M.Sc.(Computer Science), JIWAJI UNIVERSITY, GWALIOR
Syllabus for college for 2020-22

Semester-I

MCS 101	*Computer Architecture*	*(85, 15)*
MCS 102	*Discrete Mathematics with Data Structure*	*(85, 15)*
MCS 103	*Operating System*	*(85, 15)*
MCS 104	*Object Oriented Programming with C++*	*(85, 15)*
MCS 105	*Practical-1 (Based on C++)*	*(100)*
MCS106	*Practical-2 (Based on Data Structure)*	*(100)*

Semester-II

MCS 201	*Computer Oriented Numerical & Statistical Method*	*(85, 15)*
MCS 202	*Software Engineering*	*(85, 15)*
MCS 203	*Database Management System (Oracle Based)*	*(85, 15)*
MCS 204	*Computer Networks*	*(85, 15)*
MCS 205	*Practical-1 (Based on Oracle)*	*(100)*
MCS206	*Practical-2(Based on Numerical & stat. Methods using C)*	*(100)*

Semester-III

MCS 301	*Theory of Computation*	*(85,15)*
MCS 302	*Techniques of Operation Research*	*(85, 15)*
MCS 303	*Object Oriented Programming with JAVA*	*(85, 15)*
MCS 304	*Optional (any one)*	*(85, 15)*
1.	*Artificial Intelligence*	
2.	*Algorithm Design*	
3.	*Modelling and Simulation*	
4.	*Visual Basic*	
MCS 305	*Practical (Based on JAVA)*	*(100)*
MCS306	*Minor Project in Visual Basic / .NET*	*(100)*

Semester-IV

MCS 401	*Systems Programming*	*(85, 15)*
MCS 402	*Computer Graphics*	*(85, 15)*
MCS 403	*Optional (any one)*	*(85, 15)*
1.	*Neural Network*	
2.	*Parallel Processing*	
3.	*Image Processing*	
4.	*Internet & Web Technology*	
5.	*Distributed Computing*	
6.	*Windows Programming & VC++*	
7.	*Data Mining and Data Warehousing*	
8.	*Bio-informatics*	
MCS 404	*Practical (Based on Computer Graphics)*	*(100)*
MCS405	*Project*	*(200)*

MCS 101 **COMPUTER ARCHITECTURE**

Unit I

Representation of Information: Introduction to computer system, computer generations, number systems (conversions and arithmetic operations), r's and (r-1)'s complements, integer and floating point representation, overflow and underflow, character codes (BCD, EBCDIC, ASCII, Gray, 2421 etc.), error detection and correction codes (hamming code, checksum), Boolean Algebra (definition and axioms), Karnaugh-map simplification (1-5 variables), logic gates.

Unit II

Combinational Circuits: (half adder, full adder, half subtractor, full subtractor, encoders, decoders, multiplexers, demultiplexers, adder-subtractor).
Sequential circuits: types of sequential circuits, flip-flops, registers (buffer register, shift register, controlled shift register, bi-directional shift register), counters (ripple counter, synchronous counter, ring counter, up and down counter), construction of combinational and sequential circuits.

Unit III

Memory Organization: Semiconductor Memory (RAM (static and dynamic), ROM, PROM, EPROM, EEPROM), cache memory organization (associative mapping, direct mapping, set associative mapping), associative memory, magnetic memory (floppy disk, magnetic disks and tape), optical memory (CD-ROM, WROM, Erasable Optical Disk). Virtual memory organization: Address space and memory space, Address mapping using pages.

Unit IV

Introduction to Microprocessor 8085 and 8086: characteristics of microprocessor, block diagram and pin diagram of 8085 and 8086,addressing modes and instruction set of 8085 and 8086, comparison of 8085 and 8086, assembly language of 8086 (variable declaration, array, conditional statement, looping).

Unit V

Interfacing: Input-Output Interface (I/O bus and interface modules, I/O versus memory bus, Isolated versus memory mapped I/O), Asynchronous data transfer (Strobe Control, Hand Shaking), Modes of transfer (Programmed I/O, Interrupt Initiated I/O, DMA (Direct Memory Access), Bit-slice microprocessor.

Text Books:

1. Computer System Architecture by M. Morris Mano.
2. Digital Logic and computer design by M. Morris Mano.

Reference Books:

1. Digital Computer Electronics by Malvino Brown.
2. Digital Computer Fundamentals by Bartee.
3. Microprocessor X86 programming by K.R. Venugopal.
4. Structured Computer Organization by Tanenbaum.
5. Advanced microprocessors and peripherals by Ray And Bhurchandi.
6. Computer Fundamentals by B. Ram.

MCS 102 **DISCRETE MATHEMATICS WITH DATA STRUCTURE**

Unit I

Logic: propositions, the conditional and the biconditional statements, conjunctive and disjunctive normal forms and simplification. Sets: Introduction, Operations on sets, finite and infinite sets, countability of sets, mathematical induction and recursion, Principal of inclusion and exclusion.

Relation: Introduction, properties of relation, equivalence relation, partial order relation, lattices, Pigeon Hole principle and its examples. Functions: Introduction, injective and surjective functions, inverse functions, composition of functions.

Unit II

Introduction to data structures: concept of data structures, data structure operations, algorithms, time and space analysis of algorithms, memory representation of arrays. Stacks and Queues: Introduction to stack and operations on stack, stack applications: infix, postfix, prefix, recursion, Tower of Hanoi, Introduction to queues and operations on queues, circular queues, dequeues.

Unit III

Linked List: Introduction to linked list, Representation in memory, Header nodes, doubly linked list, circular linked list. Operations on linked list- traversing, insertion, deletion, searching and concatenation.

Unit IV

Trees: definition & concepts, binary trees, representation of binary tree in memory, traversal of binary tree: inorder, preorder & postorder, binary search tree, heap, general trees, conversion of general trees to binary trees, minimal spanning tree, Kruskal and Prim's algorithm to find a minimal spanning tree.

Graphs: various definitions, diagraphs, multigraphs and weighted graphs, path and circuits, Eulerian path and circuits, Hamiltonian paths and circuits, planner graphs.

Unit V

Searching & Sorting: sequential searching, binary searching, insertion sort, selection sort, quick sort, bubble sort, heap sort, merge sort, radix sort, comparison of sorting methods.

String processing: string storage, string operations, word processing: replacement, insertion, deletion, pattern matching algorithms.

Note:- Implementation of algorithms through C.

Text Books:

1. Data Structure and Program Design by Robert Kruse.
2. Data Structures by Seymour Lipschutz, Schaum Outline Series
3. Discrete Mathematics by K.D.Joshi
4. Discrete Mathematics Structure for Computer Science by B. Kolman. and R.C. Busby, IInd Edition, Prentice Hall of India Pvt. Ltd. New Delhi.

MCS 103 **OPERATING SYSTEM**

Unit I

Operating system: concept, definition, types: on-line system, off-line system, spooling, buffering, multiprogramming, multitasking, multiuser system, multiprocessing, batch processing system, time sharing systems, parallel systems, distributed systems, real time systems, Operating system services: system calls and system program.

Unit II

File concepts-file support, access methods, allocation methods, directory systems, process concept, process scheduling, scheduling concepts, algorithms evaluation techniques, NTFS, HTFS, AFS.

Unit III

Memory Management- monitors, swapping, MFT, MVT, compaction, paging, segmentation, paged segmentation, segmented paging, multilevel paging, Virtual Memory- demand paging, overlays, page replacement algorithms, thrashing, disk & drum scheduling -FCFS, SSTF, SCAN, C-SCAN, Look, C-Look.

Unit IV

Deadlock- problem, prevention, avoidance, detection, recovery, concurrent processes, precedence graph, critical section problem, semaphores & its implementations, introduction to networks and distributed systems, distributed coordination.

Unit V

Architecture of Unix O.S.: introduction to system concept buffer cache, buffer headers, structure of buffer pool, buffer retrieval, reading and writing disk blocks, advantage and disadvantage of buffer cache, i-node, structure of regular files, directories, conversion of path name to an inside, super block i-node assignment to new file, allocation of disk blocks.

Text Books:

1. Operating systems concepts by Silberschatz.
2. The design of the UNIX operating system by Maurice J. Bach.

Reference Book:

1. Operating systems by Andrew S. Tanenbaum.

MCS 104 **OBJECT ORIENTED PROGRAMMING WITH C++**

Unit I

Oops fundamentals: Oops vs. procedural programming, Oops terminology, data abstraction, data-hiding, class, object and methods, inheritance, polymorphism.

Unit II

General C and C++ programs: including files, declaration and definition of variables, basic types, array, structures, conditional operators, operator precedence, and statements; if-else, case and loops. Functions, call by reference, call by value. Introduction to pointers, pointer arithmetic.

Unit III

Implementation of features of Oops in C++ (a): overloaded operator and functions, inline function, friend function. keywords eg. new, type conversions.

Unit IV

Implementation of features of Oops in C++ (b): derived classes, constructor and destructor, overriding, inherited member functions, multiple inheritance, this pointer. virtual functions and polymorphism.

Unit V

File Handling: classes for file stream operations, opening and closing a file, file opening modes, file pointers and their manipulations sequential access, random access, error handling, command line arguments, Exception Handling: basics of exception handling, handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception.

Text Books:

1. ANSI C++ by Balagurswamay.
2. Let us C by Kanetkar.

Reference Books:

1. Object oriented programming in Microsoft C++ by Robert Lafore, Galgotia publication.
2. ANSI C by Balaguruswamy.

MCS 201 COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS

Unit I

Solution of transcendental and polynomial equations in one variable and solutions of system of linear equations. Errors in numerical calculations, Bisection method, Iteration method, Newton Rapson method, False Position method, Jacobi Iterative method, Gauss Seidel method, Gauss Elimination method.

Unit II

Newton's interpolation formulas, Lagrange's interpolation formula, Newtons divided Difference interpolation formula, Hermite's problem and Hermite's interpolation, Spline interpolations.

Unit III

Numerical Differentiation and Integration: Numerical differentiation, numerical integration, Trapezoidal rule, Simpson's 1/3 rule, Newton Cotes formulas, Gauss Legendre, Chebyshev formula.

Unit IV

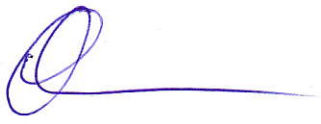
Numerical Solution of Ordinary Differential Equations: O.D.E. of first order, Euler, Picards and Tailors series method, Runge-Kutta Method, Predictor-Corrector method.

Unit V

Discrete Probability: various definitions additive and multiplicative theorem & problems, Bayes' Theorem, Basic concept of Probability distribution, Binomial distribution, Poisson Distribution, normal distribution, correlation and regression analysis, Monte Carlo techniques.

Text Books:

1. Numerical algorithms computations in science and engineering by E. V. Krishnarnurthy and S.K. Sen.
2. Numerical methods by E.S.Sastry.
3. Basic statistical computing by D.Cook, A.H. Vraven.
4. Numerical Methods for Scientistics and Engineers by M.K.Jain.



MCS 202 **SOFTWARE ENGINEERING**

Unit I

Introduction to Software Engineering: Software development life cycle, project size and its categories. Software team Structure-democratic, chief programmer and hierarchical team structures, project control. Life cycle models-Spiral model, Waterfall model, Prototyping model. Software cost estimation techniques-Expert judgment, Delphi cost estimation techniques, WBS cost estimation techniques, COCOMO model.

Unit II

Software Design: fundamental design concepts, abstraction, information hiding, structure, modularity, modules and modularization criteria, coupling and cohesion. Design-notations- data flow diagrams, structure charts, HIPO diagrams, procedure templates, pseudo codes, structured flowcharts, structured english, decision tables. Design techniques-stepwise refinement, structured design, integrated top-down development. Object oriented design concept and methods, class and object definition, refinery operation.

Unit III

Software Quality Assurance: quality concepts, metrics for software quality, software quality assurance, SQA activities, software reviews, formal technical reviews, software reliability.

Unit IV

Software testing techniques: Software testing fundamentals, white box testing, basis path testing, control structure testing, black box testing. Software testing strategies: strategic approach to software testing, unit testing, integration testing, validation testing, system testing.

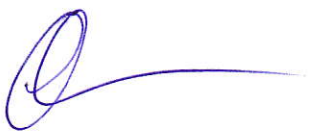
Unit V

Computer Aided Software Engineering: building blocks for CASE, taxonomy of CASE tools, Integrated CASE environments.

Brief introduction to Ada and features relevant to software engineering.

Text Books:

1. An Integrated approach to Software Engineering by Pankaj Jalote.
2. Software Engineering Concepts by Richard Fairley.
3. Software Engineering by R.S. Pressman.



MCS 203 **DATABASE MANAGEMENT SYSTEM (ORACLE- BASED)**

Unit I

Introduction to E-R Model & Relational Algebra: Introduction, advantage of DBMS approach, various views of data, data independence, schema & sub-schema, primary concept of data models, Data base languages, Database Administrator & users, Data dictionary, Overall System architecture. E-R Model: basic concept, design issues, mapping constraints, keys, ER-diagram, weak and strong entity sets, specialization & generalization, aggregation, design of ER Schema to tables.

Unit II

Relational Model: domains, relations, relational databases, various types of keys (super, candidate, primary, alternate, secondary, foreign keys), structure of Relational Algebra, Relational Algebra with extended operations, modifications of databases, idea of relational calculus.

Unit III

SQL, Functional Dependencies & Normalization: basic structure of SQL , set operations, aggregate functions, null values, nested sub-queries, views, modification of databases, join relations, DDL, DML, Assertion and Triggers: basic definitions, trivial and non trivial dependencies, closure set of dependencies & of attributes, canonical cover. Introductions to normalization: loss less and lossy decomposition, First, second and third normal forms, dependency preservation, BCNF, multi-valued dependencies and fourth normal form, join dependencies and fifth normal form.

Unit IV

Transactions, Concurrency & Distributed Databases: basic concept of transaction, ACID properties, transaction state, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, data access. Recovery & Atomicity -log based recovery, deferred database modification, immediate database modification, check points. Distributed Databases: basic idea, distributed data storage, data replication, data fragmentation (horizontal, vertical & mixed).

Unit V

Storage Structure, File Organization, Network & Hierarchical Model: overview of physical storage media, magnetic disks (performance and optimization), basic idea of RAID, File organization, organization of records in files, basic concept of indexing, ordered indices. Network model, Hierarchical Models: Basic Idea, Data structure diagram, DBTG model, Implementation of Network model, Tree structure diagram, Implementation technique of Hierarchical model, comparison of three models.

Text Book:

1. Database System Concepts by A.Silberschatz, H.Korth (3rd edition) McGraw Hill Pub.

Reference Books :

1. An Introduction to Database System by C.J. Date (6th edition) Addison Wesley.
2. An Introduction to Database System by B.C. Desai, Galgotia Publication.
3. Fundamentals of Database System by Elmasri & Navathe(3rd edition)Addison Wesley.
4. Database Management System by Alexix Leon Mathews Leon
5. Oracle 8 The complete reference by Koch & Loney, Oracle Press .

MCS 204
Computer Networks

Unit-I
Basic Concept of Computer Network : Line Configuration, Topology, Transmission Modes, Categories of Network, Signals (Analog & Digital) , Encoding and Modulation : (Digital to Digital Conversion, Analog to Digital Conversion, Digital to Analog Conversion, Analog to Analog Conversion), Multiplexing, Layered network architecture, ISO-OSI Reference Model,

Unit –II
Transmission media, Error detection, parity check codes, CRC, Hamming code, Data Link Protocols Stop and wait protocol, Noise free and noisy channels, Sliding window protocol (Go Back n ARQ, Selective Reject ARQ), HDLC data link protocol, Asynchronous transfer mode (ATM) : ATM cells, header and cell formats, layers in ATM , class 1,2,3,4, traffic.

Unit-III
Random Access Data Networks: Concept of Random access, pure ALOHA, slotted ALOHA. Local Area Networks: -IEEE 802.3, 802.4 and 802.5 protocols, FDDI protocol.

Unit-IV
Network Layer Protocols: Design Issues, virtual circuits and datagram, routing Algorithms, Flow and Congestion control: General principles, window flow control, packet discarding, traffic shaping, choke pocket, dead locks and their avoidance.

Unit-V
Presentation and Application Layer protocols: presentation concepts, SNMP, Abstract syntax Notation 1 (ASN 1), Cryptography: substitution and transposition ciphers, DES, DES Chaining, Breaking DES, Public Key Cryptography, authentication protocols, electronic mail.

TextBooks:-

1. A.S. Tanenbaum "Computer Networks" PHI
2. Data Communication and Networking : Behrouz A. Frozen

Reference Books:-

1. J.F. Hayes "Modelling and Analysis Computer Communication Networks"
2 D. Bestsekas and R. Galleger "Data Networks", PHI 2nd edition.
3 D.E. Comer "Internetworking with TCP/IP" PHI.
4 G.E. Keiser "Local Area Networks" McGraw Hills.
5 W. Stallings "Data & computer communication" Maxwell international

MCS 301 **THEORY OF COMPUTATION**

Unit I

Mathematical Preliminaries: principal of mathematical induction / strong mathematical induction, automation systems, DFA, NDFA, NDFA to DFA conversion & related theorem, 2DFA, Crossing Sequences, Design of Finite Automata, Mealy and Moore machines: Properties & Construction. Minimization of FA.

Unit II

Phrase structured grammar: Chomsky classification, construction of grammar, derivation of language generated by grammar, closure properties of family of languages: union, concatenation, complement, intersection, kleene star, transpose, homomorphism, substitution & related theorem.

Unit III

Regular Expression: Equivalence of R.E. to FA & related theorems, DFA with Null moves, Arden's theorem and conversion of T.S. into R.E. and vice versa, equivalence of two finite automata, pumping lemma and its application, conversion of regular grammar to FA and vice versa, closure properties, decision algorithms.

Unit IV

Context free grammar & push down automata: definition, derivation tree, ambiguity & unambiguifying CFG, reduced grammer (no proof), removal of null & unit production (no proof), CNF & GNF (no proof), closure properties, decision algorithms, CYK membership algorithms, pumping lemma and its application. Push Down Automata: definition, I.D., determinism and non-determinism, construction of PDA, relation of PDA and CFG, conversing of PDA into CFG & CFG into PDA (no proof). 2way PDA, Linear bounded Automata. Parsing: top down and bottom up parsing.

Unit V

Turing Machines: definition, I.D., determinism and non-determinism in TM, Multitape, Multitrack & Multihead TMs, construction of TM, undecidable problems, post correspondence problem, modified PCP, Introduction to complexity theory, Russel's Paradox, NP-completeness.

Text Book:

1. Mishra & Chandarshekharan: Theory of Computer Science, PHI.

Reference Books:

1. Introduction to Automata theory, Languages & Computation by Hoperoft & Ullman, Narosha Publishing House.
2. Theory of Computation by Lewish Papadimutrau, PHI, New Delhi.
3. Elements of Discrete Mathematics by C. L. Liu, Mc. Graw Hill.

MCS 302 **TECHNIQUES OF OPERATION RESEARCH**

Unit I

Introduction: nature and meaning of O.R. Modelling in operations research, features of operation research, scope of operations research. Linear Programming Problem: formulation of L.P.P. solution of L.P.P. graphical method, simplex methods, duality.

Unit II

Assignment problems: Mathematical formulation, Reduction theorem, methods of solving the assignments problems, Unbalanced assignment problem, Transportation problem: formulation, basic feasible solution: North-West-Corner method, least cost method, Vogel's approximation method, Optimum solution: Modi method.

Unit III

Project management: introduction, network diagram representation, time estimates and critical path in network analysis, project evaluation and review techniques. Job sequencing: processing n jobs through 2 machines, processing n jobs through 3 machines, processing 2 jobs through m machines.

Unit IV

Queuing Theory: introduction, queuing system Transient and steady traffic inlets, Distribution of arrival distribution of departure, M/M/I: ∞/ FCFS model. Replacement problems: replacement policy for items whose maintenance cost increases with time and money value is constant.

Unit V

Deterministic Inventory Models, what is inventory, types of inventory, inventory decisions, how to develop n variables model, costs involved in inventory problems, variables in inventory problem, classification of characteristics of inventory systems, EOQ model without shortage.

Text Books:

1. Operations Research by Taha.
2. Operations Research by S D Sharma.

Reference Books:

1. Introduction to Operations Research (Sixth Edition) by F.S. Hillier and G.J. Lieberman, Mc Graw Hill International Edition, Industrial Engineering Series, 1995.
2. Linear Programming by G. Hadley, Narosa Publishing House, 1995.

MCS 303 **OBJECT ORIENTED PROGRAMMING WITH JAVA**

Unit I

The overview of Java: Introduction of Java and Object Oriented Programming, data types, variables, literals, type conversion and casting, operators and expressions arrays, control statements (if, switch, while, do-while, for, break, continue, return).

Unit II

Introduction to classes: class fundamentals, declaring objects, introduction of methods and constructors, finalize() method, this keyword, overloading of methods and constructors, exploring the string class ,nested and inner classes, command line arguments. Inheritance (basics, use of super keyword, multilevel inheritance, method overriding, abstract classes, use of final with inheritance.)

Unit III

Interfaces Exception handling and Multithreading:- packages (defining a package, understanding of classpath, access protection, importing packages). Interfaces (defining an interface, implementation, inheritance in interfaces). Exception Handling (fundamentals, exception types, try and catch, multiple catch clauses, nested try, throw, throws, finally, creation of your own exception sub classes).

Unit IV

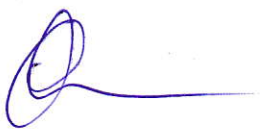
Multithreaded Programming (main thread, creating a thread), implementing Runnable Interfaces and Extending Thread class, Use of isAlive(), join(), sleep(), wait(), notify(), notifyall(), suspend() and resume() functions and synchronization.

Unit V

Special Features of Java: Introduction of Applet class (Applet basics, architecture, simple applet display methods), Introduction to AWT, Event Handling (Delegation event model, Event classes and Event Listener Interfaces), Basic Introduction of Java Beans and Servlets.

Text Books :

1. The complete reference Java 2 by Pattrick Naughton and Herbert Schieldt.
2. Beginning Java 2 by Ivor Horton (Wrox Publication).
3. Mastering Java 2 by BPB Publication.



MCS 304(1) **ARTIFICIAL INTELLIGENCE**

Unit I

AI problems and problems solving technique, production systems, control strategies, forward and backward chaining, matching indexing, DFS & BFS, 8-puzzle problem. Heuristics Search techniques: hill climbing, branch and bound search, best first search, A* algorithm, AND/OR graph & AO* algorithm, constraint satisfaction problems.

Unit II

Introduction to LISP, knowledge representation: PL, FOPL, skolemization, clausal form, unification, resolution, Monkey-banana problem, inference rules, frames, conceptual dependency and scripts, associative networks.

Unit III

Game playing: Minimax search procedure, Alpha-Beta cutoffs, additional refinements. Natural language processing: parsing techniques, RTN, ATN, semantic analysis.

Unit IV

Planning: components of planning system, goal stack planning, nonlinear planning. Expert Systems: introduction and application, expert system shells, explanation based learning, knowledge acquisition.

Unit V

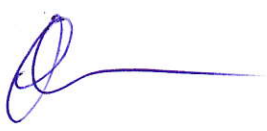
Learning: Rote learning, learning by taking advice, learning from examples: induction, explanation based learning, machine learning. Elements of computer vision. Inconsistency and uncertainty.

Text Books:

1. Artificial Intelligence by E.Rich.
2. Artificial intelligence by D. W.Patterson.

Reference Books:

1. Principles of Artificial Intelligence by Nils J. Nilson.
2. Artificial intelligence by P .H. Winston.
3. LISP by Wriston & Horn.



MCS 304 (2) **ALGORITHM DESIGN**

Unit I

Introduction- algorithm, writing algorithm in sparks, writing structured programs, analyzing algorithms, stacks, queues, trees, heaps and heap sort, set & disjoint set, union, graphs, hashing.

Unit II

Divide and Conquer: the general method, binary search, finding the maximum and minimum, merge sort, quick sort, selection sort.

Unit III

The Greedy Method: the general method, optimal storage on tapes, knapsack problem, job sequencing with deadlines, optimal merge patterns, minimum spanning trees, single source shortest paths.

Unit IV

Backtracking: the general method, the sequence problem, sum of subsets, eight queens problem, graph coloring, Hamiltonian cycles.

Unit V

Branch and Bound, LCR, FIFO branch and bound, zero-one knapsack problem, algebraic simplification and transfer matrix, fast fourier transform.

Text Books:

1. Fundamentals of Computer Algorithms by E. Horowitz. & S. Sahni.
2. Design and analysis Algorithms by Aho, J.E. Hoproft. & J.D. Ullman.

MCS 304(3) **MODELLING AND SIMULATION**

Unit I

System Models: concept of system, system environment, continuous and discrete systems, system modeling, types of models, static and dynamic models, subsystems, environment segment, production segment, management segment, function of system, analysis of system design.

Unit II

System Simulation: techniques of simulation, Monte Carlo method, types of system simulation, numerical computation techniques for continuous and discrete models, distributed lag models, Cobweb models, continuous system models.

Unit III

Differential equations Continuous System, simulation languages, CSMP III, feedback systems, System Dynamics: exponential growth and delay models, logistic models representation of time delays, feedback in socio-economic system, biological example.

Unit IV

Dynamo language, discrete system, simulation, discrete events, generation of arrival patterns, simulation programming tasks, simulation of a telephone system, discrete simulation languages.

Unit V

Probability concepts in Simulation: stochastic variables, discrete probability functions, continuous probability functions, measures of probability functions, continuous uniformly, distributed random numbers, computer generation of random numbers, a uniform random number generator generating discrete distributions.

Text Books:

1. System Simulation by G. Gordan, PHI.
2. System Simulation with digital Computer by N.Deo.

MCS 304(4) **VISUAL BASIC**

Unit I

Introduction to VB programming, the integrated development environment (menu bar, toolbars, toolbox, properties window, form designer, project, explorer), designing the user interface, aligning the controls.

Unit II

Variables, constants, keywords, procedures (subroutines & functions), control statements (if-then, select-case), loop structures (do-loop, for-next, while-wend), nested control structure, array, collections.

Working with Forms, designing forms at runtime, developing database applications, linking with the other database tables, key board triggered events, graphics control, co-ordinate system, graphics methods.

Unit III

Using data manager, dialogue boxes, built-in and customized dialog boxes, communication with other window applications (such as worksheets), grid control. Interaction with files, reading and writing files.

Unit IV

Creating reports, crystal reports, Basic ActiveX controls, multiple document. Tree view, list view control interface, OLE Automation.

Unit V

Database Programming with VB, data control, data record set bound control, database object, ADO and RDO, data environment.

Text Books:

1. Complete Reference to VB by Noel Jerke (Tata McGraw Hill).
2. Mastering Visual Basic (Tata McGraw Hill).

MCS 401 **SYSTEMS PROGRAMMING**

Unit I

Introduction: machine structure, machine language and assembly language, elements of assembly language programming, need for assemblers, design of assemblers: one pass and two pass assembler, symbol table organization, table processing, searching and sorting.

Unit II

Macro Processors: Macro instructions, features of macro facility, design of macro processor: design of one and two pass macro processor and their relationship with an assembler.

Unit III

Linkers: relocation and linking concepts, design of linker, self-relocating programmes. Loaders: Loading schemes: compile and go loaders, General loading Scheme: absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, other loader schemes: binders, linking overlays, dynamic binders, design of absolute loader, design of direct linking loader.

Unit IV

Compiler Design: structure of a compiler, finite automaton and lexical analysis: role of lexical analyzer, regular expressions, finite automation, LEX. Syntax analysis: Role of parser, context free grammar. Basic parsing techniques: bottom up parsing, top down parsing, operator precedence parsing, LR parsers.

Unit V

Syntax directed translation schemes, intermediate code generation, intermediate languages, code optimization, loop optimization, code generation, machine model of code generator, error detection and recovery.

Text Books:

1. System Programming by John J. Donovan (Tata McGraw Hill).
2. Compilers principle, techniques and tools by Alfred V. Aho, Ram Sethi (Pearson Education)

Reference Books:

1. Systems Programming and Operating Systems by D.M. Dhamdhare (Tata McGraw Hill)
2. Compiler Design by A S Ullman.

MCS-402 **COMPUTER GRAPHICS**

Unit I

Input / output devices, refresh CRT, raster and random scan displays, DVST, Line DDA Algorithm, Bresenham's line algorithm Midpoint and Bresenham's Circle Generating algorithm, Ellipse, Scan-line polygon fill, inside/ outside test, Boundary – fill, flood fill algorithm, character Generation.

Unit II

Attribute of output primitives: line attributes, color and Gray Scale levels, CMY, RGB color model Character attributes, 2-D viewing, Cohen-Sutherland, Midpoint subdivision, Cyrus beck and Liang-Barsky line clipping algorithm, Character clipping.

Unit III

Transformation in 2D and 3D: translation, rotation, scaling, shearing, reflection. Homogeneous Coordinate System.

Unit IV

Parallel and perspective projections, Ortho graphics cabinet, cavalier and axonometric, projections, methods of general parallel and one point perspective projections, clipping list priority hidden line elimination algorithm, Z-buffer and floating horizon algorithm.

Unit V

Hermite cubic curves and surfaces, Beizer and B-spline curves and surfaces, rational curves and surfaces of revolutions, cylindrical, ruled and Sweep surfaces.

Text Book:

1. Computer Graphics by Hearn and Baker.

Reference Books:

1. Commuter graphics by Foley, Vandam, Feiner & Hughes, 2nd Edition, Addition Wesley publishing.
2. Computer graphics by Hill, Mac Millan publishing.
3. Mathematical elements of computer graphics by Rogers & Adams, 2nd Edition, McGraw hills, ISE.
4. Geometric modeling by Mortenson, John Wililay publishing.

MCS 403 (1) **NEURAL NETWORK**

Unit I

Characteristics of Neural Networks, biological neuron , action potentials , neuron firing, artificial neural networks, TLU, multilayer neural networks models of neuron, topologies, basic learning laws.

Unit II

Activation dynamics models: additive and shunting, bivalent additive BAM, functional units of ANN for pattern recognition Task.

Unit III

Analysis of Pattern Association, classification and mapping networks, training the threshold as weight in perception rule and delta rule, LMS and Back propagation algorithm.

Unit IV

Analysis of pattern storage networks: Hopfield Model: capacity and energy analysis, state transition diagram. Competitive learning Neural Networks: introduction, components, analysis of feedback layer for different output functions.

Unit V

Fuzziness as multivalence, subset hood, fuzzy systems: as structured numerical estimators, as parallel associators, fuzzy – entropy theorem, subsethood theorem, fuzzy hebb's FAM, fuzzy truck backer upper control systems.

Text Books:

1. Artificial Neural Networks by B.Yagnarayana.
2. Neural Networks and Fuzzy systems by Bart Kosko , PHI.

MCS 403 (2) **PARALLEL PROCESSING**

Unit I
Introduction to parallel processing: parallel processing mechanism, parallelism in unprocessed system, parallel computer structure, architecture classification scheme.

Unit II
Pipelining and vector processing: Instruction and arithmetic pipelines, vector processing requirements, pipeline computers and vectorization methods, Various vector processors: STAR - 100, CRA Y-I, CYBER-205, FUJITSU-200, and their special features.

Unit III
SIMD Array processor: parallel algorithm for array processors, SIMD computers and performance enhancement.

Unit IV
Multiprocessor architecture and programming: functional structures, interconnection networks, parallel memory organizations, multiprocessor control algorithms.

Unit V
Interprocess communication mechanisms, system deadlocks and protection, multiprocessor scheduling strategies. Parallel algorithms for multiprocessor-synchronous & asynchronous, Data flow computers: data-driver computing and languages, advantage and potential difficulties etc.

Text Book:

1. Computer architecture and Parallel Processing by Hwang K., Briggs F.A., McGraw Hill, 1985.

Reference Books:

1. Parallelism in Hardware and Software by Lorin H., Prentice hall, 1982.
2. Parallel Processing System by Evans D.J., Cambridge Univ. 1982
3. The Architecture of Pipelined computer by Koggh H.
4. Computer system Architecture by Bafr J.L. Computer Sct. Press, 1980.
5. Parallel Computers Architecture Programming & Algorithm by Hockney R. W. & Jesshope C.R.

MCS 403(3) **IMAGE PROCESSING**

Unit I

Digital Image Fundamentals: an image model, sampling and quantization, some basic relationships between pixels, imaging geometry, image transforms: introduction to the Fourier transform, Discrete Fourier transform, some properties of the two-dimensional Fourier transform, convolution and correlation, sampling, Fast Fourier transform, FFT algorithm, inverse FFT, other separable image transforms, Walsh transform, Hadamard transform, discrete cosine transform, Hotelling transform, application to image rotation, Hough transform.

Unit II

Image Enhancement, background, spatial-domain methods, frequency domain methods, image enhancement by histogram-modification techniques, foundation, histogram equalization, local enhancement, image smoothing, neighborhood averaging of multiple images, image sharpening, sharpening by differentiation, highpass filtering, ideal filter, Butterworth filter, enhancement based on an image model, generation of spatial masks from frequency domain specifications.

Unit III

Image Restoration: degradation model, some definitions, degradation model for continuous functions, discrete formulation, diagonalization of circulant and block-circulant matrices, algebraic approach to restoration, unconstrained restoration, constrained restoration, inverse filtering, removal of blur caused by uniform linear motion, least-mean-square filter, constrained least-squares restoration, interactive restoration, geometric transformations, spatial transformations, gray -level interpolation.

Unit IV

Image Encoding: fidelity criteria, objective and subjective fidelity criteria, encoding process, the mapping, the quantizer, the coder, entropy, Huffman code, b-codes, image encoding relative to a fidelity criterion.

Unit V

Image Segmentation: detection of discontinuties, point and line detection, edge detection, gradient operator, Laplacian operator, combined detection, edge linking and boundary detect1on, local analysis, global analysis via the Hough transform global analysis via graph-theoretic techniques, threshold1ng: foundat1on, role of illumination, a global thresholding technique, optimal thresholding region-oriented segmentation, basic formulation.

Text Book:

1. Image Processing by Gonzalez and Wintz.

MCS-403 (4) **INTERNET & WEB TECHNOLOGY**

Unit I

The Internet's brief history, getting connected to the internet, installing the essential internet clients, internet addresses, domain name system, internet governance, internet hosts, LAN internet access, PPP/SLIP internet access, TCP/IP and other protocols on the internet.

Unit II

Features of the Internet, services provided by the internet, e-mail system, usenet newsgroups, ftp, chatting and conferencing, world wide web: e-commerce, internet and extranet, internet security (firewalls, cryptography, protection from viruses), security of web browsers, impact of the internet on social life.

Unit III

General Web Terminology: web sites, web servers, http, web pages, web portal, web browsers, URL, gophers, search engines, HTML, WML, hypertext and hypermedia.

Unit IV

Virtual networks, value-added networks, private networks, creating a web site, creating web pages with HTML, creating web pages with front page express.

Unit V

Electronic publishing: advantages, disadvantages, copyright issues; credit issues, project gutenberg and online books, electronic journals, magazines and newspapers, web programming material: the java script programming language, applets, guest books web page, counters programming languages, applets, guest book, web page counters.

Text Books:

1. Using the Internet by Honeycutt (Prentice Hall of India).
2. Fundamentals of the Internet by Raynold Greenlaw & Ellen Hepp (Tata McGraw Hill).

MCS 403 (5) **DISTRIBUTED COMPUTING**

Unit I
Parallel computer organization: introduction of multiprocessor, pipeline & vector processor, associative processor, array processor, SIMD, MIMD, data flow M/C, RISC, interprocessor communication, synchronization, systolic structures, Non-vonneumann type computers, data flow machines, production machines.

Unit II
Distributed operating system, resource sharing, neroarteopirating system command languages, agent process, memory management schemes, case study of system like mach, locus accent, file servers, operating system for parallel computing.

Unit III
Distributed Data Base, Introduction to data base structure, relation building database storage, Case study of distributed queries and updates in DDBS, failures line SDDR, ORACLE, INGRES.

Unit IV
Distributed Software: introduction of parallel programming languages, parallel C, OCCAM, concurrent pascal, system programming with C.

Unit V
Parallel language and Algorithm design for the array processor: Actus, other Non-von-neumann type languages; CSP, distributed process (DP), Ada, SR, Linda.

Text Book:

1. Distributed systems: Concepts and Design by Coulouril, Addssion Wesley.

Reference Book:

1. An Introduction to Distributed and Parallel Computing by Joel M. Crichlow PHI Publication.

MCS 403 (6) **WINDOWS PROGRAMMING & VC++**

Unit I

The structure of Windows programming code and Resources, program instances, hungarian notation, a minimal window program structure, the windows: file creating a new window class, message loop.

Unit II

Menus, mouse handling, text and graphics output, types of windows controls (static buttons, option & check buttons, list and combo boxes, scroll bar, edit control), child and pop-up windows, dialog boxes, exchanging data with dialog boxes modeless and system modal dialog box.

Unit III

Memory management in windows using fixed and discard able memory blocks, global memory allocation, file management bitmaps and DLL.

Unit IV

C++ Basics: constants, keywords, variables and data types, control statements, pointers, objects & classes.

Unit V

The VC++ Environment MFC programming with VC++, scrolling, strong data in a file, toolbars & selection, the MFC source code files.

Text Books:

1. Windows API bible by James L. Conger, Galgotia publications.
2. Windows 2000-programming form ground up by Heberl Shield.
3. Windows API primer plus by Jim Conger.
4. Learn VC++ 6.0 Now by Chuck sphar (prentice-Hall India).
5. Professional MFC With Visual C++5 by Mike Blaszczak (work press).

MCS 403(7) **DATA MINING AND DATA WAREHOUSING**

Unit I

Introduction to data mining, data mining – on what kind of data?, data mining functionalities , classification of data mining system. Data Warehousing: introduction to data warehousing. Multidimensional data model: data cubes, star, snow, flake and fact – constellation schemes, measures, concept hierarchies, OLAP operations in Multidimensional, Data model, Data warehouse Architecture, Data warehouse implementation.

Unit II

Data pre-processing & DMQL: Data clearing, data integration and transformation, data reduction, discretization and concept hierarchy generation, data mining primitives, DMQL.

Unit III

Concept description: Introduction to concept description, data generalization, mining class compressions, mining descriptive statistical measures in large data bases.

Unit IV

Association mining: Association rule mining, mining single dimensional association rules from transactional data bases, apriori, improving the efficiency of apriori, FP growth, mining multilevel association rules, mining multidimensional association rules, from association mining to co-relation analysis, constraint based association mining.

Unit V

Classification and prediction: Introduction to classification, issues, classification by decision tree introduction, Bayesian classification, classification by back propagation, introduction to cluster analysis: types of data in cluster analysis, categorization of major clustering methods, partitioning methods, hierarchical methods, outlier analysis.

Text Book:

1. Data Mining Concepts and Techniques by Han and Kamber (Elsevier Publication).

Reference Books:

1. Data warehousing in the real world by Sam Arahory and Dennis Murray.
2. Data mining by Petter Adriaans and Dolfzantinge, Addition Welsey.
3. Data warehousing fundamentals by Paulraj Porria Wse Wiley publication.

MCS 403(8)
BIO-INFORMATICS

Unit I
Bioinformatics – an overview: Introduction, objectives of bioinformatics, kind of data used, information molecules, basic structures of nucleic acids, DNA, RNA, DNA sequencing and polymerase chain reaction (PCR), proteins structure, functions, protein folding and characterization.

Unit II
Biological databases: Introduction, types of databases, nucleotide and protein sequence databases, major bioinformatics databases, introduction to biostatistics, data integration, data analysis. Operating system (Linux, UNIX), HTML, XML, CML, BSML etc.

Unit III
Sequence analysis: Models for sequence analysis, methods for alignment (dot matrices), methods for optimal alignment (gap penalties and scoring matrices), tools for sequence alignment – Fasta, BLAST, PSI-blast, Multiple Sequence Alignment (MSA) - tools and applications.

Unit IV
Phylogenetic analysis: Phylogenetic trees, distance matrix (MD) and character based methods, methods of phylogenetic evaluation, gene prediction methods, gene prediction tools, gene mapping, DNA sequencing, algorithms for alignment of sequencing fragments, DNA micro arrays.

Unit V
Proteomics: Proteome analysis, tools for proteome analysis, different structural proteins, protein classification, methods of structure prediction (known folds and unknown folds), protein function prediction, metabolic pathways, gene networks their properties and analysis.

Text Books:

1. Introduction to Bioinformatics by Attwood.
2. Bioinformatics – Sequence and Genome analysis by David W. Mount.
3. Bioinformatics – Concepts, skills and applications by S. C. Rastogi.
4. Recent advances in Bioinformatics by Irfan K. Khan.