MCS 301

THEORY OF COMPUTATION

Unit I
Mathematical Preliminaries: principal of mathematical induction / strong
mathematical induction, automation systems, DFA, N DFA, N DFA to DFA conversion &
related theorem, 2 DFA, 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 & Multthead 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, Narisha Publishing House.
2. Theory of Computation by Lewis Papadimitra, PHI, New Delhi.
Unit I

Unit II

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 n machines.

Unit IV
Queueing Theory: introduction, queuing system Transient and steady traffic inlets, Distribution of arrival distribution of departure, M/M/1: x/ 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:

Reference Books:
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 Patrick Naughton and Herbert Schieldt.
2. Beginning Java 2 by Ivor Horton (Wrox Publication).
3. Mastering Java 2 by BPR Publication.
ARTIFICIAL INTELLIGENCE

Unit I

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: Role learning, learning by taking advice, learning from examples: induction, explanation based learning, machine learning. Elements of computer vision, inconsistency and uncertainty.

Text Books:
2. Artificial intelligence by D. W. Patterson.

Reference Books:
2. Artificial Intelligence by P. H. Winston.
3. LISP by Wriston & Horn.
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:
MCS 304(3)  
MODELING 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. Jordan, PHI.
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, keyboard 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: