MCA Course Structure

Sem.	S.No	Course Code	Course	Type	L-T-P	Credits
I	1.	MCA-101	Discrete Mathematics	Core	3-1-0	4
	2.	MCA-102	Introduction to Programming Languages through C	Core	3-1-6	7
	3.	MCA-105	Business Accounting	Maj.E	3-0-0	3
	4.	MCA-103	Data and File Structure	Core	3-1-0	4
	5.	MCA-104	PC Software Lab.	Core	2-0-6	5
II	6.	MCA-201	Digital Computer Fundamentals and Assembly language programming	Core	3-1-6	7
	7.	MCA-202	E-commerce	Min.E	3-0-0	3
	8.	MCA-203	Data Base Management Systems	Core	3-1-6	7
	9.	MCA-204	Operating Systems	Core	3-1-0	4
III	10.	MCA-301	Design Methods and Analysis of Algorithms	Core	3-0-6	6
	11.	MCA-302	Software Engineering	Core	3-1-0	4
	12.	MCA-303	Computer Networking	Core	3-0-0	3
	13.	MCA-304	OOP	Core	3-0-6	6
IV	14.	MCA-401	Computer Graphics	Core	3-1-6	7
	15.	MCA-402 /MCA-403	Operations Research /Numerical Methods	Maj.E	3-1-6	7
	16.	MCA-404	Compiler Design	Maj.E	3-0-0	3
	17.	MCA-405	Managerial Finance	Maj.E	3-0-0	3
V	18.	MCA-501 /MCA-502	Soft Computing Techniques /Theory of Computation	Maj.E	3-0-0	3
	19.	MCA-503	Internals of OS and Network Programming	Core	3-1-6	7
	20.	MCA-504	Multimedia and Web Technology	Maj.E	3-1-6	7
	21.	MCA-505	Simulation and Modeling	Core	3-1-6	7
VI	22.	MCA-601 /MCA-602 /MCA-603	Parallel Computing /Advance Course in DBMS /Advance Course in OS	Maj.E	3-1-0	4
	23.	MCA-604	Comprehensive Viva			4
	24.	MCA-605	Dissertation		10+10=20	20
					Total Credits	135

(Core:82 Credits/ Maj. E :30+20=50 Credits / Min.E :3 Credits/   Total = 135 Credits)

MCA-101   Discrete Mathematics   Credits: 4

Poset, Hasse Diagrams, Lattice, Boolean Algebra, Application to switching circuits.

Formal grammars, Chomsky Hierarchy, Finite state Machines: Moore and Mealey.

Permutation, Combination, Recurrence Relations, Generating Functions, Principle of Inclusion and Exclusion.

Basic Concepts of Graphs and Trees, Adjacency and Incidence Matrices, Spanning Tree, Transitive Closure, Shortest Path, Planar Graphs, Graph colouring, Applications of Graph Theoretic concepts to Computer Science.

Introduction to Mathematical Logic.

Suggested Books:

(1)   J.P. Trembley and R.P.Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.
(2)   Dornhoff and Hohn, Applied Modern Algebra, McMillan.
(3)   N. Deo, Graph Theory with Applications to Engineering and   Computer Science, PHI.
(4)   R. Johnsonbaugh, Discrete Mathematics, Pearson Education, 2001.
(5)   R. P. Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education, 1999.
(6)   C.L. Liu, Elements of Discrete Mathematics, McGraw-Hill, 1985.
(7)   K.H. Rosen, Discrete Mathematics and Its Applications, Tat McGraw Hill, 2003.

MCA-102   Introduction to Programming Languages Through C   Credits: 7

High-level programming Languages and paradigms, Syntactic Structure, Semantics, Data Representation, Data Abstraction, Procedure activation, Structured Programming, Block Structuring.

Procedural Languages, Object-oriented Programming, Functional Programming, Logic Programming.

Introduction to Programming Language C, Data Type, Operators and Expressions in C, Control and Repetitive   Statements : IF-THEN-ELSE, SWITCH,   WHILE, FOR, DO. Break and   Continue Statements. Input and Output functions, Function and Program Structure in C, Parameter passing, Pointers, Arrays, Structures, C-Library.

Suggested Books:

(1)   R. Sethi, Programming Languages, Addison-Wesley, 1996.
(2)   D. Appleby and J. J. VandeKopple, Programming Languages, Tata McGraw-Hill, 1991.
(3)   B.W. Kernighan and D.M. Ritchie, The C Programming Language,   PHI.
(4)   R.C. Hutchinson and S.B. Just, Programming using the C   Language, McGraw-Hill.
(5)   B.S. Gottfried, Schaum's Outline of Theory and Problems of   Programming with C, McGraw-Hill.
(6)   H. Schildt, C Made Easy, Osborne McGraw-Hill.

MCA-103   Data and File Structures   Credits: 4

Data Structures:

Basic Data Structures : Arrays, Linked Lists, Stack, Queue, Dequeue, Tree, Heap, Hash Table and Collision resolution. Basic algorithms for Creation, Manipulation of Data Structures. Internal Sorting Algorithms : Bubble, Heap, Quick Sort. Tape sorting and Merging. C as the programming language for implementation of these algorithms.

File Structures:

Primary File Organization: Sequential, Direct, Indexed Sequential.

Multi-list File Organization, Inverted Files.

File Sorting, Hashing

Suggested Books:

(1)   Lipshutz, Data Structure, McGraw Hill.
(2)   Standish, Data Structure, Addison-Wesley.
(3)   B. Salzberg, File Structures, Prentice-Hall, 1988.
(4)   A.L. Tharp, File Organization and Processing, John Wiley and Sons, 1988.
(5)   A. M. Tennenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C, PHI, 1991.

MCA-104   PC Software Laboratory   Credits: 5

Document preparation using MS Word, Latex, Electronic Spreadsheet, Database Package using Access, Use of Mathematica.

MCA-105   Business Accounting   Credits: 3

Introduction, Definition, Concepts and Conventions of Accounting, Principles of Double Entry System, Recording, Classification and Summarization of business transactions, Preparation of Cash Book and Bank Reconciliation statement.

Final Accounts: Final Accounts of Sale proprietary concern, Partnership and Joint Stock Companies.

Cost Accounting: Definition, objectives and significance of cost Accounting, cost Accounting Vs. Financial Accounting, Classificvation of costs, Preparation of Cost sheet.

Marginal Costing.

Suggested Books:

(1)   J. Kellock, Elements of Accounting, Heinemann.

(2)   R.L .Gupta & M. Radhaswamy, Advanced Accountancy, Sultan Chand.

(3)   Dr. S.M. Shukla, Advanced Accounting, Sahitya Bhawan.

(4)   Jawahar Lal, Cost Accounting, Tata McGraw Hill.

(5)   S.P. Jain and K.L. Narang, Cost Accounting, Kalyani Publishers.

MCA-201   Digital Computer Organisation and Assembly Language Programming   Credits: 4

Information Representation and Manipulation, Character Codes, Redundant Coding, Logic Gates, Switching Algebra, De-Morgan's Theorem, Switching function minimization using Karnaugh's map (up to 4 variables). Basic building blocks of digital computer: Flip flops. Registers, Counters, Multiplexer, etc.

Basic Model of Stored Program Computer, Instruction sets : Reduced, Complex. Addressing Schemes, Instruction Execution mechanism,   Organization of CPU, Memory Organization, RAM, ROM, Cache Memory, Associative memory Organization, I/O devices with special reference to modern peripheral devices, Data Transfer Schemes : Hand Shaking, Polling, DMA. I/O Processor. Overview of 32-bit Processors.

Assembly Language Programming :

Assembly Language of P-IV, Assembler, Machine Language Instruction Processor, Completeness of Instruction Set. Details of the instructions of P-IV with timing diagrams for instruction execution. Design of Assembly Language Programs for Common Application Problems such as Maximum finding, Summation, Sorting, Searching, Multiple Precision Arithmetic, etc.

Suggested Books:

(1)   Malvino, Digital Computer Electronics, TMH.

(2)   Gaonkar, Microprocessor Architecture Programming Applications with 8085/8080A, Wiley Eastern.

(3)   J.P.Hayes, Digital System design and Microprocessor, McGraw Hill

(4)   J.P.Hayes, Computer Architecture and Organization, McGraw Hill.

(5)   M.M.Mano, Computer System Architecture, PHI.

(6)   Y. Yu and C. Marut, Assembly Language Programming and Organisation of the IBM PC, McGraw Hill, 1992.

MCA-202   E-Commerce   **Credits: 3**

Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, IT Acts.

Suggested Books:

(1)   Bharat Bhaskar, Electronic Commerce – Frameroork Technologies and Applications, Tata McGraw Hill.

(2) Ravi Kalakota & A.B. Whinston, Frontiers of Electronic Commerce, Pearson Education.

(3) Ravi Kalakota & A.B. Whinston, Electronic Commerce – A Manager's Guide, Pearson Education.

(4) Agarwala Kamlesh, N and Agarwala Deeksha, Business on the Net_Introduction to the E-Com., Macmillan India.

(5) P. T. Joseph, E-Commerce: A Managerial Perspective, PHI, 2002.

MCA-203   Data Base Management System   Credits: 7

DBMS Concepts: Data abstraction, database system architecture, Schemas and Subschemas, data independence. Physical Data Organization: Hashed, index file, B-tree.

Data Models: Data modeling using entity relationship. Hierarchical and Network Model: DBTG proposals, data manipulation languages.

Relational Model : Relational Algebra and Calculus, Storage organization for relations, Functional, Multivalued and Project-Join dependencies, Decomposition. Normal Forms: First, Second, Third, BCNF, Fourth and PJ normal forms.

Relational Query language, Query processing, Query optimization : General strategies of optimization, Optimizing Algebraic Expression, Systematic Query optimization using cost estimate.

Security in DBMS to gain integrity mechanism of roll-back and recovery, validation and data translation of database operation and management.

Case Study of Oracle.

Suggested Books:

(1) C.J. Date, An Introduction to Database Systems, Vol I & II, Addison Wesley.

(2) J.D. Ullman, Principles of Database Systems, Galgotia, New Delhi.

(3) Wiederhold, Database Design, McGraw Hill.

MCA-204   Operating System   Credits: 4

Evolution of Operating System. Basic concepts: User, job, Resources, Batch processing, Multi-programming, Time sharing, Process, Process Control Block.

Memory management: Address Protection, Segmentation, Virtual Memory, Paging, Page replacement algorithms. Support for concurrent process : Mutual Exclusion, Shared Data, Critical Sections, Busy form of waiting, lock and unlock primitives, synchronization, blocking and wake up. Process 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.

Shell Programming, UNIX-C interface, System calls, Device Driver,

Interrupt Handler.

UNIX and Linux as example systems.

Suggested Books:

(1) Peterson and Silberschatz, Operating System Concepts, Addison Wesley.

(2) P. B. Hansen, Operating System Principles, PHI.

(3) K. Christian, The UNIX Operating System, John Wiley.

(4) A. N. Haberman, Introduction to Operating System Design, Galgotia.

(5) Manuals of DOS, UNIX and Netware.

MCA-301   Design Methods and Analysis of Algorithms   Credits: 6

Elementary Data Structures, Basic Computational Models.

Simple Algorithms. Analyzing Algorithms, Asymptotic Notation,   Recurrence relations.

Design Methods : General Consideration, Algorithm design paradigms and representative problems: Divide and Conquer (Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers, etc.), Greedy Method (Minimal Spanning Tree, Shortest Paths, Knapsack, etc.), Dynamic Programming (Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees, etc.), Backtracking (8-queens problem, Graph Colouring, Hamiltonian Cycles, etc.), Branch and Bound (0/1 Knapsack problem, Travelling Salesperson, etc.), Approximation (Graph Colouring, Task Scheduling, Bin Packing, etc.), Probabilistic Algorithms (Numerical Integration, Primality Testing, etc.).

Polynomial Evaluation and Interpolation, Fast Fourier transforms.

Intractable Problems: Basic Concepts, Nondeterministic Algorithms, NP Completeness, Cook's Theorem, Examples of NP-Hard and NP-Complete problems. Problem Reduction.

Lower Bound Techniques: Comparison tree, Reduction, Adversary argument.

Suggested Books:

(1) A. Aho, J. Hopcroft and J.Ullman, The design and Analysis of Computer Algorithms, Addison Wesley.

(2) E. Horowitz and S. Sahani, Fundamentals of Computer Algorithms, Galgotia, New Delhi.

(3) S.E. Goodman and S.T. Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.

(4) G. Brassard and P.Bratley, Algorithmics, PHI.

(5) S.K. Basu, Design Methods and Analysis of Algorithms, PHI, 2005.

(6) T.H. Coremen, *et. al*, Introduction to Algorithm, PHI, 2001

MCA-302   Software Engineering   Credits: 4

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 concepts and notations; Modern design techniques; Verification and Validation methods; Documentation and implementation procedures; Performance of   software systems; Software metrics and models.

Documentation of Project-systems, manuals and implementation. Software Reliability: Definition and concept of software reliability; software errors, faults, repair and availability; Reliability and availability models; Use of database as a study tool.

Modern Programming Language features Relevant to Software Engineering : A brief introduction of ADA, C++, Modula II languages and explanation of concepts such as data abstraction, exception handling, concurrency mechanism, etc; Software development environments; ADA (C++) language facilities for handling large software Projects.

Suggested Books:

(1)   R.E. Fairley, Software Engineering Concepts, McGraw-Hill.

(2)   D.A.Lamb, Software engineering, PHI.

(3)   Jalota, Software Engineering, Narosa Publishing House.

(4)   R.S. Pressman, Software Engineering, McGraw-Hill, 1982.

(5)   R. Mall, Fundamentals of Software Engineering, PHI, 1999.

MCA-303   Computer Networking   Credits: 3

Elements of data communication : Concepts and terminology, analog and digital data transmission, signals, attenuation, delay distortion, noise, channel capacity, transmission media, data encoding, asynchronous and synchronous transmission, multiplexing .

Networking : Communication network, Circuit Switching, Message Switching and Packet Switching, Radio and Satellite Networks, Local Area Network topology, medium access control protocols, Naming and Advertising, Routing, Performance considerations.

Network Architecture and Distributed Processing: OSI reference model, layered and hierarchical approaches, network interface, principles of inter-networking, internet protocols and standards. Network services, electronic mail, network security issues.

Introduction to high-speed networks.

Suggested Books:

(1)   W. Stallings, Data and Computer Communication, McMillan.

(2)   A.S. Tanenbaum, Computer Networks, PHI.

(3)   J. Martin, Computer Network and Distributed Data Processing, Prentice Hall.

(4)   W. Stallings, Local Networks, McMillan.

(5)   M.Schwertz, Computer Communication Network Design and Analysis, Prentice Hall.

(6)   B.A. Forouzan, Data Communications and Networking, TMH, 2003.

(7)   S. Keshav, An Engineering Approach to Computer Networking, Pearson Education, 2001.

MCA-304   Object Oriented Programming   Credits: 6

General concepts, Object-oriented programming paradigm and design. Object, Class: Superclass, Subclass, Metaclass, Hierarchy, Instance, Polymorphism (Operator Overloading), Inheritance:

Hierarchical, Multiple, Selective. Object-oriented methods: Object-oriented analysis, Construction and Testing. Object Modeling Techniques. Case studies.

Introduction to OOP languages: Class concept in SIMULA, Pure object-oriented language like Smalltalk 80, Hybrid Object-oriented language like C^{++}, etc.

Details of C^{++}: Data Types: Primitive and User defined; Operators, Classes: Friend, Derived. Structures and Expressions, Pointers and reference parameters, Virtual Functions, Templates, Storage Representation. Subprograms and Storage Management, Functions, Function prototyping, Class definition, Class Extension, Nesting of Classes, Constructor and Destructor, Memory Allocation for Objects. Type Definitions, Operator Overloading, Type conversions and Casting, Data Abstraction. Input and output, File Handling, Programme-defined exceptions, Conditional Compilation.

Applications: Use of OOP concepts in different areas:

1. Object-oriented Software Engineering :
   Architecture of OOSE method, Reusability and OOP, Testing in OOSE, Case study in OOSE.
2. Object-oriented OS: Objects and operations, Cooperating objects, Capabilities, Process Management, Memory Manager, Device Management, Object-based communication, Architecture of an object-based OS.
3. Object-oriented DBMS: Introduction, Object Identifier, Object Structure, Type Constructor and Destructor, Encapsulation, Object-oriented Data Model, Object-oriented Data Definition Language, Type Hierarchies and Inheritance, Example OODBMS.
4. Object-oriented graphics: Requirements of Graphics System, Advantages of Object-oriented approach, Object-oriented Interface Architecture, Generation and Display of Graphics Objects. GKS and Object-oriented system design. Part Hierarchies and Computer Graphics, Phigs and Part Hierarchies, Object-oriented standards in Graphics.

Suggested Books:

(1) T. Budd, An Introduction to Object Oriented Programming, Addison-Wesley.
(2) G. Booch, Object Oriented Analysis and Design, Addison-Wesley.
(3) B. Stroustrup, The C++ Programming Language, Addison-Wesley.
(4) R. S. Pressman, Software Engineering – A Practitioner's Approach, McGraw Hill.

MCA-401   Computer Graphics   Credits: 6

Graphic display devices (monochrome and colour), Interactive device.
Line and Circle plotting using Bresenhem's algorithm, DDA line drawing algorithm.
Filling algorithm: Edge fill , Seed fill algorithm.
Curve drawing using Hermite polynomial, Bezier Curves, B-Splines.
Transformation: Translation, Rotation, Scaling, Mirror Images, Coordinate system, 3D-Transformation, Rotation about an arbitrary axis, Orthogonal Projections, Multiple Views, Isometric Projection, Perspective Projections (one ,two and three vanishing points), Wire Frame Prespective Depth.
Window and Clipping: The Viewing Transformation, Windowing Transformation, Sutherland Cohen, Mid Point Subdivision, Cyrus Beck Algorithms.

Segmented Display Files: Display File Compilation, Segment Table, Geometric Model and Picture Structure.

Hidden Line and Surface Removal, Introduction to Shading.

Curved Surface Generation, Generation of Solids, Sweep method, Interpolation.

Graphics Standards: GKS/PHIGS/X WINDOW.

Introduction to Computer Animation.

Suggested Books:

(1) W.K. Gilloi, Interactive Computer Graphics, PHI.
(2) D.F. Rogers, Procedural Elements for Computer Graphics, McGraw-Hill.
(3) J.D. Foley and A.D. Van, Fundamentals of Interactive Computer Graphics, Addison-Wesley.
(4) Rogers and Adam, Mathematical Elements for Computer Graphics, McGraw-Hill.
(5) D. Hearn and M. P. Baker, Computer Graphics, PHI, 1996.

MCA-402   Operations Research   Credits: 7

Network Analysis: Terminology of network, shortest route problem, minimal spanning tree problem, max-flow problem.

Project Scheduling by PERT, CPM: Diagram, representation, critical path calculation, construction of time chart and resource labeling, probability and cost consideration in project scheduling, project control.

Linear Programming: Simplex Method Revised simplex method, Duality in Linear programming, Application of Linear Programming to Economic and Industrial Problems.

Nonlinear Programming: The Kuhn-Tucker conditions, Quadratic programming, Convex programming.

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

Sequencing Model: Classification of self problems, processing of n jobs through two machines, three machines, processing of two jobs through m machines.

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

MCA-403   Numerical Methods   Credits: 7

Note : Emphasis is on computational methods

Errors in Computer Arithmetic, Normalization.

Bisection, Falsiposition and Newton-Raphson methods for solution of nonlinear equations. Errors in the solutions, Convergence of Solutions.

Gauss, Gauss-Siedel and Iterative methods for system of linear equations. Ill conditioned system, Pivotal Condensation, Matrix Inversion, Eigen-values, Eigen-vector, Diagonalization of Real Symmetric Matrix by Jacobi's Method.

Polynomial Interpolation using Newton's and Lagrange's formulae.

Numerical Differentiation. Numerical Integration : Trapezoidal Rule, Simpson's Rule, Weddle's Rule, Gauss Quadrature Formula.

Error in numerical Integration. Numerical Solution of differential Equations: Runge-Kutta Method, Predictor-Corrector Method.

Suggested Books:

(1)   V. Rajaraman, Computer Oriented Numerical Methods, PHI.

(2)   F.Acton, Numerical Methods that Work, Harper and Row.

(3)   A.A. Affifi, Statistical Analysis : A Computer Oriented Approach, Academic Press.

(4)   S.D.Conte and C.d.Boor, Elementary Numerical Analysis, McGraw Hill.

(5)   E. Balagurusamy, Numerical Methods, Tata McGraw Hill, 2000.

MCA-404   Compiler Design   Credits: 3

Compilers and Translators, Syntactic and lexical structure of a language.

Finite Automata and design of lexical analyzer, Context free grammars and derivation of parse trees, basic parsing techniques: shift-reduce, operator-precedence, top-down, predictive.

Automatic construction of efficient parsers: LR parser, construction of parsing tables. Disambiguation of grammar.

Syntax Directed Translation.

Symbol table organization, Run time storage management, Error detection and recovery.

Suggested Books:

(1)   Aho, Ullman and Sethi, Principles of Compiler Design, Addison Wesley.

(2)   J. P. Trembley and P. G. Sorensen, The Theory and Practice of Compiler Writing, McGraw Hill.

(3)   Holub, Compiler Design in C, PHI.

MCA-405   Managerial Finance   Credits: 3

Introduction, Nature and scope of finance, objective of Financial management, Functional areas for managerial decision in Finance – Investment decision, Financing Decisions and Dividend Decisions.

Sources of Finance and Optimum Capital Structure: Sources of long term and short term finance, Theories of capital structure and leverage analysis for determining optimum capital structure.

Management of Revenue and Profit: Features of cost and Revenue curves, profit position and equilibrium of a firm under perfect competition, Monopoly and Monopolistic Competition.

Financial Analysis: Ratio Analysis: Liquidity. Profitability operating and Proprietary Ratios, Fund Flow Analysis with the analysis of working capital charges, cash flow Analysis.

Suggested Books :

(1) J. Fred Weston & Eugene F. Brigham: Managerial Finance, Tata MacGraw Hills Pvt. Ltd., New Delhi.
(2) James Van Horne Essential of Financial Management, Prentice Hall of India Ltd., New Delhi.
(3) Prasanna Chandra : Financial Management, Tata McGraw Hill Pvt. Ltd., New Delhi.
(4) Walker EW: Financial Management, Prentice Hall of India Ltd., New Delhi.
(5) Dwivedi D.N. : Managerial Economics, Sultan Chand & Co., New Delhi.
(6) Joel Dean : Managerial Economics, Prentice Hall of India Ltd., New Delhi.
(7) Haynes, Mote & Paul: Managerial Economics, Vakil, Seffer & Simm Co. Ltd. Bombay.
(8) Crowson, P : Economics for Managers – A Professional Guide, Macmillan, London.

MCA-501 Soft Computing Techniques   Credits: 3

Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Backpropagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Suggested Books:

(1) M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall, 1998.
(2) D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.
(3) Z. Michalewicz, Genetic Algorithms+ Data Structures = Evolution Programs, Springer-Verlag, 1994.
(4) N.K. Sinha & M. M. Gupta(Eds), Soft Computing & Intelligent Systems: Theory & Applications, Academic Press, 2000.
(5) M.T. Hagan, H. B. Demuth, And M. Beale, Neural Network Design, Thompson Learning, 1996.
(6) C. Lau (Ed), Neural Networks, IEEE Press, 1992.
(7) J. Freeman and D. Skapura, Neural Networks: Algorithms, Applications, and Programming Techniques, Addison-Wesley, 1991.
(8) G. J. Klir and T. A. Folger, Fuzzy Sets, Uncertainty, and Information, PHI, 1988.
(9) G. J. Klir, and B. Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice-Hall, 1995.
(10) H. J. Zimmerman, Fuzzy Set Theory and Its Applications, Kluwer Academic Press, 1991.

MCA-502   Theory of Computation   Credits: 3

Mathematical Preliminaries.

Deterministic and Non-deterministic finite automata, Regular expressions and Finite automata, Minimisation of state set of Finite automata.

Context-free languages and grammars, Pushdown automata, non-context-free languages, Properties of context-free languages.

Turing machines and its variants, CT thesis, Recursive and Recursively enumerable languages. Decidable and undecidable problems.

Suggested Books:

(1) H. R. Lewis and C.H. Papadimitriou, Elements of the Theory of Computation, Prentice-Hall of India, 2002.
(2) M. Sipser, Introduction to the Theory of Computation, PWS Publishing Company, 1997.
(3) J. E. Hopcroft, J. D. Ullman, Introduction to Automata theory, Languages and Computation, Addison-Wesley, 1979.
(4) D. I. A. Cohen, Introduction to Computer Theory, John Wiley.

MCA-503   Internals of UNIX OS and Network Programming   Credits: 7

The general overview, Unix Kernel, Internal representation of files, Buffering, System calls, Process structure and control, Process scheduling, memory management, I/O subsystem, Shell Programming , IPC, Distributed UNIX systems.

The unix model, Interprocess communication,, Communication protocols, Berkeley sockets, Transport layer interface, Library and other routines, Security issues, FTP, Line printer spoolers, Remote login, remote execution, Remote procedure calls, Remote drive access.

Suggested Books:

(1) R. Thomas and J. Yates, A User Guide to The UNIX System, Osborne McGraw-Hill, 1985.

(2) M. J. Bach, The Design of Unix Operating System, PHI, 1996.

(3) B. W. Kernighan and R. Pike, The UNIX Programming Environment, PHI, 1996.

(4) W.R. Stevens, UNIX Network Programming, PHI, 1997.

(5) Barry Nance, Network Programming in C, PHI, 1990.

MCA-504   Multi-media and Web Technology   Credits: 7

Introduction to Multi-media Technology, Audio System, Image Compression, Data Compression, Digital Motion Video, Authoring tools, Multimedia Applications, Multimedia DBMS.

Working of Internet, Connections, TCP/UDP/IP, IP addressing, Ipv4 to Ipv6. ARP, RARP, DCHP, BOOTP, ICMP. Internet Routing/EGP/BGP/OSIF, etc. HTTP, SMTP, and E-mail SNMP, Domain Name Server, Internet Services, WWW, Web Servers, Web Browsers, Web page makers and Editors,

Plug-Ins and Delivery vehicles, URL, HTML. VoIP, Multimedia over IP Mobile IP/Next Generation Internet COM, DCOM, Scripting, ASP and its security issue, CGI, Web-enabled Databases

Suggested Books:

(1) C.I. Stems, Internet: An Introduction, TMH.

(2) Forouzan, TCP/IP Protocol Suite, TMH.

(3) Commer, TCP/IP, PHI.

(4) Firewalls and Encryption, Asset International, TMH.

(5) M. J. Crouch, Web Programming with ASP and COM, Addison-Wesley, 2000.

(6) D. Chapman, Web Development with Visual Basic 5, PHI, 1998.

(7) J. Greenberg and J.R. Lakeland, Building Professional Web Sites with the Right Tools, Prentice Hall, PTR, 2000.

(8) R. Steinmetz and K. Nahrstedt, Multimedia: Computing, Communications and Applications, Prentice Hall, PTR, 1995.

MCA-505 Simulation and Modeling Credits: 7

Introduction, general principles. Statistical models in simulation. Queuing models.

Random numbers, Random-variate generation. Input modeling, verification and validation of simulation models, output analysis.

Simulation of LAN, Computer system, manufacturing systems.

Introduction to Simulation software.

Suggested Books:

(1) T.A. Payer, Introduction to Simulation, McGraw Hill.
(2) G. Gordon, System Simulation, Prentice Hall.
(3) J. Reitman, Computer Simulation Application, Wiley.
(4) W.A. Spriet, Computer Aided Modeling and Simulation, Academic Press.
(5) B. Barnes, Modeling and Performance Measurement of Computer Systems.
(6) Manuals for SIMULA/SIMSCRIPT.
(7) N. Deo, System Simulation with Digital Computer, PHI.
(8) A. M. Law and W.D. Kelton, Simulation Modeling and Analysis, McGraw-Hill, 1991.
(9) J. Banks, J. S. Carson II, B. L. Nelson and Nicol, Discrete-Event System Simulation, PHI, 2002.

MCA-601 Parallel Computing Credits: 4

Introduction, Minsky's Conjecture, Amdahl's Law.

Static Networks : Tree, Diamond Network, Mesh, Linear Array, Ring, Star, Hypercube, Chordal ring, Cube- connected-cycles, Perfect shuffle network, ILLIAC IV, Torus, PM2I, Butterfly, Mesh-

of-tree, Pyramid, Generalized Hyperbus, Twisted Cube, Folded Hypercube, Incomplete Hypercube, Enhanced Incomplete Hypercube, Cross-Connected Cube, Banayan Hypercube.

Dynamic Networks: Non blocking Network CLOS, Rearrangable Benes Network, Blocking Networks Baseline, Omega, Flip(Cube).

Computational models: PRAM : CRCW, CREW EREW, Simulating CRCW on CREW & EREW.

Boolean Circuit Model, Theorem 1 (Pipepenger and Fisher)[*]. Theorem 2 (Borodin)[$], NC Problems, P-Complete problems, PRAM algorithms: List Ranking, Parallel Prefix on a list, Finding Roots of trees in a Forest, Maximum of an Array, etc.

 * Relating Sequential Time with Parallel Space.

 $ Relating Sequential Space with Parallel Time.

Introduction to Parallel Algorithms: Addition on Tree, Cube, Mesh, Linear Array, PSN, etc. Matrix multiplication on Mesh, Cube, Torus, etc.

Parallel Sorting : Odd-Even transposition sort on Linear Array, Merge Splitting sorting, Theory of Odd-Even Merging, Zero-one Principle, Batchers network, Bitonic sorting on PSN, Mesh, Hypercube, Time and comparator requirements for odd-even and Bitonic sorting.

Fourier Transform on Butterfly, Cube, PSN, etc.

Associative processing : Example systems like STARAN, PEPE. Associative algorithms such as Pattern matching, Finding maximum and minimum elements, Not-smaller-than search, Summation of Vector Components, etc.

Suggested Books:

(1)   Hwang and Briggs, Computer Architecture and Parallel processing, McGraw Hill.

(2)   Crichlow, Introduction to Distributed and Parallel computing, PHI.

(3)   M.J. Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw-Hill.

(4)   V. Rajaraman, Elements of Parallel Computing, Prentice-Hall of India.

(5)   Joseph JA JA, Introduction to Parallel Algorithms, Addison Wesley.

(6)   S.G. Akl, The Design and Analysis of Parallel Algorithms, PHI.

MCA-602   Advance Course in Data Base Management System   Credits: 4

Design Theory for Relational Database: Functional Dependencies, Decomposition of Relation schemes, Normal Forms for Relations. Schemes, Multivalued and other kinds of Dependencies.

Query Optimization: Basic Optimization Strategies, Algebraic Manipulation, Optimization of Selections in System, Exact Optimization for a Subset of Relational Queries, Optimization under Weak Equivalence.

Database Protection: Integrity, Constraints in Query-by-Example, Security, Security in query-by-Example, Security in Statistical Databases.

Concurrent Operations on the Database: Basic Concepts, A simple Transaction Model, Model with Read- and Write-Locks, Read-only, Write-only Model, Concurrency for Hierarchically Structured Items, Protection against Crashes, Optimistic Concurrency Control.

Principles of Distributed Data Bases, Framework for distribution. Translation of global queries into fragment queries. Query optimization and management of distributed transaction. Concurrency control and reliability in distributed databases.

Administration of Distributed Data Bases. Example Systems.

Suggested Books:

(1)   J.D.Ullman, Principles of Database Systems, Galgotia, New Delhi.

(2)   S.Ceri and G. Relagatti, Distributed Databases, McGraw-Hill.

(3)   C.Papadimitriou , The Theory of Database concurrency Control, Computer Science Press.

(4)   T. Ozsu and P. Valduriez, Principles of Distributed Database Systems, Prentice-Hall.

MCA-603   Advance Course in OS   Credits: 4

Distributed Systems, Communication in distributed systems, processes and processors in distributed systems. Threads, systems Models, Process allocation, scheduling in distributed systems, fault tolerance, real-time distributed systems.

Theoretical issues in distributed systems: Logical clock, mutual exclusion, deadlock detection, agreement protocols, resource security and protection, concurrency control.

Distributed File System: Design and implementation, trends.

Distributed shared Memory, consistency models, page-based distributed shared memory, shared variable distributed shared memory, object-based distributed shared memory.

Multiprocessor OS, Database OS: General features and theoretical issues.

Case Studies: Amoeba, Mach, chorus, DCE, etc.

Multimedia Operating Systems: Process scheduling, File system, Caching, Disk scheduling for multimedia.

Suggested Books :

1.   A.S. Tanenbaum, Distributed Operating System, Prentice-Hall, 1995.

2.   A.S. Tanenbaum, Modern Operating Systems, Pearson Education Asia, 2001.

3.   M. Singhal and N. G. Shivaratri, Advance Concepts in Operating Systems, McGraw-Hill, 1994.

4.   J. W. S. Liu, Real-Time Systems, Pearson Education, 2000.

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