th Edition)

CS/MCA/105 Probability and Statistics

Probability:
Probability Axioms, Sample Spaces, Events , Mutually Exclusive Events , Law of Total Probability, Conditional Probability, Bayes' Rule, Independent Events, Counting techniques
Random Variables - Definition of a Random Variable, Cumulative Distribution Functions , Probability Density Functions, Discrete Random Variables: Bernoulli, Binomial, Multinomial, Poisson, and Uniform, Continuous Random Variables: Uniform, Exponential, Normal, and Pareto, Moments and Moment Generating Functions, Independent Random Variables, Covariance, Correlation, and Affiliation Among Random Variables.
Stochastic Processes- Definition of a Stochastic Process, Poisson Processes, Discrete Time, Discrete Space Markov Processes, Continuous Time, Continuous Space Stochastic Processes

Statistics:
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 ;

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Chi-square test & F-test ; Applications to medicine, psychology, agriculture, etc.

Books:

1. Chung K.L. (1983): Elementary Probability Theory with Stochastic Process, Springer / Narosa
2. Feller W. (1968): An Introduction to Probability Theory & its Applications, John Wiley
3. Goon A.M., Gupta M.K. & Dasgupta B. (1994): An Outline of Statistical Theory (Vol-1), World Press
4. Rohatgi V.K. (1984): An Intro. to Probability Theory & Math. Statistics, John Wiley 4
5. Cramer H. (1954): The Elements of Probability Theory, John Wiley
6. Parzen E. (1972): Modern Probability Theory and its Applications, John Wiley
7. Uspensky J.V. (1937): Introduction to Mathematical Probability,McGraw Hill

CS/MCA/106 Programming Lab

Familiarization of a computer and the environment and execution of sample programs, Expression evaluation, Conditionals and branching, Iteration, Functions, Recursion, Pointers, String handling, Arrays, Structure, File handling.

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,2nd 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/107 Basic Electronics & Digital Logic lab

Basic Electronics:

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

Digital Logic

Realization of NOT, OR, AND, XOR, XNOR gates using universal gates
Gray to Binary conversion & vice-versa.
Code conversion between BCD and EXCESS-3
ODD and even parity generation and checking.

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4-bit comparator circuit
Design of combinational circuit to drive seven-segment display
Design of combinational circuits using multiplexer
Adder/Subtractor circuits using Full-Adder using IC and/ or logic gates., BCD Adder circuit using IC and/ or logic gates
Realization of RS, JK, and D flip flops using Universal logic gates
Realization of Asynchronous up/down counter
Realization of Synchronous Mod-N counter
Digital to Analog conversion

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:Introduction 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/108 Communicative English Practice Lab

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.
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.
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.
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.
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.
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.

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

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

Reference:

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

MCA SEMESTER – II

CS/MCA/201 Data Structure

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.

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.

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. Applications of recursion in problems like 'Tower of Hanoi'.

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues. 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.

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.

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

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.

Books:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-

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2002
3. A. M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd., New Delhi.
4. K Loudon, “Mastering Algorithms with C”, Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, “Data Structures and Algorithms with Object Oriented Design Pattern in C++”, Jhon Wiley & Sons, Inc.
6. Adam Drozdek, “Data Structures and Algorithms in C++”, Thomson Asia Pvt. Ltd.(Singapore)

CS/MCA/202 Accounting & Financial Management

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.

Books:

1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
2) Mukherjee - Financial Accounting for Management (TMH, 1st Edition).
3) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
4) Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
5) Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
6) Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
7) Ghosh T.P- Financial Accounting for Managers (Taxman, 3rd Edition)
8) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management (Vikas, 1st Edition)
9) Gupta Ambrish - Financial Accounting for Management (Pearson Education, 2nd Edition)
10) Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).

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CS/MCA/203 Computer Architecture & Organization

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.

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

CS/MCA/204 Microprocessor

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.

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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).

Books:

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.

CS/MCA/205 Computer Oriented Numerical Methods

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.

Books:

1. Numerical Analysis, Shastri, PHI
2. Numerical Analysis, S. Ali Mollah
3. Numerical Analysis, James B. Scarbarough

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4. Numerical Methods for Mathematics ,Science & Engg., Mathews, PHI
5. Numerical Analysis,G.S.Rao,New Age International
6. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
7. Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
8. Numerical Methods,Arumugam,Scitech
9. Numerical Methods in Computer Application,Wayse,EPH

CS/MCA/206 Data Structure Lab

Write a program in C to implement simple Stack, Queue, Circular Queue, Priority Queue.
Write a menu driven program that implements singly linked list for the following operations:
Create, Display, Concate, merge, union, intersection
Write a menu driven program that implements doubly linked list for the following operations:
Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
Write a menu driven program that implements doubly linked list for the following operations:
Create, Display, Concate, merge, union, intersection
Write a menu driven program that implements Singly circular linked list for the following operations:
Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
Write a program in C for sorting methods.
Write a menu driven program in C to
Create a binary search tree, Traverse the tree in Inorder, Preorder and Post Order
Search the tree for a given node and delete the node
Write a program in C to implement insertion and deletion in B tree
Write a program in C to implement insertion and deletion in AVL tree
Write a menu driven program that implements Heap tree (Maximum and Minimum Heap tree) for the following operations. (Using array) Insert, Delete
Write a program to implement double hashing technique to map given key to the address space. Also write code for collision resolution (linear probing)
Write a program in C to implement Dijkstra's shortest path algorithm for a given directed graph.
Write a program in C to insert and delete nodes in graph using adjacency matrix.
Write a program in C to implement Breadth First search using linked representation of graph.
Write a program in C to implement Depth first search using linked representation of graph.
Write a program in C to create a minimum spanning tree using Kruskal's algorithm.
Write a program in C to create a minimum spanning tree using Prim's algorithm, etc.

Books:
1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
3. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.

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4. K Loudon, “Mastering Algorithms with C”, Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, “Data Structures and Algorithms with Object Oriented Design Pattern in C++”, Jhon Wiley & Sons, Inc.
6. Adam Drozdek, “Data Structures and Algorithms in C++”, Thomson Asia Pvt. Ltd.(Singapore)

CS/MCA/207 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

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Books:

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.

CS/MCA/208 Numerical Methods Lab

Problems and assignment based on Paper CS/MCA/205

MCA SEMESTER – III

CS/MCA/301 Database Management System

Introduction:

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

Entity-Relationship Model:

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

Relational Model:

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

SQL and Integrity Constraints :

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.

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

Internals of RDBMS:
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:
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 .

Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.
8. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
9. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
10. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

CS/MCA/302 Theory of Computing

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,

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

CS/MCA/303 Object-oriented Programming Technique

Introduction:
Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language, Object oriented analysis, Usecase diagram; Major and minor elements, Object, Class.

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

Basic concepts of object oriented programming using Java:
Object, class, message passing, encapsulation, polymorphism, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages.

Fundamentals of Object Oriented design in UML :

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

CS/MCA/304 The Design & Analysis of Algorithm

Models of computation : RAM,TM etc. time and space complexity

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

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

Divide and Conquer : Basic method, use, Examples: Merge sort, Quick Sort, Binary Search

Dynamic Programming: Basic method, use, Examples: matrix-chain multiplication, All pair shortest paths, single-source shortest path, Travelling Salesman problem

Branch and Bound : Basic method, use, Examples: The 15-puzzle problem

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

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

Lower Bound Theory : Bounds on sorting and sorting techniques using partial and total orders.

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

Properties of graphs and graph traversal algorithms: BFS and DFS

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

Notion of NP-completeness : P class, NP-hard class, NP-complete class, Circuit Satisfiability problem, Clique Decision Problem.

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

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

CS/MCA/305 Operating System

Introduction :
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:
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.

Processes : Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.

Threads : overview, benefits of threads, user and kernel threads.

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

Process Synchronization : 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.

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

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

File Systems : 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 : 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 : disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

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

Books :

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/306 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.

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

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5. Priestley – " Practical Object Oriented Design using UML" - TMH
6. Jana, C++ & Object Oriented Programming, PHI
7. Alhir, learning UML, SPD/O'Reily
8. Page Jones, Meiler - "Fundamentals of object oriented design in UML"
9. Roff: UML: A Beginner's Guide TMH
10. Rajaram: Object Oriented Programming and C++, New Age International
11. Mahapatra: Introduction to System Dynamic Modelling, Universities Press
12. Muller : Instant UML, Shroff Publishers / Wrox
13. Srimathi, Object Oriented Analysis & Design Using UML, Scitech
14. Alhir : UML in a Nutshell, Shroff Publishers / O'reilly
15. Olshevsky : Revolutionary guide to Object Oriented Programming using C++.

CS/MCA/307 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)

Books:

1.UNIX: Concepts & Applications, Sumitava Das, TMH
2.Your UNIX –The Ultimate Guide, Sumitava Das, TMH
3.Design of UNIX Operating System,Maurice Bach, PHI
4.Learning the UNIX operating Systems,Peek,SPD/O'REILLY
5.Mastering UNIX/LINUX/Solaris Shell Scripting, Randal k. Michael, Wiley Dreamtech
6.Unix,Xavier,Scitech
7.Learning the Vi Editor,Lamb, SPD/O'REILLY

CS/MCA/308 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

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- 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/309 Seminar-I

The seminar topics will be provided by the department on the start of the semester.

MCA SEMESTER – IV

CS/MCA/401 Graphics & Multimedia

Introduction to computer graphics & graphics systems

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:

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.

2D transformation & viewing

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

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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

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.

Curves

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

Hidden surfaces

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

Light & color model; interpolative shading model; Texture;

Multimedia

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.

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

CS/MCA/402 Java Programming

Oops Concept and Introduction to JAVA

An overview of Java

Data Types - variables and arrays

Operators, Control statements

Classes and objects, Inheritance, String and string buffer, Packages, Interfaces, Exception handling, Multithreaded Programming, Applets,

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Event handling
Abstract Window Toolkit

Books:
1.JAVA 2- The Complete Reference, TMH
2.Beginning JAVA 2 SDK 1.4, Horton,SPD/WROX
3.Programming in JAVA, EXCEL
4.Object Oriented Programming With C++ & JAVA,Samanta,PHI
5.Object Oriented Application Development Using JAVA, Doke, VIKAS
6.Programming with Java 2,Xavier,Scitech

CS/MCA/403 Compiler Construction

Introduction to system softwares
Assembler: functions, features, design of one pass and two pass assemblers
Macroprocessors: functions, features and design
Introduction to Compiler, Different phases and passes of compiler
Lexical Analysis: Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Finite state machines and regular expressions and their applications to lexical analysis, Implementation
of lexical analyzers
Syntax Analysis: Role of the parser, Formal grammars and their application to syntax analysis,
Context free grammars, Derivation and parse trees, Top Down parsing, LL(1) grammars, Predictive Parsing, Bottom-up-parsing, Shift Reduce Parsing, LR(0) grammars, LR parsing algorithms
Syntax Directed Translation: Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S-attributed definitions, L-attributed definitions
Runtime Environments: Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter passing mechanism
Intermediate Code Generation: Intermediate languages, Graphical representation, Threeaddress code, Implementation of three address statements (Quadruples, Triples, Indirect triples)
Code Optimization and generation: Introduction, Basic blocks and flow graphs, Transformation of basic blocks, DAG representation of basic blocks, Principle sources of optimization, Loops in flow graph, Peephole optimization.
Issues in the design of code generator, Register allocation and assignment
Loader and Linkers: Basic Concepts of Linkers and Loader Functions, Boot Loaders, Linking Loaders, Linkage Editors, Dynamic Linking
Concept of Editor and text editor, Interpreters, Simulator,
Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive
debugging systems - Debugging functions and capabilities – Relationship with other parts of the
system – User-Interface Criteria.

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Books:

1. Alfred Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia (2nd Ed. - 2009).
2. Leland L. Beck, “System Software: An Introduction to Systems Programming”, 3/E, Addison-
Wesley, 1997.
3. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003.
4. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Pearson Education.
5. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.
6. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI,
2001.
7. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thomson Learning.
8. Systems Programming and Operating Systems – D. M. Dhamdhere, TMH
9. John J. Donovan, “ Systems Programming”, 3rd edition, 1997, Addison Wesley.

CS/MCA/404 Computer Networks

Overview of data communication and Networking:

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:

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;

Data link layer:

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:

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;

Network layer:

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.

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

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

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

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

CS/MCA/405 Operation Research and Optimization Technique

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

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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

Book:

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.

CS/MCA/406 Graphics and Multimedia Lab

Problems and assignment based on Paper CS/MCA/401

CS/MCA/407 Java Programming Lab

Problems and assignment based on Paper CS/MCA/402

CS/MCA/408 Compiler Lab

Problems and assignment based on Paper CS/MCA/403

CS/MCA/409 Network Lab

Problems and assignment based on Paper CS/MCA/404

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MCA SEMESTER – V

CS/MCA/501 Internet & Web Technology

Internet:
Evolution of the Internet and the Growth of the World Wide Web. Client-Server model. Architecture of the Intranet/ Internet /Extranet. Access methods: dialup, ISDN, ADSL/2+, cable, LAN, WIFI, Mobile & Satellite. Application areas: E-commerce, Education Entertainment such as games and gambling. Portals, discussion forums, Weblogs, Podcasting, RSS / ATOM, Wiki, VoIP, video on demand. Search Engines, webbots, integrity of information, databases online. URL, TCP/IP fixed and dynamic IP addressing. Role of DNS.
Email: email clients, server and gateways; SMTP,POP3, IMAP & Webmail. File transfer – FTP. Remote login – telnet. WWW – HTTP and HTTPS. Role of W3C Accessibility. Mobile computing, wireless, 3G, GPS

Style Sheets:
CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators- Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

Host Objects :
Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies¬U RL Rewriting-Other Capabilities-Data Storage Servelets and Concurrency-Case Study- Related Technologies.

Representing Web Data:
XML-Documents and Vocabularies-Versions and Declaration - Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data :XPATH-Template-based Transformations: XSLT-Displaying XML Documments in Browsers-Case Study- Related Technologies. Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.

Web Services:
JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

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Book:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
3. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
4. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
5. Bates, "Developing Web Applications", Wiley, 2006.

CS/MCA/502 Software Engineering

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.

Book:

1. Bruegge, Bernd and Allen H. Dutoit. "Object-Oriented Software Engineering: UsingUML, Patterns and Java", Pearson: Prentice Hall Publishers 2004.
2. Braude, E. J. "Software Engineering: An Object-Oriented Perspective". Wiley, 2001
3. Schmuller, Joseph. "SAMS Teach Yourself UML in 24 Hours". Sams Publishing. 1999.
4. Sommerville, Ian. "Software Engineering". Addison-Wesley, 2004.

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CS/MCA/503 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/504 Elective – I

1. **Image Processing:**

DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS**:**
Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms –Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

IMAGE ENHANCEMENT TECHNIQUES**:**
Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.

IMAGE RESTORATION**:**
Model of Image Degradation/restoration process – Noise models – Inverse filtering –Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition.

IMAGE COMPRESSION**:**
Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.

IMAGE SEGMENTATION AND REPRESENTATION**:**
Edge detection –Thresholding – Region Based segmentation – Boundary representation: chair codes- Polygonal approximation –Boundary segments –boundary descriptors: Simple descriptors-Fourier descriptors – Regional descriptors –Simple descriptors- Texture.

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Book:

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education 2003.
2. William K Pratt, Digital Image Processing John Willey (2001)
3. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).
4. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
5. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000

2. 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 associators and content addressable memories, hardware realizations. Syntactic 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.

Books:

1. Pattern Recognition, Theodoridis S, Elsevier
2. Pattern Recognition, M N Murty, V S Devi, Universities Press
3. Pattern Recognition - Techniques and Applications, R Shinghal, Oxford University Press India
4. Pattern Recognition, Gibson, William, PENGUIN

3. Soft Computing :

Fuzzy Systems: Fuzzy sets, Fuzzy Logic, Fuzzy relations, Approximate Reasoning , Fuzzy logic Control systems. Application of Fuzzy Theory. Artificial Neural Networks: Feed forward Networks & Supervised Learning, Perception learning rules, Adaline, Back Propagation, Associative memories, Hopfield networks, Unsupervised learning Networks, Self-organizing feature map, Adaptive Resonance Theory, Radial Basis function, Recurrent Neural Networks, Refinement Learning. Application of Neural network. Genetic Algorithm(GA): Evolutionary Computing, Basics of Genetic Algorithm. Application of GA. Hybridisation of Soft computing methodology.

Books:

1. Robert J. Schalkoff, “Artificial Neural Networks”, McGraw-Hill International Editions,1997.
2. Timothy J. Ross , “Fuzzy Logic with Engineering Applications”, McGraw- Hill International Editions,1995 (& 3)

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3. David E. Goldberg, “Genetic Algorithms-In Search, optimization and Machine Learning”, Pearson Education.
4. Elaine Rich and Kelvin knight ,“Artificial Intelligence”,McGraw- Hill 2000
5. N. K. Bose and P. Liang , “Neural Network Fundamentals”
6. Freeman J.A. & D.M. Skapura , “Neural Networks: Algorithms, Applications and Programming Techniques”, Addison Wesley, 1992.
7. G.J. Klir & B. Yuan, “Fuzzy Sets & Fuzzy Logic”, PHI, 1995.

4. Human Computer Interaction:

Foundations of human-computer interaction:
Human-centered development and evaluation, Human performance models, accommodating human diversity, Principles of good design and good designers, engineering tradeoffs
Human-centered software evaluation:
Evaluation without users: walkthroughs, KLM, guidelines, and standards, Evaluation with users: usability testing, interviews, survey, experiment
Human-centered software development:
Approaches, characteristics, and overview of process, Functionality and usability: task analysis, interviews, surveys, Specifying interaction and presentation, Prototyping techniques and tools Graphical user-interface design (10 hours): Choosing interaction styles and interaction techniques, HCI aspects of common widgets, HCI aspects of screen design: layout, color, fonts, labeling, Handling human failure, Beyond simple screen design: visualization, representation, metaphor, Multi-modal interaction: graphics, sound, and haptics, 3D interaction and virtual reality
Graphical user-interface programming:
UIMS, dialogue independence and levels of analysis, Widget classes, Event management and user interaction, Geometry management, GUI builders and UI programming environments, Cross-platform design
HCI aspects of multimedia systems:
Categorization and architectures of information: hierarchies, hypermedia, Information retrieval and human performance (Web search, Usability of database query languages, Graphics, Sound), HCI design of multimedia information systems, Speech recognition and natural language processing, Information appliances and mobile computing
HCI aspects of collaboration and communication:
Groupware to support specialised tasks: document preparation, multi-player games, Asynchronous group communication: e-mail, bulletin boards, Synchronous group communication: chat rooms, conferencing, Online communities: MUDs/MOOs, Software characters and intelligent agents

Book:

1. Human-Computer Interaction, Finlay Dix, Pearson India
2. Human Computer Interaction, Uzma Shaheen, Shweta Saini, A. B. Publication
3. HUMAN COMPUTER INTERACTION, Dan Olsen, CENEAGE LEARNING INDIA PVT LTD
4. Interaction Design : Beyond Human - Computer Interaction, Preece, Rogers, Sharp, Wiley Publication
5. Designing the User Interface: Strategies for Effective Human-Computer Interaction, Cohen, Jacobs, Shneiderman, Plaisant, Pearson Education

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5. 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.

Book:

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

6. Parallel Processing:

Parallel Processing Architecture: Models of parallel computer design: Processor.
Arrays Multiprocessors, Multicomputers, PRAM Model: Concepts, Algorithms (e.g. Prefix sums, Preorder tree traversal, Merging), Introduction to Parallel Programming Languages-Basic concepts and methodology.
Parallel Computing Algorithms: (To be explained for different platforms): Summation, Matrix Multiplication, Linear Systems Solving, Graph Algorithm, Fast Fourier Transform.
Parallel Virtual Machine: Concepts, Case study, Using examples, Comparison with Message Passing Interface (MPI).

Book:

1. Introduction To Parallel Processing, Shikhare Dinesh, Prakash P. Ravi, Sasikumar M., Phi Learning
2. An Introduction to Parallel Computing: Design and Analysis of Algorithms, Ananth Grama, Pearson Education

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3. Introduction to Parallel Computing, W.P. Petersen, P. Arbenz, Oxford University Press

7. 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.

Book:

1. Natural Language Processing And Information Retrieval, TANVEER SIDDIQUI, U. S TIWARY, Oxford University Press
2. NATURAL LANGUAGE UNDERSTANDING, J Allen, Pearson India
3. Multilingual Natural Language Processing Applications from Theory to Practice, Bikel, Pearson India
4. NATURAL LANGUAGE PROCESSING, Dipti Mishra Sharma, MACMILLAN INDIA LTD

CS/MCA/505 Elective – II

1. Mobile Computing

UNIT - I

Introduction to MC, novel applications, limitations, and architecture. GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

UNIT - II (Wireless)

Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT - III

Mobile Network Layer : Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT - IV

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT - V

Database Issues : Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

UNIT - VI

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Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, pushbased mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT - VII

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT - VIII

Protocols and Tools : Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

BOOKS :

1. Jochen Schiller,"Mobile Communications",Addison-Wesley
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004,
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
6. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

2. 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.

BOOKS :

1. O'Reilly, " Developing Bio informatics computer skills", Indian Edition's publication
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics concepts, skills & Applications", CBS Publishers
3. Rashidi, Hooman and Lukas K. Buehler, "Bioinformatics Basic Applications"

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CRC Press.
4. “Bioinformatics” , Addison Wesley
5. Stephen Misner & Stephen Krawetz, “ Bioinformatics- Methods & Protocols”

3. Distributed System

UNIT - I:
Computer architecture : CICS, RISC, Multi-core
Computer networking : ISO/OSI Model
Evolution of operating systems
Introduction to distributed computing systems (DCS)

UNIT - II:
DCS design goals, Transparencies, Fundamental issues

UNIT - III:
Distributed Coordination: Temporal ordering of events, Lamport's logical clocks
Vector clocks; Ordering of messages, Physical clocks, Global state detection

UNIT - IV:
Process synchronization: Distributed mutual exclusion algorithms, Performance matrix

UNIT - V:
Inter-process communication: Message passing communication, Remote procedure call, Transaction communication, Group communication; Broadcast atomic protocols

UNIT - VI:
Deadlocks in distributed systems, Load scheduling and balancing techniques

Books:

1. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
2. Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill
3. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
4. Distributed Operating Systems, A.S. Tanenbaum, Prentice Hall
5. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International

4. Environmental Sciences

Unit-I
Definition, Scope and Importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.
Effects of Human Activities on environment-Agriculture, Housing, Industry, Mining

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and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

Unit-II
Natural Resources: Water Resources – Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water Induced Diseases, Fluoride Problem in Drinking Water; Mineral Resources, Forest Wealth, Material Cycles- Carbon, Nitrogen and Sulphur Cycles
Energy-Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Source of energy

Unit-III
Environmental Pollution and their Effects, Water Pollution, Land Pollution, Noise Pollution, Public Health aspects, Air Pollution, Solid Waste Management.
Current Environmental Issue of Importance: Population Growth, Climate Cha nge and Global Warming-Effects, Urbanization, Automobile Pollution.
Acid Rain, Ozone Layer Depletion

Unit-IV
Environmental Protection-Role of Government, Legal Aspects, Initiatives by Non-Governmental Organizations (NGO), Environmental Education, Women Education

Books:

1. ENVIRONMENTAL STUDIES, Dr. Jagdish Krishnaswamy Dr. R. J. Ranjit Daniels, WILEY INDIA PVT LTD
2. ENVIRONMENTAL STUDIES, R. Rajagopalan, Oxford University Press
3. ENVIRONMENTAL STUDIES , A Basak, Pearson India
4. ENVIRONMENTAL STUDIES, Benny Joseph, Tata Mcgraw Hill Education Private Limited
5. Fundamental Concepts In Environmental Studies, D. D. Mishra, S Chand & Company Ltd

5. Real time System

Introduction: Real-time systems, Properties, Misconceptions, Real-Time tasks, Scheduling results.

Uniprocessor Real-Time System: Task Scheduling, Resource access control protocols, Overload handling, Energy-aware scheduling, Feedback control scheduling.

Multiprocessor Real-Time System: Task Scheduling, Fault-tolerance, Resource reclaiming.

Distributed Real-Time System: Global scheduling - transfer, information, and location policies..

Real-time Networks: Real-time channel, Packet scheduling, Real-Time MAC protocols.

Real-time OS and Applications: Case studies of RTOS and Cyber-Physical System applications

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Other Issues: Architecture and software engineering issues, Case studies.

Books:

1. Resource Management in Real-time Systems and Networks, C. Siva Ram Murthy and G. Manimaran, MIT Press, March 2001.
2. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.

3.Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.

4. Krishna and Shin, "Real-Time Systems," Tata McGraw Hill. 1999.

6. Machine Learning

Introduction and Basic concepts.

Supervised learning:
Supervised learning setup. LMS., Logistic regression. Perceptron. Exponential family. Generative learning algorithms. Gaussian discriminant analysis. Naive Bayes. Support vector machines. Model selection and feature selection. Ensemble methods: Bagging, boosting. Evaluating and debugging learning algorithms.

Learning theory:
Bias/variance trade off. Union and Chern off/Hoeffding bounds. VC dimension. Worst case (online) learning. Practical advice on how to use learning algorithms.

Unsupervised learning:
Clustering. K-means. EM. Mixture of Gaussians. Factor analysis. PCA (Principal components analysis). ICA (Independent components analysis).

Reinforcement learning and control:
MDPs. Bellman equations. Value iteration and policy iteration. Linear quadratic regulation (LQR). LQG. Q-learning. Value function approximation. Policy search. Reinforce. POMDPs.

Books:
1. Machine Learning , M. Mitchell, McGraw Hill Education
2. Introduction To Machine Learning, Ethem Alpaydin, PHI
3. Pattern Recognition Machine Learning, Bishop C M, CBS PUBLISHERS & DISTRIBUTORS
4. Machine Learning : An Algorithmic Perspective, Stephen Marsland, Chapman & Hall

7. Cryptography & Steganography

Unit-I

Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography,

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stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation

UNIT I I
Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT I I I
A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.
Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.
2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
3. Bruce Schiener, "Applied Cryptography".

4. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
5. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
6. Bolle, Connell et. al., "Guide to Biometrics", Springer

MCA SEMESTER – VI

CS/MCA/601 Project

Student will do their six months external project in an industry / institute.

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CS/MCA/602 Seminar

Student will give seminar presentation on a topic provided by the department.

CS/MCA/603 Group Discussion

Student will have group discussion on topics given by the Examiners.

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