

**Department of Computer Science**  
**M.Sc Computer Science**  
 Revised Syllabus from the academic year 2008 onwards

**Scheme**

<b>I Semester</b>			
Course No	Subject	Credits	Total Credits
COS511	Computer Organization & Architecture	4	21+
COS512	Data Structures and C++	3	
COS513	Mathematical Foundations of Computer Science	3	
COS514	Advanced Database Management Systems	3	
COS5--	Elective I	3	
COS515	Lab I (based on Data Structures and Graphics using C++)	4	
COS516	Case Study I	1	

<b>II Semester</b>			
Course No	Subject	Credits	Total Credits
COS521	Operating Systems	3	20+
COS522	Computer Networks	3	
COS523	Network Programming in Java	3	
COS524	Design and Analysis of Algorithms	3	
COS5--	Elective II	3	
COS525	Lab II (based on Network Programming in Java and DBMS)	4	
COS526	Case Study II	1	

<b>III Semester</b>			
Course No	Subject	Credits	Total Credits
COS531	System Software and Compiler Design	3	21+
COS532	Software Engineering-an OO approach	3	
COS533	Embedded Systems	3	
COS5--	Elective III	3	
COS5--	Elective IV	3	
COS533	Lab III (based on Embedded Systems and Rational Rose)	4	
COS534	Seminar	1	
COS535	Case Study III	1	

<b>IV Semester</b>			
Course No	Subject	Credits	Total Credits
COS541	Project & Viva-Voce	12	12

**List of electives**

<b>Semester I</b>		
Course No	Subject	Credits
COS501	Computer Graphics and Multimedia	3
COS502	Modeling and Simulation	3
COS503	Artificial Intelligence	3
<b>Semester II</b>		
COS503	Artificial Intelligence	3
COS504	Micro Processors and Interfacing	3
COS505	Computer Based Optimization Techniques	3
COS506	Distributed Computing	3
COS507	Machine Learning & Data Mining	3
COS508	Unix & Socket Programming	3

<b>Semester III</b>		
COS508	Unix & Socket Programming	3
COS509	Cryptography And Network Security	3
COS5010	Network Administration and Management	3
COS5011	Pattern Recognition	3
COS5012	Wireless Networks	3
COS5013	Software Project Management	3
COS5014	Software Agents	3
COS5015	Current Trends and Technologies	4

Note: The elective papers shown in the above list can be offered in any one of the first three semesters as per the decision of the Department Council.

#### **Eligibility**

Candidates shall be required to possess First class Bachelor's Degree with not less than 60% marks in Computer Science/ Computer Applications/Electronics/Any other degree in Science with Computer Science or Computer Applications as major components (with at least 2 core papers in Computer Science) or an equivalent degree recognized by the University of Kerala.

**Admission:** As per C.S.S regulations

**Duration:** 4 semesters: 3 semesters of taught courses and one semester of project work.

**Examinations:** As per C.S.S regulations

#### **Sessional Marks:**

The sessional marks awarded in each paper will be based on 2 class tests and assignments/ lab reports for theory/ practical and attendance. Split up is shown below:

##### Theory

Internal Examination (CA) - 40 marks

The split-up for internal mark is given below:

Attendance	- 5 marks
Class Test (minimum 2)	- 15 marks
Assignment (minimum 2)	- 10 marks
Test/Seminar/Practical Test/Records/Viva	- 10 marks

End Semester Examination (ESA) - 60 marks

For seminars, the sessional marks will be based on presentation/seminar report and participation.

##### Practical:

Lab Exam	- 80 %
Viva-Voce	- 20 %

##### Case Study:

Content	- 20%
Software & Methodology	- 40%
Presentation	- 25%
Viva-Voce	- 15%

##### Project:

Content	- 20%
Software & Methodology	- 40%
Presentation	- 25%
Viva-Voce	- 15%

The students are required to present the progress of their project works at least twice to the concerned Faculty members.

**Programming platforms:** Unix/Linux, Windows

**Special Software Skills:** Other skill sets required to complete the programme will be announced by the Department at the beginning of the semester.

# Detailed Syllabus

## Core Subjects

### First Semester

#### **COS 511 COMPUTER ORGANIZATION & ARCHITECTURE**

**Module I** Introduction to digital design- Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed Point, Floating Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits. ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic , Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.

**Module II** Introduction, Computer Evolution and Performance, System Buses : Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, PCI. Internal Memory : Computer Memory system, Semi Conductor Main Memory, Cache Memory, Advanced DRAM Organization. External Memory : Magnetic Disk, Optical Memory, Magnetic Tapes. Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupted –Driven I/O, DMA, I/O Channels and Processors, External Interface.

**Module III** Computer Arithmetic: ALU, Integer Representation, Integer Arithmetic, Floating - Point Representation, Floating - Point Arithmetic Representation. Instruction Sets: Characteristics and Functions: Machine Instruction Characteristics, Types of Operands, Types of Operations, Assembly Language, Instruction Sets: Addressing modes and Formats: Addressing, Instruction Formats. CPU Structure and Function: Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining

**Module IV** Reduced Instruction Sets Computers: Instruction Execution Characteristics, Reduced Instruction Set Architecture, RISC Pipelining, The RISC versus CISC Controversy. Control Unit Operations: Micro Operations, Control of the Processor, Hardwired Implementation, Micro programmed Control: Microinstruction sequencing, Microinstruction Execution.

#### **Text books:**

- Computer System Architecture By M. Morris Mano ( Unit I)
- Computer Organization & Architecture By William Stallings. Pearson Education (Unit II,III & IV).

#### **Reference:**

- V.C.Hamatcher,et al “Computer Organization”, Tata Mcgraw Hill.

#### **COS512 DATA STRUCTURES AND C++**

**Module I:** Introduction to Object Oriented programming: Object Oriented programming Concepts- Class, Objects, Messaging, Polymorphism and Inheritance. Syntax and semantics of C++, Object Oriented programming in C++

**Module II:** Implementation of Object Oriented programming Concepts in C++ - classes, objects, constructors, destructors, inheritance, templates, exception handling. Linear Data Structure: Arrays, Linked lists, stack and queue.

**Module III:** Nonlinear Data Structures: Trees,- binary tree, AVL trees; Graphs and its representations. File structures – Fields, records and files, sequential, direct, indexed sequential and relative files, Hashing, Inverted lists and Multi-lists, B trees and B+ trees.

**Text books:**

- Lippman, Stanley B, C++ primer .3 ed.-Pearson Education Asia,2000
- Y.Langsam, M.j. Augenstein and A.M.Tanenbaum,"Data Structures Using C and C++"

**Reference:**

- G.L. Heileman, "Data Structures, Algorithms and Object Oriented Programming"
- Horwitz ,E and Sahni, Sartaj, Fundamentals of Data structures.- Galgotia,
- Cormen, Thomas H; Leiserson, Charles E and Rivest, Ronald L,
- Introduction to Algorithms. 2ed.-New Delhi, Prentice Hall,1990

**COS513 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

**Module I:** Mathematical Logic-Propositional (Boolean) Logic, Predicate Logic, Well-Formed Formulae (WFF), Satisfiability and Tautology, Review of Set Theory and Vector Space, Relations, Functions, Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques.

**Module II:** Algebraic structures:-Semigroups and Monoids, Homomorphism , Isomorphism, Groups, Subgroups, Symmetric Groups, Co-sets and Lagrange's Theorem, Normal Subgroups, Permutation of Groups and Burnside's Theorem, Finite fields and Error correcting/detecting codes. Graphs-Basic Terminology, Weighted Graphs, Walk, Path and Circuit, Hamiltonian Paths and Circuits, Planar Graphs and Euler's formula, Trees, Rooted trees, Prefix codes, Binary Search Trees, Spanning Trees, Eccentricity of a vertex radius and diameter of a graph.

**Module III:** Introduction to formal languages: Basic concepts of automata theory, Finite automata: Deterministic finite automata, Non- Deterministic finite automata, PDA, DPDA, CFG, Turing Machine and Chomsky hierarchy of languages.

**Text books:**

- Tremblay, J P; Manohar, R, Discrete mathematical structures with applications to computer science. - TMH, 1975.
- Liu, C L, elements of discrete mathematics. 2 ed.-MCH,1986.
- John.E.Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia, 2002.

**References:**

- Deo, Narsingh, Graph theory with applications to engineering and computer science. – PHI
- McElice, Robert J; Ash, Robert B; Ash, Carol, Introduction to discrete mathematics. - MCH, 1989.

**COS514 Advanced DBMS**

**Module I:** Introduction to Databases, Database Environment, The Relational Model and Languages: The Relational Model, Relational Algebra and Relational Calculus, QBE, Database Design, ER diagrams and their transformation to relational design, Normalization, Security, Transaction Management: Transaction Support, Concurrency Control, Database Recovery.

**Module II:** Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands, Database objects like – Views, indexes, sequences, synonyms and data dictionary, SQL.

**Module III:** Object Oriented Database Management Systems: Concepts, Composite objects, Integration with RDBMS applications, Issues in OODBMSs, Advantages and Disadvantages of OODBMSs Object-Oriented Database Design. Decision making processes, evaluation of DSS, Group decision support system. Distributed Databases.

**Text books:**

- Connolly, Thomas M; Begg, Carolyn E, Database systems: a practical approach to Design, Implementation, and Management. 3 ed. - Pearson Education Asia, 2003.
- C.J. Date, Introduction to Database Systems, Pearson Education Asia, 2003.

**References:**

- Excerpts from Database Systems Design, and Implementation & Management; ISBN: 017641360X
- Database System Concepts Fifth Edition. Avi Silberschatz · Henry F. Korth · S. Sudarshan. McGraw-Hill ISBN 0-07-295886-3

## **Second Semester**

### **COS521 OPERATING SYSTEM**

**Module I:** Introduction, Mainframe Systems, Desktop Systems, Multiprocessor Systems Distributed Systems, Clustered Systems, Real-Time Systems, Handheld Systems. Computer - System Structure: Computer-System Operation, I/O Structure, Storage Hierarchy, Hardware Protection, Network Structure. Operating - System Structures: System Components, Operating System Services, System Calls, System Programs, System Structure and Virtual Machines. Process Management: Processes: Process Concept, Process Scheduling, Operating on Processes, Cooperating process, Inter-process Communication. Threads: Multithreading Models, Multithreading Issues, Pthreads.

**Module II:** CPU Scheduling: Scheduling Criteria and Scheduling Algorithms, Multiple-Processor Scheduling, Real Time Scheduling and Algorithms Evaluation. Process Synchronization: Critical Section Problem, Semaphores & Monitors. Deadlock: Deadlock-Characterization, Methods of Handling the Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery. Storage Management: Memory Management: Swapping, Contiguous Allocation, Paging, Segmentation and Segmentation with Paging. Virtual Memory: Demand Paging, Page Replacement, Allocation of frames, Thrashing.

**Module III:** File System Interface: Access Methods, Directory Structure, File Sharing, Protection. File System Implementation: File System Structure, Allocation Methods, Free-Space Management. I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations. Mass-Storage Structure: Disks Structure, Disk scheduling and Management, Swap-Space Management. Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Language-Based Protection. Security: Security Problem, User Authentication, Program Threats, System Threats, Encryption and Computer Security. Case Studies: Linux System, Windows 2000, Windows XP.

**Text book :**

- Silberschatz A and Galvin P, Operating system Concepts, 6th Ed Addison Wesley.

**Reference:**

- Operating System, William Stallings, Prentice Hall Second Edition.

## **COS522 COMPUTER NETWORKS**

**Module I:** Network fundamentals and Data Communication: Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN), Wireless Networks, Internetworks; Data Communication: Channel capacity. Transmission media-twisted pair, coaxial cables, fibre-optic cables, wireless transmission, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LAN's, The Web and HTTP; File Transfer: FTP; Electronic Mail in the Internet; DNS-The Internet's Directory Service.

**Module II:** Transport Layer- Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control, Networking Layer & Routing- Introduction and Network Service Model, Routing Principles, Hierarchical Routing, Inter-networking:Switch/Hub,Bridge,Router,Gateways,Concatenated virtual circuits, Fragmentation,Firewalls.The Internet Protocol, Routing and the Internet, What's Inside a Router, IPv6, Multicast Routing, Mobility and the Network Layer.

**Module III:** Link Layer- Data Link Layer: Introduction and Services, Error Detection and Correction Techniques, Multiple Access Protocols, LAN Addresses and ARP, Ethernet. Hubs, Bridges and Switches, Wireless Links, PPP: The Point-to-Point Protocol, Asynchronous Transfer Mode (ATM), Frame Relay, Network Security-cryptography-public key, secret key. Wireless & Mobility- Introduction to Wireless and Mobility. Wi-fi, Mobility Principles, Cellular Telephony, Mobile IP, Ad hoc Networks, Moving Beyond the Link Layer-An Interlude.

### **Text Books:**

- Kurose,James F ; Ross,Keith W , Computer networking: a top-down approach featuring the internet. - Addison-Wesley, 2001.

### **Reference:**

- Comer, Computer Networks and Internets with Internet Applications 4/e
- Andrew S. Tanenbaum, Computer Networks, 4/E, Pearson
- William Stallings, Data and Computer Communications, Seventh Edition, Pearson

## **COS523 NETWORK PROGRAMMING IN JAVA**

**Module I :** Introduction to programming in java - Syntax and semantics of Java. Characteristics of java - a comparative study between java & C++. Interfaces, Packages, Exception handling, Multithreading, AWT and applets, data base programming in Java.

**Module II:** Computer Network and Internet Addressing. Introduction to inter-process communication & Sockets, Java and Network programming: Sockets – Client & Server sockets, UDP Datagrams. URLConnection. Remote Method Invocation.

**Module III:** Web services: Web server – apache & IIS, Basic knowledge in HTML & XML Introduction to client side scripting languages – JavaScript & VB scripts, Introduction to server side scripting languages Servlets, JSP and PHP.

### **Text Books:**

- Naughton, Patrick; Schildt, Herbert., Java 2, the complete reference. - New Delhi, TMH, 1999.
- Harold, Java Network Programming, 3/ED Shroff Publishers

### **Reference:**

- Darnell, Rick Etal., HTML 4. - Techmedia, 1999.
- Ladd, Eric; O'Donnell , Jim, Using HTML 4,XML, and Java 1.2. - PHI, 1999.

- Lerdorf,Rasmus; Tatroe,Kevin., Programming PHP. - Shroff, 2002.
- Harold, Elliot Rusty., XML bible. - IDG books, 2000.
- Using Internet Information Server 4, Nelson Howell,et al, Prentice Hall of India 2001
- Goodwill, James., Developing java servelets. - Techmedia, 1999.
- Hanna, Phil., JSP: the complete reference. - TMH, 2001.

## **COS524 DESIGN AND ANALYSIS OF ALGORITHMS**

**Module I:** Review of basic data structures. Design of Efficient Algorithms -algorithms, Analysis of Algorithms, Time and Space complexity, Asymptotic Notations, Average case analysis of simple programs like finding of a maximum of n elements. Recursion and its systematic removal. quicksort - non recursive implementation with minimal stack storage..

**Module II:** Design of algorithms - Divide and conquer-General methods, binary search, Min Max; Greedy Method -Elements of greedy strategy, 0-1-knapsack problem, Graph Algorithms – Breadth First Search, Depth First Search , Minimum Spanning Trees, Single Source Shortest Path.

**Module III:** Dynamic Programming –all pairs shortest path. Backtracking, Branch and Bound – TSP problem. Deterministic and non deterministic algorithms, NP hard and NP complete problems.

### **Text Books:**

- Cormen, Thomas H; Leiserson, Charles E; Rivest, Ronald L, Introduction To Algorithms. - Prentice Hall of India, 1990.
- Horowitz, Ellis; Sahni, Sartaj; Rajasekara, Sangathevar, Computer algorithms. - Galgotia, 1998

### **References:**

- Weiss, Data Structures and Algorithm Analysis in C++ 2/e
- Levitin, Introduction to the Design and Analysis of Algorithms 1/e

## **Third Semester**

### **COS531 SYSTEM SOFTWARE AND COMPILER DESIGN**

**Module I:** Assembly language fundamentals (8085 based assembly language programming). Assemblers- One pass and Two pass. Macro, Macro Processors- Macro definition and expansion. Macro processor algorithm, Macro processor Design options. Loading, Linking, Relocation, Program relocatability, Linkage editors, Bootstrap compilers.

**Module II:** Compilers- Compiler structure, compiler construction tools, Phases of compiler, Finite Automata, Push Down Automata (PDA), Non-determinism and NFA, DPDA and PDAs and languages accepted by these structures. Grammars, Languages-Types of grammars-type 0, type 1, type 2, type 3. The relationship between types of grammars, and finite machines. Push Down Automata (PDA) and Context free grammars (CFG). Lexical analysis: Specification and recognition of tokens, regular expressions and regular languages. LEX package on Unix. Conversion of NFA to DFA. Minimizing the number of states to DFA. Compilation and Interpretation.

**Module III:** Context free grammars (CFG): Parsing and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Top-down parsers-left recursion and its removal, Recursive descent parser and predictive parser. Bottom up parsers-shift reduce, operator precedence parsing, LR parsers. YACC package on Unix system. Intermediate Codes-Quadruples, triples. Intermediate code generation, Code generation, Code Optimization-optimization.

### **Text Books:**

- Beck, Leland L, System Software: An introduction to system programming.3ed Addison Wesley, 97.
- Aho, Alfred V; Ullman, Jeffrey D., Principles of compiler design. - Narosa, 1985.

**Reference:**

- Donovan, John J., System Programming. - TMH, 1995.
- Holub, Allen., Compiler design in C. - PHI, 1990.

**COS532 SOFTWARE ENGINEERING □ AN OO APPROACH**

**Module I:** Introduction: Structured Programming versus Object Orientated Paradigm. Object Orientation : Benefits, Drawbacks-Object Oriented Software Process. Gathering User Requirements: Fundamental Requirement gathering Techniques-Interviewing, Brainstorming. Essential Use Case Modeling : Drawing Use Case Diagrams, Use Cases : Identifying use cases, Modeling different logic flows. Domain modeling with class responsibility collaborator (CRC) cards: Preparing to CRC Model, Finding classes and responsibilities, Defining collaborators, Arranging CRC cards, Advantages and disadvantages of CRC Modeling. Developing a Supplementary Specification. Identifying change cases. Requirement Validation techniques: Use case scenario testing, User interface walkthroughs, Requirement reviews.

**Module II:** Object - Oriented Concepts: Objects and Classes, Attributes and Methods, Abstraction, Encapsulation and Information hiding, Inheritance, Association, Aggregation, Collaboration, Persistence, Coupling and Cohesion, Polymorphism, Interfaces, Components, Patterns. Object - Oriented Analysis: System Use Case Modeling, Sequence Diagram, Conceptual Modeling, Activity Diagramming, User Interface Prototyping. Object - Oriented Design : Layered Architecture, Class Modeling, State chart modeling, collaboration modeling, Collaboration Modeling, Component Modeling, Deployment Modeling, Relational Persistence modeling, User Interface Design. Object - Oriented Testing: Full Life Cycle Object Oriented Testing (FLOOT).

**Module III:** Software Process: Definition, Waterfall/Serial Development, Iterative and Incremental Development, Process patterns, Extreme Programming, Open Process, Catalysis. The Post-2000 (P2K) Environment – Skills for Specific Positions –Learning Process. Case study based on Rational Ross.

**Text Books:**

- Ambler,Scott W., The Object primer: the application developer’s guide to object orientation and UML. 2 rev ed. - Cambridge University Press.

**Reference:**

- Jawadekar, Waman S.,Software engineering:principles and practice. - TMH, 2004.
- Jacobson, Ivar.,Object-oriented software engineeringb a use case driven approach. - England, Addison-wesley, 1992.
- Booch, Grady;; Rumbaugh, James; Jacobson, Ivar., The Unified Modeling Languageuser guide. - Pearson Education Asia, 2002.

**COS533 EMBEDDED SYSTEMS**

**Module I** Embedded Systems – Hardware Fundamentals Gates – Timing Diagrams – Memory – Microprocessors – Buses – DMA – Interrupts – UART – Other Communication Ports - Interrupts – Interrupt basis – Shared Data Problem - Interrupts Latency. Software Architecture – Round-Robin Round-Robin with Interrupt – Function Queue Scheduling Architecture – Real-Time System Architecture.

**Module II** Introduction to Real Time Operating Systems – Tasks –Task states – Semaphores and Shared Data. Operating Systems Services – Message Queue, Mailboxes and Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment. Basic Design Using a RTOS – Overview – Principles – Encapsulating Semaphores and Queues.

**Module III** Embedded Software Development Tools – Host and Target Machines – Linkers/Locaters for Embedded Software – Getting Embedded Software into the Target System - Debugging Techniques - Testing on your Target Machine – Instruction Set Simulators.

**Text book:**

- David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

**Reference:**

- Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw Hill, First reprint 2003

### **COS534 SEMINAR**

In this paper the students have to prepare a well written seminar report on any new techniques/technologies in computer science and related fields. There shall be a presentation on the basis of the report submitted. The distribution of marks is

Contest	:	40%
Presentation	:	40%
Viva (open session)	:	20%

## **Elective Subjects**

### **First Semester**

#### **COS501 COMPUTER GRAPHICS AND MULTIMEDIA**

**Module I:** Overview of graphic systems, Display devices, Hard Copy Devices, Interactive Input Devices, Display Processors, Output primitives and it's construction algorithms-DDA(Digital Differential Analyzer Algorithm) line drawing algorithm, Bresenham' s line drawing algorithm, Bresenham's circle drawing algorithm. Two Dimensional Geometric Transformations, Window to View port Transformations, Clipping, 3-D Display Techniques, 3-D transformations, Hidden Surface Removal Methods-Back face Detection, Depth Buffer Method,. A-Buffer Method,Scan-line Method,Depth Sorting Method and Area Subdivision Method.

**Module II. Multimedia:** Introduction, Definition, Multimedia System Architecture, Design Objects for Multimedia systems, File Formats for Multimedia Systems, Need for Data Compression, The stages of a Multimedia Project, Multimedia skills and training, The term-multimedia building blocks, Text, The power of meaning, Fonts and faces, Text in Multimedia, Font editing and design tools, Hypermedia and Hypertext.

**Module III:** Multimedia Building Blocks: Sound, The power of sound, Multimedia system sounds, MIDI versus Digital Audio, Digital audio making, MIDI Audio, Audio File Formats, , Adding sound to your multimedia project, Images, making still images, color image file formats, Animation, The power of Motion, Principles of Animation, Making Animations that work, Video, Using Video, How Video works, Broadcast video standards, Integrating Computers and Television, Shooting and Editing Video, Video tips, Recording formats, Digital Video.

**Text Books:**

- Hearn, Donald; Baker, Pauline, M., Computer graphics: C version .2 ed. - Pearson, 1995.
- Vaughan, Tay., Multimedia, Making it work .6 ed. - TMH, 2004.

**References:**

- Newman, William M; Sproull, Robert F., Principles of interactive computer graphics., MCH, 1979.

**COS502 MODELING AND SIMULATION**

**Module I:** System Models - Continuous and discrete models - Static and Dynamic Models - Principles used in modeling - system studies - system analysis - design and postulation. System simulation: Techniques of simulation - Monte Carlo Method - Comparison of analysis and simulation.

**Module II:** Types of system - Simulation Numerical computation for simulation -Applications of digital analog and hybrid computers in continuous system simulation - Real time simulation. Exponential growth models, exponential decay models - Logistic curves - Generation of growth models - system models - system dynamic diagrams

**Module III:** Multisegment models Representation of time - delay - Review of probability concepts - Arrival pattern and service times - Poisson arrival patterns - Exponentiations, Erlang and Hyper Exponential Distribution - Mathematical studies of Queuing problems, Discrete system Simulation.

**Text Books:**

- Gordon, Geoffrey., System simulation.2 ed. - New Delhi, PHI, 1999.

**References :**

- Maryanski F., Digital Computer Simulation , CBS Distributors.
- Banks, Jerry; Carson, John S; Nelson, Barry L, Discrete-event system simulation. 2ed. - PHI, 1999

**COS503 ARTIFICIAL INTELLIGENCE**

**Module I:** Overview of AI, Rule Based Expert Systems, Knowledge Acquisition and Representation: Machine Intelligence, Knowledge Engineering, Procedure for Knowledge Acquisition, Knowledge Representation, Different Representation Schemes,

**Module II:** Reasoning and KRR Systems: Reasoning, Knowledge Representation and Reasoning (KRR) System, Knowledge Representation (KR) Languages, Domain Modeling, Semantic Nets (Associative Networks) Reasoning Systems, Frames Based Systems, Hybrid Representation Systems.

**Module III:** Uncertainty: Introduction, Non-monotonic and Monotonic Reasoning, Confidence Factor, Bayes Theorem, Non-classical logics, Default Logic, Bayesian Networks, Fuzzy Logic, Search Technologies: Problem Solving in AI, Blind Search Techniques, Heuristic Search Techniques, Expert Systems: Introduction, Skill versus Knowledge, Basic Characteristics of an Expert System.

**Text Books:**

- Stuart Russel and Peter Norvig, Artificial Intelligence a Modern Approach, 2nd ed., Pearson Education 2002.

**Reference:**

- Rajendra Akerkar, Introduction to Artificial Intelligence, PHI, 2005. Reading Material
- Nilsson, N.J., Artificial Intelligence: A New Synthesis., Morgan Kaufmann , 1998.
- Rich & Knight ., Artificial Intelligence , 2nd ed., McGraw Hill, 1992

## **Second Semester**

### **COS504 MICROPROCESSORS AND MICRO CONTROLLER**

**Module I** Architecture-General 8-bit microprocessor and its architecture-8085. Functional block diagram-architecture functions of different sections-architecture of 8086 CPU. Instruction Sets-Instruction format - addressing modes-instruction set of 8085 CPU - Instruction cycle-timing diagrams-different machine cycles-fetch and execute operations-estimation of execution time-estimation of execution time.

**Module II** Assembly Language Programming - Assembly format of 8085-assembly directions-multiple precision arithmetic operations-binary to BCD and BCD to binary code conversion – ALU programming using look up table – stack and subroutines. Data Transfer and Interfacing – Data transfer schemes – programs I/O & interrupt structure of 8085 – interrupt driven I/O – DMA serial I/O – input/output ports.

**Module III** Introduction to 8051 Micro controller, 8051 assembly language programming, Jump, loop, call instructions, I/O port programming, 8051 addressing modes, arithmetic instructions, logic instructions.

**Text book :**

- Gaonkar R.S., Microprocessor architecture Programming and application, Wiley Eastern Ltd.,
- New Delhi.
- The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi,Janice Gillispie Mazidi, Pearson Education Asia, Fifth Indian Reprint 2003.

**Reference:**

- Mathur A.P., Introduction of Microprocessors, Tata McGraw Hill Publishing Co.Ltd., New Delhi.
- Mohamed Rafiquzzaman “Introduction to Microprocessors and Microcomputer- Based System Design” 2nd edition, CRC Press.

### **COS505 COMPUTER BASED OPTIMIZATION TECHNIQUES**

**Module I:** Linear Programming- Formulation of LPP, General mathematical model of LPP, Slack and Surplus variables, Canonical and standard form of LPP, Graphical method; standard LPP and Basic solution. Fundamental theorem of LPP, Simplex Algorithm, Big-M method and revised simplex algorithm. Concept of Duality: Formulation of Dual LPP, Duality theorem, advantages of duality, dual simplex algorithm and sensitivity analysis.

**Module II:** Ellipsoid method and Karmakar’s method for solving LPPs, Solving LPPs through these methods, Comparison of Complexity of these methods. Shortest Path problems: Dijkstra’s and Moore’s method and complexity. Transportation Problem- Transportation problem, Loops in transportation table, Methods for finding initial basic feasible solution. Tests for optimality, Unbounded transportation problem.

**Module III:** Assignment Problem-Mathematical form of the assignment problem, methods of solving assignment problem, Variations of the Assignment problem. Non-Linear Programming: Kuhn-Tucker conditions. Convex functions and convex regions. Convex programming problems. Algorithms for solving convex programming problems-Rate of convergence of iterative methods for solving these problems.

**Text Books:**

- Taha H., Operations Research.3ed .-Collin McMillan,1982
- L.R. Potti, Operations Research, Yamuna Publications.
- S.M.Sinha, Mathematical Programming, Elsevier, 2006

**References:**

- Hiller, F.S ; Leibermann, G.J., Operations Research.- Holden Day 1974

**COS506 DISTRIBUTED COMPUTING**

**Module I:** Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols – Network Case Studies. Process and Distributed Objects – Inter process Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

**Module II:** Operating System Issues I - The OS Layer - Protection - Processes and Threads - Communication and Invocation – OS Architecture - Security - Overview of Security Techniques- Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies - Distributed File Systems - File Service Architecture - Sun Network File System - The Andrew File System. Operating System Issues II - Name Services -Domain Name System - Directory and Discovery Services – Case Studies: Global Name Service and. X.500. Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time and Logical Clocks - Global States - Distributed Debugging Distributed Mutual Exclusion – Elections – Multicast Communication – Consensus Related Problems.

**Module III:** Distributed Transaction Processing - Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication and Distributed Multimedia Systems and Shared Memory.

**Text Books:**

- Coulouris, George; Dollimore, Jean; Kindberg, Tim., Distributed Systems Concepts and Design. 3 ed.- Pearson Education, 2002.
- Mullender, Sape .,Distributed Systems.2 ed.- Addison Wesley, 1993.
- Fleishman, Albert.,Distributes Systems: software design and implementation.-Springer-Verlag, 1994

**Reference:**

- Liu, M.L., Distributed Computing Principles and Applications.- Pearson Education, 2004.
- Tanenbaum, Andrew S ; Steen, Maartenvan,. Distibuted Systems:principles and pardigms.-,Pearson Education, 2002
- Singhal, Mukesh; Shivaratri, Niranjn G., Advanced concepts in Operating Systems : distributed,database, and multiprocessor operating systems. - New York, McGraw-Hill, 1994.

**COS507 MACHINE LEARNING & DATA MINING**

**Module I:** Introduction to Data mining; Data Warehouses; Data preprocessing -cleaning, integration and transformation, data reduction, data mining primitives, languages and system architecture.

**Module II:** Introduction to probability-random variables; spatial random variables; supervised learning; Bayesian decision theory; dimensionality reduction; clustering; decision trees; multi layer perceptrons;

**Module III:** Hidden Markov methods; accessing and comparing classification algorithms; combining multiple learners; reinforcement learning. Mining association rules in large data bases, application and trends in Data mining

**Text Books:**

- Han,Jaiwei; Kamber,Micheline.,Data mining: concepts and techniques. - Morgan Kaufmann Publishers, 2001

**Reference:**

- Yazdani, Sima ; Wong, Shirley., Data warehousing with oracle: an administrator's hand book. - New delhi: Addison-wesley, 1999.
- Dunham , Data Mining : Introductory and Advanced Topics 1/e.
- Berson, Alex; Smith, Stephen; Thearling, Kart., Building data mining applications for CRM. - TMH, 2000.
- Alpaydin, Ethem., Introduction to machine learning. - Prentice-Hall of India, 2004.

## **COS508 UNIX AND SOCKET PROGRAMMING**

**MODULE I:** UNIX-architecture-structure, features, shells, basic components and commands. File Handling; Directory structure, file system and inodes, path names file and directory related commands. Process: process system calls. Shell Scripting-environment variables and profile file, programming constructs of shell.

**MODULE II:** Socket programming; Introduction-Process and Files, IO system calls-open, create, read, write, lseek, dup, fcntl; signals; Process Control-fork, exit, exec, wait, wait3; Daemon Process; File and Record Locking

**MODULE III:** Inter process Communication: Client Server Communication, Pipes, FIFOs, Streams and Messages, Semaphores, Shared memory, Berkely Sockets: Socket addresses, Socket system calls, Reserved Ports, Stream Pipes, Socket options, Sockets and signals

**Text Books:**

- W. Richard Stevens; Unix Network Programming, PHI-1996

**Reference:**

- Yashawant Kanitkar, Unix Shell Programming.

## **Third Semester**

### **COS509 CRYPTOGRAPHY & NETWORK SECURITY**

**Module I:** Symmetric Cipher Models- Substitution techniques- Transposition techniques-Rotor machines- Steganography - DES: Simplified DES- Block Cipher principals- The Data Encryption Std.. The Strength of DES- Differential and linear Cryptanalysis- Block Cipher Design principles-

Block Cipher modes of operations- IDEA: Primitive operations- Key expansions- One round, Odd round, Even Round- Inverse keys for description. AES: Basic Structure- Primitive operation- Inverse Cipher- Key Expansion, Rounds, Inverse Rounds.

**Module II:** Public key Cryptography and RSA functions:- Principles of Public key Cryptography Systems- RSA algorithms- Key Management - Diffie-Hellman Key Exchange, Elliptic curve cryptography- Authentication requirements- Authentication functions- Message authentication codes- Hash functions- Security of Hash functions and MACS- Digital signatures- Authentication protocols- Digital signature standards.

**Module II:** Network Security - Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security. System level Security – Intruder - Intrusion Detection - Password Management – Viruses and Related Threats – Virus Counter Measures – Firewall Design Principles – Trusted Systems.

**Text book :**

- William Stallings Cryptography and Network Security–3rd ed., Principles& Practice, Pearson Education.

**Reference:**

- Charlie Kaufman, Radia Perlman, Mike Speciner , Network Security- Private Communication in a Network World, 2nd ed., Pearson Education

## **COS5010 NETWORK ADMINISTRATION AND MANAGEMENT**

**Module I:** Global Concepts for Administration and Management & Security and Administration; Hardware, switches routers and gateways; Hardware interfaces: ethernet, ADSL and modems; Networking software - network configuration: TCP/IP, port mapping; Classfull and classless network addressing; System Backup, and Software Installation. system backup and utilities, compiling source code into programs and installing programs using Red Hat Package Manager

**Module II:** Introduction to Unix and Windows server; DHCP and Bootp servers; Network Information Services - Configuring Network Services and Security. Discussed types of network services, configuring DNS, DHCP, Apache, Samba, NFS, FTP, NIS, and SSH.; Networked file systems: Linux File system Administration. the File system Hierarchy Standard, file and directory management commands, finding files, linking files, file and directory permissions and ownership and special permissions, the /dev directory and device files, file system types, mounting, working with floppy disks, working with CD-ROMS, working with hard disks, hard disk partitioning, monitoring disk usage, checking file systems for errors, and hard disk quotas

**Module III:** Basic routing mechanisms, routing protocols and strategies; Domain Name Servers; Network monitoring and traffic flows; Securing Your Server and Network- restricting user access to the network, password properties, and intruder lockout. restricting administrative access to the network, protecting servers and workstations from viruses, common internal security problems, and firewall technologies.

**Module IV:** Firewall and Gateway configuration - iptables, fwbuilder; Caching servers and proxy servers - squid. Network Performance- Queuing, Buffering, Error Rates, Retransmission. Fault Discovery, Fault Analysis, Fault Resolution, Backup/Recovery

**Text Books:**

- Steven Andres, Brian Kenyon, Security Sage's Guide to Hardening the Network Infrastructure, Syngress Publishing

- Bozidar Levi , UNIX Administration: A Comprehensive Sourcebook for Effective Systems & Network Management, CRC press, 2001
- Tony Bautts, Terry Dawson, Gregor N. Purdy, Linux Network Administrator's Guide, O'Reilly, 2005

**Reference:**

- Murphy, IP version 6.0 network Administration, Shroff Publishers
- Smith , Linux Network Security, Shroff Publishers
- Andrew S. Tanenbaum, Computer Networks, 4/E, Pearson
- William Stallings, Data and Computer Communications, Seventh Edition, Pearson
- Craig Hunt, Robert Bruce Thompson, Windows NT TCP/IP Network Administration, O'Reilly, 1998
- Scott Mueller, Terry Ogletree, Upgrading and Repairing Networks, 4th Ed, Que.
- Craig Hunt, TCP/IP Network Administration, O'Reilly, 2002
- Neal Allen, Network Maintenance and Troubleshooting Guide, Cisco Press
- John M Lusa, The Network Manager's Handbook, CRC press, Third Edition, 2001
- Thomas R Peltier , Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management, CRC press, 2001
- Randhawa, Tejinder S., Hardy, Stephen, Network Management in Wired and Wireless Networks, Springer

**COS5011 PATTERN RECOGNITION**

**Module I:** Introduction-Application of Pattern recognition, statistical decision theory, image processing and analysis. Probability: Introduction, probability of events, Random variables, Joint Distribution and Densities, Moments of Random variables, Estimation of Parameters from samples, minimum Risk estimation.

**Module II:** Statistical Decision Making: introduction, Baye's Theorem Multiple Features. Conditional Independent Features, Decisions boundaries, Estimation of Error rates, characteristics centers, estimating the composition of populations.

**Module II:** Non Parametric Decision making: Introduction, Histograms, Nearest neighbor Classification Techniques, Artificial Neural networks: Introduction, Nets without Hidden layers, Nets with Hidden layers, The back, propagation algorithm, hopfield nets.

**References:**

- Gose, Earl; Johnsonbaugh, Richard; Jost, Steve. Pattern recognition and image analysis. PHI, 1997
- Fu.K.S, Syntactic Methods in Pattern Recognition,- Academic Press,1994
- Duda, R O ; Hart, P E., Pattern Classification and Scene Analysis,-John Wiley,1973

**COS5012 WIRELESS NETWORKS**

**Module I:** Overview of Wireless networks-Characteristics of the Wireless Medium-physical layer alternatives for wireless networks-wireless medium access alternatives. Network planning- Wireless Network Topologies – Cellular Topology - Cell fundamentals - Capacity expansion techniques – Network Planning for CDMA Systems- wireless network operation- Mobility Management – Radio Resources and Power Management – Security in Wireless Networks.

**Module II:** GSM and TDMA Technology - CDMA technology – Reference Architecture – IS 95 and IMT 2000 - Mobile Data Networks – Data oriented CDPD Network – GPRS and Higher data rates - SMS in GSM – Mobile Application Protocols. Introduction to wireless LAN- IEEE 802.11x, WLAN-wireless ATM and HIPERLAN.

**Module III:** Ad hoc Networking – routing- static and dynamic-examples – WPAN-Wireless Geo location – Wireless Geo location System Architecture.

**Text Books:**

- Kaveh Pahlavan, Prashant Krishnamurthy., Principles of Wireless Networks.- Pearson Education, 2002.
- Rappaport, Theodore S.,Wireless Communications: principles and practice.- Pearson Education, 2002.
- Stallings, William .,Wireless Communications and Networks.- Pearson Education, 2002.

**Reference:**

- Mallick,Marty., Mobile and Wireless Design Essentials.- Wiley, 2003.
- Feher, Kamili., Wireless Digital Communications.-Prentice Hall of India, 2002.
- Black, Toy .,Wireless Communication Technology.- Thomson Learning 2001.

## **COS5013 SOFTWARE PROJECT MANAGEMENT**

**Module I:** Introduction- Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management.

**Module II :** Software Management Process Framework- Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process. Software Management Disciplines - Iterative Process Planning - Organisation and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process.

**Module III :** Managed And Optimized Process - Data Gathering and Analysis: Principles of Data Gathering. Data Gathering Process, Software Measures, Data Analysis - Managing Software Quality –Defect Prevention. Case Studies -COCOMO Cost Estimation Model– Change Metrics–CCPDS-R.

**Text books:**

- Walker Royce “Software Project Management – A Unified Framework “, Pearson Education, 2004 (Unit I, II, III & V)
- Humphrey, Watts: “Managing the software process “, Addison Wesley, 1989. (Unit IV)

**References:**

- Ramesh Gopaldaswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
- Bob Hughes, Mikecoterrell, “Software Project Management”,3rd Edition, Tata McGraw Hill, 2004.

## **COS5014 SOFTWARE AGENTS**

**Module I:** Introduction to Agents. Reactive Machines-stimulus response agents, introduction to neural networks, state machines, robotic vision

**Module II:** Search in state space: agents that plan, uniformed search, heuristics search, planning, acting, and learning. alternative search formulations and applications, adversarial search

**Module III:** Planning methods based on logic: the stimulation calculus, planning; Communication and integration-multiple agents, communication among agents, agent architectures.

**Text Books:**

- Nilsson, Nils J., Artificial intelligence, a new synthesis. - Harcourt(India), 2000
- Russel, Stuart J and Norvig, Peter.,Artificial intelligence, a modern approach. - Pearson Asia, 1995
- Rich, Elaine; Knight, Kevin., Artificial Intelligence. - Tata McGraw-Hill, 1991.

**References:**

- Wooldridge MR, Intelligent Agents, in G.Weiss(Ed), Multiagent Systems,MIT Press, Cambridge.
- Jeffrey M. Bradshaw, Software Agents (Editor). MIT Press
- Luger., Artificial Intelligence. 4 ed.- Pearson Education.
- Relevant websites on Agent systems

## **COS5015 CURRENT TRENDS AND TECHNOLOGIES**

**Module I:** Parallel Computing: Parallel virtual machine (PVM) and message passing interface (MPI) libraries and calls. Advanced architectures. Today's fastest computers. Mobile Computing. Mobile connectivity-Cells, Framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications. Mobile databases-protocols, scope, tools and technology, M-business.

**Module II:** E-Technologies: Electronic Commerce: Framework, Media Convergence of Applications, Consumer Applications, Organizations Applications. Electronic Payment Systems: Digital Token, Smart Cards, Credit Cards, Risks in Electronic Payment System, Designing Electronic Payment Systems. Electronic Data Interchange (EDI): Concepts, Application, (Legal, Security, and Privacy) issues, EDI and Electronic Commerce, Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Internet Based EDI.

**Module III:** Digital Libraries and Data Warehousing: Concepts, Types of Digital documents, Issues behind document infrastructure, Corporate Data Warehouses. Software Agents: Characteristics and properties of Agents, Technology behind Software Agents (applets, Browsers and Software Agents). Main concepts in Geographical Information System (GIS), E-cash, E-business, ERP packages. Data Warehousing: Data Warehouse environment, architecture of a data warehouse methodology, analysis, design, construction and administration.

**Module IV:** Data Mining: Extracting models and patterns from large databases, data mining techniques, classification, regression, clustering, summarization, dependency modeling, link analysis, sequencing analysis, mining scientific and business data.

**Text Books:**

- Introduction to Parallel Computing, 2/E Ananth Grama,George Karypis,Vipin Kumar,Anshul Gupta
- Fundamentals of Database Systems (5th Edition) by [Ramez Elmasri](#), [Shamkant B. Navathe](#)
- E-Commerce: Business, Technology, Society, 3/E ,Kenneth Laudon, Publisher: Prentice Hall, 2007.
- Han,Jaiwei; Kamber,Micheline.,Data mining: concepts and techniques. - Morgan Kaufmann Publishers,2001.

- Yazdani, Sima ; Wong, Shirley., Data warehousing with oracle: an administrator's hand book. - New delhi: Addison-wesley, 1999
- [Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals](#) by Paulraj Ponniah,2001

**Reference:**

- Dunham , Data Mining : Introductory and Advanced Topics 1/e.
- Berson, Alex; Smith, Stephen; Thearling, Kart., Building data mining applications for CRM. - TMH, 2000.
- Delmater, Rhonda; Hancock, Monte., Data Mining explained, a manager's guide to customer-centric business intelligence. - Boston: Digital Press, 2000.
- [The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling \(Second Edition\)](#) by Ralph Kimball and Margy Ross, 2002