

DEPARTMENT OF COMPUTER SCIENCE

Syllabus
FOR M.C.A. (Master of Computer Applications)
with effect from July 1984

TELEPHONE - 425 001

NORTH MANCHESTER UNIVERSITY

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M.C.A.
STRUCTURE

SEMESTER - I

CA-101	Computer Programming and problem solving (Using PASCAL)
CA-102	Computer Organization And Assembly programming.
CA-103	Mathematical Foundations of Computer Science.
CA-104	Computer based Numerical Techniques.
CA-105	Combinatorics and Graph Theory.
CA-106	Organisational structures and Personnel management.

SEMESTER - II

CA-201	Data & File structures (Pascal,C).
CA-202	Computer Architecture.
CA-203	Theoretical Computer Science.
CA-204	Computer based Optimization Techniques.
CA-205	Business Data Processing.
CA-206	System Software.

SEMESTER -III

CA-301	Accounting.
CA-302	Data Base Management System.
CA-303	Operating Systems.
CA-304	Design And Analysis of Algorithms.
CA-305	Computer Networks.
CA-306	Programming Languages.

SEMESTER-IV

CA-401	Computer Graphics.
CA-402	Farallel Computing.
CA-403	Artificial Intelligence
CA-404	Software Engineering.
CA-405	Financial Management.
CA-406	Management Information System.

SEMESTER - V

INDUSTRIAL TRAINING

SEMESTER - VI

CA-601	Compiler Construction.
CA-602	Simulation and Modelling.
CA-603	PC Software.
CA-604	Seminar.
CA-605	Project (In Lab.).

DETAILED SYLLABUS

I - RENTIMES

CA-101 COMPUTER PROGRAMMING & PROBLEM-SOLVING.

4) **Problem Analysis:** Flowcharts, decision tables, codes and algorithms in High Language programming a computer system.

Algorithmic Programming Language: Representation of integers, reals, characters, constants and variables, expressions and their evaluation using rules of hierarchy. Assignment statements, logical constants, structures - sequencing, iteration, branching, manipulating vectors and matrices, Subroutines and linkage. Data Management, Sample I/O statements, Debugging, storage and execution time estimation.

Examples illustrating structured programming methodology and use of a block structured algorithmic language to solve specific problems.

Reference Books:

1. Dromey, G. : How to solve it with computers, Prentice Hall, 1985.
2. Wirth, N. : Systematic Programming and Introduction, Prentice -Hall, 1973.
3. Jackson N.A. : Principles of Program Design, Academic Press, 1975.
4. Gries D. : Programming methodology, Springer-verlag, 1987.
5. Conway R. : Gries D. and Zimmerman, E.C. A primer on PASCAL, Winthrop Publ. Co., Cambridge, 1978.
6. Rajaraman V. : Computer programming in Pascal, Prentice Hall India, 1983.
7. Jensen K. & Wirth N. : PASCAL user Manual and report, Narosa Publ. House, 1985.
8. Schneider G.M. & Bruell S.C. : Advanced programming and problem solving with PASCAL, Wiley -Inter Science, 1981.
9. Grover P.S. : PASCAL programming fundamentals (Allied Publishers, 1989).

CA-102 COMPUTER ORGANIZATION AND ASSEMBLY PROGRAMMING. (L : 4, P : 4)

Representation of information : Number systems, integer and floating point representation, character codes (ASCII, EBCDIC), Error detection and correction codes.

Basic Building blocks, Boolean Algebra, Combination logic design, flip-flops, registers, counters, ALU, Arithmetic and Logic Operations, Organization of Control Units, Memory: types and organization, Peripheral Devices: I/O Devices (Video terminals and printers) and controllers, Storage devices (Tape and Disks);

Programmed and Interrupt Control mechanisms. I/O Controllers, Bus bandwidths. Assembly Language Programming: Programmers Model of a machine. Example of a typical 16 to 32 bit Processor. Registers, Addressing Models, Instruction set. Use of Assembly language for specific programs for typical problems like: Table Search, Subroutines: Symbolic and Numeric manipulations and I/O.

Reference Books:

1. Gear, C.W. : Computer Organization and Programming, McGraw-Hill, 1975.
2. Tannenbaum, A.S. : Structured Computer Organization, Prentice-Hall of India.
3. Mano, M.M. : Computer System Architecture, Prentice-Hall of India, 1983
4. Langhels, G., Grancioni, J. and Kandell, A. : Elements of Computer Organization, Prentice-Hall International, 1988.
5. Assembler Manual for the chosen Machine.
6. Hayes, : Computer Architecture and Organization, McGraw-Hill International Edition.
7. Slean, M.E. : Computer Hardware and Organization, 2nd Edn. Galgotia Publ., Pvt. Ltd.

CA-103 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE.

(L : 4 ; P : 0)

Sets, Relations and Functions:

Definition of Sets and Subsets; Intersection, Union and Complements; DeMorgan's law; Cardinality; Relations - Equivalence relations etc.; Mappings - One-one, Onto etc.

Logic:

Logic operators like AND, OR etc.; Truth tables; Theory of inference and Deduction; Mathematical Induction; Predicate Calculus; Predicates and Quantifiers.

Linear equations and matrices:

Row/Column operations; Gaussian Elimination; Decomposition; Inverse.

Determinant:

Properties of determinants; Cramer's Rule; Determinants of transpose and inverse.

Vector spaces:

Linear independence; Bases, subspace and dimensionality.

Inner Products and Norms:

Length, angle, direction cosines; Orthogonalizations.

Reference Books:

1. Korthage, R.R. : Discrete Computational Structures, Academic Press, 1974.
2. Preparata, F. P., Yeh, R. T. : Introduction to Discrete Structures, Addison-Wesley, 1973.

3. Trembley, J.F. and Manohar, S. P. : Discrete Mathematical Structure: with applications to Computer Science, McGraw-Hill, 1975.
4. Law : Computer Science : A mathematical introduction Prentice-Hall International, (Paperback Edition).

CA-104 COMPUTER BASED NUMERICAL TECHNIQUES.

(L:4, P:4)

1. Some Computer Programming topics: Functions and Subroutines, Common block and Equivalence declarations.
2. Numerical methods in Fortran: In the following topics on Numerical Methods, Students are expected to be able to write programs or subprograms or program segments as well as perform Numerical calculations using Electronics Calculators and mathematical tables.
 - I. Iterative methods for solution of Algebraic Equations. Newton Raphson method, Iteration method, method of False Position, Rate of Convergence, Comparison of these methods, choice of an iterative method and implementation.
 - II. Solution of Simultaneous Equations: Direct methods- Cramer rule, Gauss Elimination method, Pivotal condensation, Iterative methods-Gauss Seidal method, Jacobi method.
 - III. Interpolation Langranges and Newton Interpolation method, Finite Difference operators, Interpolating Polynomials using finite differences, Difference tables- Central, Forward, Backward.
 - IV. Numerical Integration Method based on interpolation , method based on undetermined coefficient, composite integration methods- Trapezoidal and Simpson's Rules, Double Integration (Derivation, Applications and Errors in the Formulae, comparison of two Formulae).
 - V. Numerical Differentiation Methods based on Interpolation , Finite Differences and Undetermined Coefficient.
 - VI. Solution of Differential Equations Numerical Methods- Euler's method, Backward Euler method, Single step method- Taylor series method, Runge-Kutta methods, Multistep methods, Stability Analysis.

Reference Books:

1. Programming with FORTRAN 77 , Kam Kumar, Tata MCGraw-Hill Company.
2. Introductory methods of Numerical Analysis, S.S. Sastry, Prentice-Hall of India.
3. Numerical Mathematical Analysis. J.F. Scarborough, Oxford, 1964.
4. Computer Programming in FORTRAN IV, V. Rajaraman, Prentice-Hall of India, 1974.
5. Computer Oriented Numerical methods, V. Rajaraman, Prentice-Hall of India.

CA-105 COMBINATORICS STRUCTURES AND PERSONNEL MANAGEMENT

(L : 4, P : 0)

Combinatorics :

Counting, rule of sum and Product. Permutations, combinations, Placing balls in boxes, distinct balls distinct Boxes; Distinct balls, Identical boxes and Sterling Numbers of Second kind; Nondistinct balls distinct boxes, Non distinct boxes and partition of Integers, Generation of Permutation and Combinations:

Recursive relations : homogeneous and Particulars Solutions, Generating functions,

Graph Theory : Basic notations, directed multigraph, Directed Graph, degree, Degree, Regular graph, Antisymmetric graph, Clique, bipartite graph, chain, Path, connected graph.

Matrix representation of graphs: Incidence; Adjacency matrices and their properties.

Shortest path in weighted Graphs- Dijkstra's Algorithm, Tree, Strongly connected graph, Quasi-strongly connected graph, Rooted tree, binary tree, recursive definition of (rooted) tree, Sequential (array) representation of binary tree, full binary Tree, complete binary tree.

Prefix codes- Optimal Binary Prefix codes- Huffman Procedure for their Construction.

Network flow Problem- Ford and Fulkerson's Algorithm, Maxflow Min-cut theorem, Exponential behaviour of Ford and Fulkerson's Algorithm.

Planner Graph: combinatorial and Geometric duals; Kuratowski's graph: Detection of Planarity.

Texts:

Liu, C.L.: Elements of Discrete Mathematics, McGraw-Hill N.Y. (Second Edition) (International Edition, McGraw-Hill, Singapore 1986.)

References:

1. Berge, C. : "Graphs", North Holland, Amsterdam (Second revised edition 1985).
2. Berlekamp, E.R. : "Algebraic Coding Theory", McGraw Hill N.Y. 1968.
3. Bose, R.C. and B. Manvel : Introduction to Combinatorial Theory, John Wiley and Sons, N. Y. (1984)
4. Foulds, L.R. : "Graph Theory Applications", Springer Verlag, N.Y. (1982). (Narosa Publishing House, New Delhi Reprint, 1983)
5. Joshi, K.D. : Foundations of Discrete Mathematics, Wiley Eastern Ltd., New Delhi (1989).
6. Papadimitriou, C.H. and K. Steiglitz : Combinatorial Optimization: Algorithms and Complexity, Prentice-Hall, Englewood Cliffs., N.J. (1982).
7. Stoll, R.R. : Set Theory and Logic, W.H. Freeman and Co. San Francisco 1963.
8. Vilenkin, N. : Combinatorial Mathematics for Recreation, Mir Publishers, Moscow 1969.
9. Wilf, H.S. : Algorithms and Complexity, Prentice-Hall, Inc., Englewood Cliffs, N.J. (1986).

Organisational Structure:

Classical Theories of Organisation: Functional approach, Division of labour, Lines of Authority, Span of control, Authority and responsibility, efficiency of Management.

Behavioural Theories of Organisation: Limitations of formal organisation, human relation, group behaviour, committee and group, decision making, motivation and responsiveness to stimuli.

Decision process approach: Parts of organisation system, development of corporate strategy, dynamics of decision, role of system.

Types of models : Mathematical planning models, deterministic and probabilistic models.

Relevance of models : For understanding analysis and design, planning and forecasting monitoring and control limitations.

Personnel Management:

Personnel Function : Its evolution, objectives, principles, philosophies and policies, duties and responsibilities of the Personnel Manager; position of the Personnel Department in the Organisation; Line & Staff Relationship and the changing concept of Personnel Management in India.

Manpower Planning: Its uses and benefits; Problems and Limitations; manpower inventory; manpower forecasting, job descriptions; manpower skills analysis and practices in the Indian industry.

Recruitment : Job specification, selection process, psychological testing; interviewing techniques, transfers, promotion and its policies, induction placement and exit interview.

Training & Development : Its objectives and policies planning and organising the training department; Training Manager and his job; on and off the job training, techniques, career planning, objective of performance appraisal and its methods.

Reference Books:

1. Manappa Arun & Saiyadain M.S., : Personnel Management, 5th Reprint, tata McGraw-Hill, 1979.
2. Rudrabasavara; M.N., : Dynamic Personnel Administration, 2nd Edn., Himalaya Publishing House Bombay, 1979.
3. Torrington and Hall, : Personnel Management : A New approach, Prentice-Hall International (Paperback Education)
4. Hellrigel Don, solum, John W. and Woodman Richard, H., : Organisational Behaviour (Third Edition) West Publishing Company; New York, 1984.
5. MC Cormic, E.J., : Human Factors in Engineering and design, McGraw-Hall, Publication, New Delhi, 1976.

CA-201 DATA AND FILE STRUCTURES (PASCAL, C)

(L : 4, P : 4)

Fundamental Notations : Primitive and composite data types, Times and space complexity of Algorithms.

Data structures : Concepts of fields, records and files. Sequential file organisation, variable length records and text files. Indexing structures like B-trees, ISAM. Hashing techniques for direct fields. Inverted lists, Multilists.

Sorting : Internal and External sorts. Searching techniques. Merging algorithms.

Reference Books.

1. Wirth, Niels : Algorithms + Data structures = Programs. Prentice Hall International, 1976.
2. Horwitz, E. and Sahani, S. : Fundamentals of Data Structures, Computer Science Press, 1978.
3. Knuth, D. : The art of Computer Programming, Vols 1-2, Addison-Wesley, 1970-80.
4. Aho, A. V., Hopcroft, and Ullman, J. E. : Data structures and Algorithms, Addison Wesley, 1982.
5. Tanenbaum, A.M., and Augenstein, M.J. : data Structures with Pascal, Prentice Hall International, 1985.
6. Trembley and Sorenson : Data structures using Pascal, McGraw Hill, 1985.
7. Stubbs, D. : Data Structures with Abstract Data Types and Modula 2, Brooks & Cole Publ. Comp., 1987.

CA-202 COMPUTER ARCHITECTURE.

(L : 4, P : 0)

Introduction of Parallel Processing : Parallel processing mechanism; Parallelism in uniprocessor system.

Parallel Computer Structures: Architecture, classification scheme.

Pipelining and Vector Processing : Instruction and arithmetic Pipelines; vector processing requirements; Pipeline computers and Vectorization methods; Various vector processors - STAR 100, CRAY- ,CYBER-205, Fujitsu 200 and their special features.

SIMD Array Processors : Parallel algorithms for array processors; SIMD computers and performance enhancement.

Multiprocessor Architecture and Programming : functional structures, Interconnection networks, Parallel memory organizations; Multiprocessor Scheduling strategies. Parallel Algorithms for Multiprocessor - synchronous and asynchronous.

Data Flow computers : Data-driven computing and Languages; Advantages and Potential difficulties. etc.

Reference Books:

1. Hawang, K., Briggs, F.A. .computer Architecture and Parallel Processing, McGraws Hill, 1985.
2. Koggi, H. : The Architecture of Pipelined Computers McGraw Hill, 1981.
3. Baer, J.L. :Computer system Architecture, computer Sci. Press,1983.
4. Evans, D.J., Parallel Processing system , cambridge Univ.,1982.
5. Hockney, R.W., Jesshope, C.R. Farallel Computers : Architecture, Programming and algorithms, Adam hilger,1981.
6. Willis, N. & Kerridge, J. : Introduction to computer Architecture, A.h. wheeler 7 comp.1983.
7. Stone, H.S. & Others:Introduction to Computer Architecture, 2nd Edn., Galgotia Publ. Ltd, 1987.
8. Lorin, H. :Parallelism in Hardware and Software, Prentice-Hall,1982.
9. Myers, G.J. : Advances in Computer Architecture, 2nd Edn. Wiley-Inter Science,1978.
10. Lorin, Harold. : Aspects of Distributed Computer systems, Wiley-Inter science,1980.

CA-203 THEORETICAL COMPUTER SCIENCE.

(C1 : 4, P : 0)

Formal Models of Computation: Finite automata, Pushdown Automata, Turing machines, Partial recursive functions, recursive and recursively enumerable set.

Analysis of formal computational models: Turing machines complexity measures, Introduction to NP Hard and NP completeness.

Program verification: Introduction to predicate calculus and axiomatic systems, Manna and Hoare program verification systems. Formal languages: Chomsky hierarchy, Language acceptors.

Reference Books:

1. Zohar Manna, Mathematical theory of Computation, (McGraw Hill) ,1974.
2. W.S. Brainerd and L.R. Landweber Theory of Computation, John Wiley , 1974.
3. J.M.Brady, The Theory of Computer Science: A programming approach (Chapman and Hall), 1977.
4. J.E. Hopcraft and J.D. Ullman, Formal Languages and Their relation to Automata, Addison-Wesley, 1969.
5. A.V. Aho, J. E. Hopcraft and J.D. Ullman, Design and Analysis of Algorithms, (Addison-Wesley), 1974.

CA-204 COMPUTER BASED OPTIMIZATION TECHNIQUES.

(L : 4, P : 4)

1. Linear Programming- Mathematical model, assumptions of linear programming, principles of simplex method, Revised simplex method, Applications, Duality, dual simplex method, sensitivity analysis.
2. Special types of Linear Programming problems- transportation and Assignment problems.
3. Integer Programming- Introduction, Branch and bound Techniques, Binary Linear programming. Assignment & Travelling salesman problems.
4. Dynamic Programming-Deterministic & Probabilistic Dynamic programming.
5. Decision Theory and Games-

Reference Books:

1. Hiller, F.S. & Liberman G.J. : Introduction to Operations Research, 2nd Edn., Holden Day Inc. London, 1974.
2. Tara, H.A. : Operations research, 3rd Edn., McMillan Publishing Company, 1982.
3. Beightler, C.S. & Phillips, D.T. : Foundations of Optimisation, 2nd Edn., Prentice - Hall, 1979.
4. McMillan Claude Jr. : Mathematical Programming, 2nd Edn., Wiley Series, 1979.
5. Srinath, L.S. : Linear Programming, East-West, New Delhi.
6. Churchman, C.W. & Arnchoff, E.L. : Introduction to Operation Research, John Wiley and sons.
7. Gillett, B.G. : Introduction to Operation Research- A Computer oriented Algorithm approach McGraw-hill Book Comp. 1976.
8. Hiller, F.S. & Liberman, G.T. : Introduction to Operation Research Holden Day Inc. 1967.

CA-205 BUSINESS DATA PROCESSING

(L : 4, P : 4)

1. Introduction to Data Processing: records and files; data collection, preparation, verification, editing and checking.
2. Business Files: Master and Transaction file, file generations, back-ups and file recovery procedures.
3. COBOL Programming : Language construction and structured program development.
4. File sorting, searching, merging, matching.

Reference Books:

1. Roy, M.K. and Bastidar Ghosh, D. : COBOL programming Tata-McGraw Hill Publ. Comp. Ltd., 1982.
2. Philippakis and Kazmier Information system Through COBOL, 2nd Edn. McGraw Hill Int. Editions.
3. Popkin, G.S. : Advanced Structured COBOL, 2nd Edn. Kent Publ. Comp. 1987.
4. Pierson & Horn : Structure COBOL Programming, Scott Foresman and Co., 1986.

5. Bajaraman, v. & Sahasrabudhe, H.v. : Computer Programming in COBOL, Practice Hall India.
6. Grover, P.S. : Programming with Structured COBOL, Mcmillan, 1989.

CA-206 SYSTEM SOFTWARE
(L : 4, P : 4)

1. Review of machine architecture, instruction set, addressing modes of the chosen machine.
2. Distinction between system software and application software Layered organisation of system software.
3. Review of machine and assembly language programming, C-language programming, data structures in C, Control Structures of C. Programming exercises.
4. Assemblers, cross assemblers, Macro processors, linking/loading, relocating, compilation and interpretation (Lexical and syntax analysis). Use of automation tools.
5. Editors, debuggers, interactive programming environments.
6. Programming examples for text handling, File management interface and device driver programming, multiple precision arithmetic and logic operations, floating point operations, interrupt handling.
7. Brief discussion on a few O.S. routines and their implementation : such as single tasking and multi tasking I/O managements, memory managements file management.
8. Typical current operating systems such MS-DOS, UNIX their use.

Reference Books:

1. Donovan, J.J. : Systems Programming, McGraw Hill, 1972.
2. Dhamdhare, D. K. : Introduction to system software, Tata McGraw Hill, Publ. Comp., 1986.
3. Jones, Robin and Stewart : The art of C Programming, Narosa Publ. House, New Delhi.
4. Cooper, Mullish : The Spirit of C, An Introduction to Modern programming, Jaico Publ. House, New Delhi, 1987.
5. Kenneth, A. : C Problem Solving and Programming, Prentice-Hall International India.
6. Kernighan, B.W. & Ritchie, D.M. : The C programming Language, Prentice-Hall India.
7. Schildt, R. : C made Easy, McGraw Hill Book Comp. 1987.
8. Raicker, s. : Programming with C (McMillan India, 1989).

CA-301 ACCOUNTING

(L : 4, P : 0)

1. Accounting : Meaning, objective and scope, Basic terms in the accounting, accounting principles, concepts and conventions, Double - entry system of book keeping, Rules of Debit and Credit.
2. Ledgers : Preparation of ledger accounts, Cash book : Simple, Double, Triple Column.
3. Various day book : Sales, Purchase, Journal, Bank book.
4. Final accounts with adjustments. Bank Reconciliation statement.
5. Manufacturing account, Profit and Loss account, Trading account, Balance sheets.
6. Cost Accountancy : Scope, Element of Cost, classification of cost, behaviour of costs, Material, Labour, Direct Expenses and overheads, Introduction to methods of Costing; Cost sheet, Tenders, Quotations, Evaluation of Incremental cost Analysis, Evaluation of Capital Investment proposals :-P.B., DCF, IRR, Social cost benefit ratio, H.K. Accounting, Inflation Accounting.
7. Introduction to computerized accounting system: Coding logic and codes required, master files, transaction files, Introduction to documents used for data collection, processing of different files and outputs obtained.

Reference Books:

1. Kellock, J.: Elements of Accounting, Heinemann, 1978.
2. Arnolet, : Financial Accounting, Prentice-Hall, International (Paperback Education).on).
3. Horngren, and Sundem, : Introduction to financial Accounting, Prentice-Hall International, (Paperback Edition).

CA-302 DATABASE MANAGEMENT SYSTEMS.

(L : 4, P : 4)

Data independence, data models; network model, DBTG proposal data definition and manipulation languages; hierarchical and relational models; storage organization for relations, relational algebra and calculus; relational query languages, query processor and optimizer; functional dependencies; normal forms, multivalued dependancies; decomposition, integrity, protection, security, concurrency, recovery; distributed data bases; available data base system.

Reference Books:

1. Date, C.J. : An Introduction to database Systems volumes I & II, Addison-Wesley, 1981, 1983, 1983.
2. Ullman, Jeffrey D. : Principles of Database Systems, 2nd Edn. Galgotia Publ. Pvt. Ltd., 1982.
3. Simpson, A. : Understanding dBASE-III, B.P.E. Publications, Delhi., Delhi.

4. Whittington, R.F.: Data Base system Engineering, Clavendon Press, vendon Press.
5. Pratt, P. :Data Base Systems Management and Design. Bod and Fraser Publ. comp. 1987, 957.
6. Kroenke, D.M. : Database Processing : Fundamentals, Design, Implementation, 2nd Edn. Galgotia Publ., Pvt., Ltd. 7. Wiederhold : Database Design. McGraw-hill Book Comp.

CA-303 OPERATING SYSTEMS.
(CL : 4, P : 4)

Review of Batch Operating System Concepts: User job, resources, termination file process systems.
Memory Management: Address protection, segmentation, virtual memory, paging, page replacement algoritms, cache memory, hierarchy of memory types, associative memory.
Support for concurrent process: Mutual exclusion, shared data, critical sections, busy form of waiting, lock and unlock, primitives, synchronization, block and wakeup.
Scheduling: Process states, virtual processors, interrupt mechanism, scheduling algorithms, implementation of concurrency primitive.
System Deadlock: Prevention, detection and avoidance.
Multiprogramming system : Queue management, I/O supervisors, memory management. File system, disk scheduling.

Reference Books:

1. Bach, M.: Design of the UNIX operating systems.
2. Peterson, James. L. and Silberschatz, A. : Operating system concepts. Addison-wesley, Publ. comp. 1985.
3. Deitel, H.M.: An Introduction to Operating system, Addison-wesley Publ. comp., 1984.
4. Milenkovic, M.: Operating system- concepts and Design, McGraw-Hill International Editions, 1987.
5. Wang, P. : An Introduction of Berkley Unix, Wadsworth Publ., comp. 1988.
6. Silverster, P.P.: The Unix System Guidebook. Narosa Publ. House, New Delhi, ew Delhi.
7. Hansen Per Brineh : Operating System Principles, Prentice-Hall India, 1978.
8. Madnic and Donavan : Operating systems, McGraw-Hill book company.
9. Hogan, t. : CP/M User Guide, McGraw-Hill Book Comp. 1986.

CA-304 DESIGN AND ANALYSIS OF ALGORITHMS.
(CL : 4, P : 0)

Review of Basic Data Structures such as Stacks, Queues, Linked Lists, Trees and Graphs.
 Concepts in algorithm analysis, asymptotic Complexity, Domain independant algorithm Design Techniques such as Divide and Conquer, Greedy method, Dynamic Programming , Backtracking, Branch and Bound techniques.

Examples Algorithms for above Techniques from sets, Graphs, Text Processing, Internal and External sorting, height balanced trees, B-Trees, Hashing Algorithms, Dynamic storage Allocation, Garbage collection, Lower Bound theory and NP-Hard Problems.

Reference Books:

1. Aho, A.V., Hopcraft, J.E., Ullman, J.D.: The Design and analysis of Computer Algorithms. Addison-Wesley Publishing Co., 1974.
2. Horowitz, E., Sahani, S.: Fundamentals of Computer algorithms, Galgotia Publication, 1984.
3. Ferlicox, P., Bizard, P.: Algorithms- The construction, Proof and analysis of Programs, John Wiley and sons, 1988.
4. Bentley, J.L.: Writing efficient programs, Prentice-hall India, Eastern Economy Edition. Edition.
5. Goodman, S.E. & Hedetniemi, : Introduction to the design and analysis of Algorithms, McGraw-Hill Book Comp. 1977.
6. Knuth, D.E.: Fundamental of Algorithms: the Art of computer Programming. Vol.1, Narosa Publ. House, 1985.

CA-303 COMPUTER NETWORKS.

(CL : 4, P : 0)

Distributed Processing Potential; Forms of distributed Processing strategies, Hexagon Diagrams.

Communication: Concepts of Data transmission, signal Encoding, Modulation methods, synchronization, multiplexing and concentration, coding method, Cryptography.

Networks: Communication system architecture-OSI reference Model, Topology types, Selections, design, Local area Networks(LAN), CSMA/CD, Token Bus, token ring Techniques, Link Travel control (LLC) Protocols, Medium Access Control (MAC) protocols, Wide Area Networks (WAN), Physical Layer Description (X.21), Data Link Layer Protocols, HDLC/ analysis of Protocols and Performance, concepting in Network Layer, Switching Techniques, routing methods.

Reference Books:

1. Tannanbaum, A.S.: Computer Networks, Prentice-Hall, 1985.
2. Martin, J.: Design and Strategy for Distributed Data Processing, Prentice-Hall, 1983.
3. Martin, J.: Computer Networks and Distributed Processing, Prentice-Hall, 1985, 1985.
4. Stallings, William : Local Networks: An Introduction Macmillan Publishing Co. Publishing Co.
5. Black, : Computer Networks: Protocols, Standards and Interfaces, Prentice-Hall International (Paperback Edition).
6. Black, : Data Networks : Concepts, Theory and Practice, Prentice-Hall International, 1988.

7. Comer, : Internetworking with TCP/IP: Principles , protocols and Architecture. Prentice-Hall International (Paperback Edition).
8. Crichlow, : Introduction to distributed and Parallel Computing , Prentice-Hall International (Paperback Edition).
9. Ahuja: Design and analysis of Computer Communication Networks, McGraw-Hill Book Comp.
10. Chorofas : Designing and Implementing Local Area Networks, McGraw-Hill Books, Comp. Comp.

CA-303 PROGRAMMING LANGUAGES.

Study and comparision of programming languages like ALGOL, ADA, PASCAL etc.

CA-401 COMPUTER GRAPHICS

(L : 4, P : 4)

Display Devices: Line and Point Plotting system; Raster, vector, pixel and point plotters, continual refresh and storage display, Digital frame buffer, Plasma panel display, Very High resolution devices, High Speed Drawing, Display Processors, Character generators, Colour- Display Techniques (Shadowmask and penetration CRT, Colour Look-up tables, analog false colours, Hard copy colour printers)

Display Description: Screen coordinates, User coordinates; Graphical Data Structures (Compressed Incremental List, Vector List, Use of Homogeneous coordinates); Display code Generation; Graphical function, The View Algorithm, Two dimensional Transformation.

Interactive Graphics: Plotting and Positioning Devices (Cursor, Light Pen, Digitising Tablets, The mouse, Track Balls), Interactive Graphical Techniques, Positioning , Elastic Lines, Inking, Zooming, Panning, Clipping, windowing, Scissoring.

Graphic Languages: Primitives (constants, actions, operators, variables), Plotting, and Geometric Transformations, Display Subroutines.

3-D Graphics: Wire Frame perspective display, Perspective depth, Projective Transformations, Hidden lines and Surface elimination, Transparent solids, Shading. GKS is to be used as the standard teaching tool.

Reference Books:

1. Giloi, W.K.: Interactive Computer Graphics; Prentice-Hall, 1978.1. 1978.
2. Newman , W., Sproul, R.F.: Principles of interactive Computer Graphics, McGraw-Hill ,1980.
3. Rogers, D.F.: Procedural Elements of Computer Graphics, McGraw- Hill , 1985.

4. Harrington, S. : Computer Graphics : A Programming Approach, Tata McGraw-Hill , 1983.1 , 1983.
5. Foley, J.D. , Van, Dan A. : Fundamentals of Interactive Computer Graphics, Addison-Wesley, 1982.
6. Hearn D., Baker P.M. : Computer Graphics, Prentice-Hall, 1986.
7. Tosijasu, L.K. : Computer Graphics, Springer Verlag, 1983.

CA-402 PARALLE COMPUTING

(L: 4, P: 03)

Introduction and classification of Parallel architectures. Pipeline and overlap processing. Array Processors. Interconnection structures, performance analysis and multiprocessing language.

Transputer and RISC architectures.

Data flow computing architecture, Demand Driven Architectures, Systolic Architectures, Languages and Software support for parallel processing .

Overview of Parallel algorithms:

Models of Parallel computation. Techniques for exploiting parallelism in algorithms. Paradigms for organising parallel computation. Paradigms for improving efficiency of parallel algorithms.

Parallel Algorithms for Problems like sorting, Matrix multiplication and matrix inversion.

Reference Books:

1. Kai Hwang and Fayae Briggs, Parallel Architectures and Parallel Processing, McGraw Hill, 1984.
2. V. Rajaraman, Elements of Parallel computing, PHI.

CA-403 ARTIFICIAL INTELLIGENCE

(L : 4, P : 0)

Introduction to Artificial Intelligence : Simulation of so called Intelligence Behaviour, in different areas; Problem solving : games , Natural Language, Question answering, Visual Perception , Learning ; Aim- Oriented (Heuristic) Algorithms Versus Solution guaranteed algorithms.

Understanding Natural Languages : Parsing Techniques, Context free and Transformational grammars, Transition nets, Augmented transition nets, fillmore's grammars, Shank's conceptual dependency, grammar free analysers, sentence generation , translation.

Knowledge Representation : First order Predicate Calculus, Horn's clauses; The Language PROLOG; Semantics nets, Partitioned nets; Minsky's frames, case-grammar theory; production rules, knowledge base, the inference system, forward and backward deduction.

Expert System : Existing systems (DENDRAL , MYCIN);
domain exploration; meta knowledge, expertised transfer,
self explaining system.

Description: Symbolic
Pattern Recognition structured
Description: Line finding,
Machine Perception, models, objective
Interpretation, Semantic and
identification, speech recognition.

The language LISP and / or PROLOG is to be covered in
this course.

Reference Books:

1. Charniak , e.: Introduction of Artificial Intelligence,
Narosa Publishing house.
2. Winston, P.H.: LISP, Narosa Publishing house.
3. Milner , : Common LISP : A tutorial, Prentice-Hall Inc.
1988.
4. Mercellus, : Expert system Programming in TURBO PROLOG,
Prentice- Hall Inc. 1989.
5. Elaine R. : Artificial Intelligence, 1983.
6. Hunt, E.B. : Artificial Intelligence, Academic Press,
1975.
7. Lloyd , J.:Foundation of Logic Programming, Springer
Verlag,1982.
8. Clark, K.L. & McCabe, F.G. : Micro PROLOG, Prentice
Hall India, 1987.
9. Clockskin, W.F. and Mellish , C.S. : Programming in
PROLOG, Narosa Publishing House.

CA-404 SOFTWARE ENGINEERING.

(L : 4, P : 0)

Introduction to Software Engineering : Software
development and life cycle; Project size and its categories;
Planning a software project; Project-control and
Project-team standards; Design of solution strategies;
software cost estimation and evaluation techniques.

Software Design : Various design concept and notations;
modern design technique. Verification and validation
methods; Documentation and implementation procedures;
Performance of software systems; Software matrices and
models. Documentation of project-systems, manuals and
implementation.

Software Reliability: Defination and concept of Software
reliability; software errors, faults, repair and
availability; reavailability and availability models; Use of
data base as a study tool.

**Modern Programming Language features relevant to Software
Engineering:** A brief introduction of ADA (Modula II)
Language and explanation and concept such as data
abstraction, exception handling, concurrency mechanism, etc;
Software development environments; ADA language facilities
for handling large software projects.

Reference Books:

1. Fairley, R.E.: Software Engineering Concepts,
McGraw-Hill, 1985.
2. Lewis, T.G.: Software Engineering, McGraw-Hill, 1982

3. Kernighan, B., Plauger, P.: Software tools. Addison-Wesley, 1976.
4. Meyers, G.: The art of software testing, Wiley-Inter-Science, 1979.
5. Shooman, M.: Software Engineering, McGraw-Hill, 1983.
6. Ghehani, N.: Introduction of ADA, McGraw-Hill, 1983.
7. Chetree, : Software Engineering concepts.
8. Hibbard, : Constructing quality softwares.
9. Shere, : Software Engineering and Management, Prentice-Hall, 1988.
10. Deutsch, Willis: Software quality Engineering: A total technical and Management approach, Prentice-Hall, 1989.
11. Sommerville, I.: Software Engineering, Narosa Publication House, 1988.

CA-405 FINANCIAL MANAGEMENT
(L: 4, P: 0)

1. Introduction : Meaning and Role of Financial management.
2. Ratio Analysis : Profitability, Turnover, Solvency and Leverage Ratios; Limitations of Ratio Analysis, Funds flow and Cash flow statement.
3. Materials : Purchase Procedure, Inventory valuation, EOQ, Material levels, Stores organization.
Labour: Various methods of wage payment and incentives to workers, time keeping, time booking.
Overheads : classification, allocation, Apportionment, Reapportionment and Absorption rates, treatment of under the over : Absorption of overheads, blanket and departmental rates.
4. Budget and Budgetary control : Nature and scope, Importance, Method of Finalization of Master Budget and Financial Budget.
5. Marginal Costing : Nature, Scope and Importance, Break-even Analysis, Its uses and limitation, construction of Break-even chart, practical applications of marginal costing.
6. Standard Costing : Nature and Scope, Computation and Analysis of variances with reference to material cost, labour cost and overhead cost, interpretation of the variances.

CA-406 MANAGEMENT INFORMATION SYSTEMS.
(L :4, P :4)

1. Meaning , nature, need, role, importance, evaluation of management through information system, relatedness of MIS with Management activities. Management function and decision making.
2. Concept of 'balanced MIS' effectiveness and efficiency criteria.
3. Development of MIS- methodology and tools/ techniques for systematic identification, evaluation, modification of MIS .

4. A study of major financial , production, manpower and marketing MIS.
5. Advanced MIS - concept, need and problems in achieving advanced MIS, Decision support system.
6. Relation Of Computer Application.

Reference Books:

1. Mardick, R.G., Ross, J.E. and Clagett, J.R.: Information system for Modern Management, 3rd Edn. Prentice-Hall India, 1987.
2. Thomas, P. & Prince: information system for planning and control.
3. Wigarders, K., Svensson, A., Behong, L., Rydin, A. and Dahlgren, G.: Structured Analysis and Design of Information System., McGraw-Hill, 1986.
4. Aktas, : Structured analysis and Design of information system., Prentice-Hall International (Paperback Edition).
5. Spargue and Watson : Decision Support system, 2nd Edn. , Prentice-Hall International , 1989.
6. David, : Applied Decision Support, Prntice-Hall International, 1988.
7. Kanter, J.:Management Information system, 3rd Edn., Prentice-Hall India, 1984.
8. Bennett, J.L.: Building Decision Support System, Addison-Wesley Publ.Comp., 1983.
9. Lucas: Analysis , Design and Implementation of Information system., 3rd Edn., McGraw-Hill Book Comp.
10. Newman : Designing Integrated systems for the Office environment, McGraw-Hill Book Comp.
11. Senn : Analysis and Design of information system., McGraw-Hill book Comp.

CA-601 COMPILER CONSTRUCTION.

(L: 4, P: 4)

Automata theory, Regular Expressions, NFA, DFA, Minimize DFA. Transition table. Different phases of compilation.

Theory of Parsing, Top-down and Bottom-up parsing methods. LR parsers.

Intermediate code generation: Different types of intermediate codes.

Code optimization techniques.

Reference Books:

1. Aho, A & Ullman, J.B., Principles of Compiler Construction.
2. Backhouse, Principles of Compiler construction.
3. Gris, D, Compiler Construction.

CA-602 SIMULATION AND MODELLING

(L : 4, P : 0)

Defination of system, types of system - continuous and discrete; Modelling process and defination of Model; Computer workload and preparation of its Models; Verification and validation Modelling procedures; Comparing modelling data with real system data; differential and partial differential equation models; combining discrete events and continuous models: (example of a Computer system should be used for illustration and discussion purposes).
Simulation Process: Use of Simulation ; Discrete and continuous Simulation Process; Simulation of Time sharing Computer system.

Simulation Languages: A brief introduction to important discrete and continuous simulation languages; study and use of one language (depending on the availability) in detail.
Use of Database and AI techniques in the area of Modelling and Simulation.

Reference Books:

1. Payer, T.A.: Introduction to Simulation. McGraw-Hill, 1982.
2. Gordan, G.: System Simulation, Prentice-Hall, 1978.
3. Reitman, J.: Computer simulation Application, Wiley, 1971.
4. Spriet, W.A.: Computer Aided Modelling and Simulation, Academic Press, 1982.
5. Barnes, B.: Modelling and Performance measurement of computer systems, 1982.

CA-603 PC SOFTWARE

(L : 4, P : 0)

Word Processing: Creation, Editing, formatting of Document, Global search and replacement of Text, Spacial Print features, Mailmerge, Spelling checker.

Database Managemnt System : Creating and Editing Database files, Record Generation, Label generation, Building menu based applications, using 4GL query commands.

Spreadsheets : Building a complex spreadsheet application using formulas, Conditional calculations, Functions like NPV and IRR. Writing macros and spreadsheet menus to build a user interface to the spreadsheet application. Using the graph plotting capabilities of the Spreadsheet package. Interfacing the spreadsheet with Database system.

Reference Books:

1. Manuals of PC softwares.
2. Held, G.: IBM PC and PC-KT user reference manual, 2nd Edn. BPB Publ. 1987.
3. Coffron, J.W.: The IBM PC Connection, BPB Publ. 1987.

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