Fourth Computer Engineering

Semester VII

7.1 Language Translators

7.2 Computer Communication Networks - II

7.3 Software Engineering

7.4 Elective I (a) Embedded System & Software Agents

7.5 Elective II (a) Web Technologies

Semester VIII

8.1 Advanced Data Structures & Algorithms

8.2 Elective III (a) Image Processing AND Pattern Recognition

8.3 Elective IV (a) Natural Languages Processing

CE 7.1 LANGUAGE TRANSLATORS

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Language processors: Fundamentals of Language processing phases of Language processing, fundamentals or language specification, Bootstrapping and Porting Macros and macro expansion, nested macro calls, design of a macro preprocessor.

MODULE 2

Assemblers: Elements of assembly language programming, statements in assemblers, design specification of an assembler, passes of an assembler, example of single pass assembler problems in single pass assemble, Design of a two pass assembler, Relocation, Linking and Loading

MODULE 3

Compilers: Phases of compilation. Lexical Analysis and lexical analyzer tool-LEX.

Parsing: Top down parsers and bottom up parsers. Recursive descent parser, predictive parser, LL parser. Shift Reduce parsers, Operator precedence parsers, LR parsers.

Parser Generator tool-Yaac.

MODULE 4

Syntax directed translation scheme, code optimization, semantic analysis, types of errors, symbol table generation, data structures in symbol table, Runtime environment, Storage administration, Code Generation.

TEXT BOOKS

1. Compilers –by Aho an Ulman, Addison Wesley.

2. System programming and Operating Systems – by Dhamdhere, Tata McGraw hill.

REFERENCE BOOKS

1. Compiler Construction –by Barett, Batesand Couch, Galgotia Publication, Pvt Ltd.
2. System Programming- by Donoven, Tata McGraw hill.
3. Theory and Practice of Compiler Writing – by P. Trembly
4. Principles of Compiler Design – by Aho and Ulman, narosa publishing House.

CE 7.2 COMPUTER COMMUNICATION NETWORKS-II

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100

Max marks for sessionals : 25
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Over view of OSI model:Design issues of transport layer ,session layer, presentation layer and the application layer.Connection management,RPC and compression techniques.

MODULE 2

TCP/IP protocol suite:Over view of TCP/IP.client server model:concurrency processing, BOOTP,DHCP,DNS,the socket interface,applications:TELNET,FTP,SMTP,SNMP,HTTP. IP Telephony:H.323 and general background of IP telephony.

MODULE 3

ATM Networks:over view of ATM:introduction,genesis,basic principle ,B-ISDN and ATM ,ATM protocol stack:physical layer,ATM layer and AAL layer. Traffic management:call admission control.ATM routing:PNNI Protocol.ATM Networks,switching in ATM, ATM in LANs.

MODULE 4

Topological Design issues of computer networks:Importance of topological design, selecting terminal-conectrator locations, multipoint connections:algorithms-Chandy Russel, Esau Williams and Kruskal's algorithm. Link and link capacity assignment, discrete links: Disjoint route topology.

TEXT BOOKS:

1.Inter networking with TCP/IP volume-II and III.-Douglas.E. Comer and Stevens. PHI
2.ATM Networks Concepts and protocols-Sumeet Kasera and Pankaj Sethi.-TMH
3.Data and Computer communication –William stallings. PHI

REFERENCES:

1.Design and analysis of computer Communication networks-Vijay Ahuja TMH.
2.IP Telephony-Oliver Hersent,David Gurle and Jean Petit. PEA
3.Computer Networks –Andrew S Tenenbaum. PHI
4.An Engineering Approach to Computer Networks-S.Keshav. PEA
5.Unix Network programming-W.Richard Stevens PHI.

CE 7.3 SOFTWARE ENGINEERING

Lectures per week : (3 + 1)
Max marks for theory paper : 100
Max marks for sessionals : 25
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Classical Software Engineering:

Introduction to Software Engineering, scope of software engineering- historical aspects, economic aspects, maintenance aspects, specification and design aspects, team programming aspects.

The software process- client, developer and user requirement phase, specification phase, Design phase implementation phase, Integration phase, maintenance phase improving the software process, capability maturity models, costs and benefits of software process management.

Software life cycle models- water fall model, rapid prototyping model, Incremental model, extreme programming, spiral model comparison of life cycle models.

Cost estimation models- Function point analysis and COCOMO-I and COCOMO-II

MODULE 2

Object Oriented Software Engineering: object basics, object terminology- cohesion- (logical, temporal procedural, communicational, functional etc. coupling- content coupling, common coupling, Data coupling etc.) Data encapsulation, software re-usability, portability, Interoperability- CASE tools in use for object oriented software engineering- UML and its usage in software engineering

MODULE 3

Software testing: software quality assurance, The six essentials of software testing, clean sheet approach, verification testing, validation testing , Integration testing(GVI) Master test planning, Organizational approaches to testing, Software testing tools- for classical engineering and object oriented engineering- software testing standards

Integration testing: Master test planning, Organizational approaches to testing object oriented testing, Testing standards

MODULE 4

Software Project management: Managing software project, project planning, process planning- the standard process, requirement change management, quality management Risk management, the project management plan team structure, communication, team development configuration management. Project execution project monitoring and control, project closure performing closure analysis, closure analysis report.

TEXT BOOKS

1. Object Oriented and Classical Software Engineering- Stephen R.Schah(TMH)
2. Software Project Management in practice- Pankaj Jalote- PEA

REFERENCE BOOKS

1. Software Engineering – A practitioner's approach – by Roger S. Pressman, McGraw Hill
2. A discipline for Software Engineering – by Watts S. Humprey, Pearson Education
3. Software Engineering – by K. K. Aggarwal and Yogesh Singh, New Age Publications
4. Object Oriented and classical Software Engineering – Steven. Schalch TMH
5. 'Ed-Kit'- Software testing in real world. Addison Wesley 1995
6. Effective methods for software testing(second edition) John-Wiley 1999
7. Software testing techniques(2^{nd} edition) Van Nostrand Rein loud 1990
8. The art of software testing, Jon Wiley Mayers G.J.

CE 7.4 Elective I (b) DIGITAL SIGNAL PROCESSING

Lectures per week	: (3 + 1 + 2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	: 3 hours
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Discrete Time signal and its application to LTI system: Discrete-time Fourier transform (DTFT), Discrete Fourier Transform (DFT), Relationship between the DTFT and DFT and their inverses, DFT properties, Linear and circular convolution, Linear filtering methods based on DFT.

Z-Transforms [Z.T.]: Introduction, definition of Z-Transform, properties, Region of convergence, evaluation of inverse Z.T., rational Z.T.

MODULE 2

Efficient computation of DFT: Fast Fourier transform [F.F.T.], Direct computation of DFT, Divide and conquer approach of DFT, **Radix-2FFT algorithm:** Decimation in Time [D.I.T] and Decimation in frequency[D.I.F], Shuffling of the data and bit reversal, Introduction to basic butterfly computation in radix-4 FFT algorithm, Goertzel algorithm and Chirp-Z Transform algorithm, Effect of Quantisation in DFT.

Realization of Discrete-Time System: Introduction, Basic Realization block diagram and the signal flow graph, Basic structures of IIR filter: Direct, canonical, cascade and parallel realizations.

MODULE 3

Design of Digital Filters: General considerations, causality and its implications, characteristics of practical Frequency selective filters. Design of FIR filters: Symmetric FIR filters, design of linear phase-FIR filters using windows, frequency sampling method.

Design of IIR filter: IIR filter design by impulse invariance, bilinear transformation, Butterworth filter, Chebyshev filters and Elliptic filters.

Frequency selective filters: Ideal filter characteristics, Lowpass, Highpass and Bandpass filters, Notch filters, Comb filters.

MODULE 4

Miltirate Digital Signal processing: Introduction, Decimation by factor D, Interpolation by factor I, sampling, sampling rate conversion by rational factor I/D, Applications of multirate signal processing, Design of phase shifters, interfacing of digital systems with different sampling rates, Subband coding of speech signals, oversampling A/D and D/A conversion.

Application of DSP: Voice processing, introduction to wavelet transforms.

Definition of an image, Image representation, introduction to 2-D Fourier Transform.

TEXT BOOKS

1. Digital Signal Processing, algorithm and application – By John C. Proakis & Dimitris. G. Manolakis, PHI

2. Digital Signal Processing ---S.Mitra – TMH

REFERENCE BOOKS

1. Digital Signal Processing -By Salivahanan
2. Signal Processing & Linear systems - By B.P.Lathi, Oxford
3. Understanding Digital Signal Processing - By Lynons,Addison Wesseley
4. Theory and Application of digital Signal Processing - ByRabiner and Gold ---PHI
5. Introduction to Digital Signal Processing - Johny R. Johnson,PHI
6. Discrete—Signal Processing - Oppenhein and Schaffer,PHI.

CE 7.4 Elective I (c) SOFTWARE AGENTS & EMBEDDED SYSTEMS

Lectures per week	: (3 + 1 + 2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	: 3 hours
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Software Agents: Introduction , Types of software agents, Intelligent agents, agent architecture, Multi agent systems, agent collaborations, agents as memory aids, mobile agents.

MODULE 2

Microcontrollers: Introduction to microcontrollers, Architecture of 8051, 8051 Instruction set- data movement instructions, arithmetic instruction, bit operators, Execution exchange operators.

MODULE 3

Programming with 8051 – Program to demonstrate arithmetic operations, bank register addressing, RAM direct addressing-conditional branching , stack operations, variable array implementation- pseudorandom LED display using 8051 – Applications of 8051(minimum two applications to be covered).

MODULE 4

Embedded software development tools: Debugging techniques, performance issues and bottlenecks.

Case study: Embedded Linux, PSOS , RTOS and Vxworks.

TEXT BOOKS

1. Text of Intelligent interfaces as agents- Chin, David N. ACM press/Addison Wesley

2. Programming and customizing the 8051 microcontroller- Myke Predko TMH

REFERENCE BOOKS

1. An Embedded Software Primer – By David E. Simon PHI
2. Software agents – Chris Dellarocas- Addisson Wesley
3. Mobile software agents for control in telecom network- Steve Appleby and S.Steward- BT. Technology Journal 12(2) : 104-113 April 94

ETC/CE 7.4 (a)- Elective I – VLSI Technology and Design

Lectures per week : (3 + 1 + 2)
Max. marks for theory paper : 100
Max. marks for sessionals : 25
Max. marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one questions from each module with two compulsory question from any one module.)

MODULE 1

Silicon Semiconductor Technology: Wafer processing, oxidation, Epitaxy, deposition, Ion-Implantation and Diffusion Silicon gate process. **Basic CMOS Technology**: A basic n-well and p-well CMOS process. Silicon On Insulator. MOSIS Layout Design Rules (Full – Custom Mask layout Designs), Stick Diagrams, layout editors (Magic) and circuit extraction.

MODULE 2

MOS Transistor: Structure, MOS system under external bias, operation of MOS transistor (MOSFET), threshold voltage, MOSFET current-voltage characteristics (GCA), channel length modulation, substrate bias effect, Measurements of parameters – Kn, V_{TO} & γ, MOSFET Scaling – Full scaling & Constant Voltage Scaling. Short channel effects, Narrow channel effects, MOSFET capacitances.

Modeling of MOS transistor circuits using SPICE (**level 1** model equation)

Features and Comparisons of level 1, 2 and 3 and BSIM.

MODULE 3

MOS Inverters: Static Characteristics: VTC, Noise Immunity and Noise Margins, NMOS Inverter, CMOS Inverter (SPICE model) – Circuit operation, Calculations of V_{IL}, V_{IH} and V_{TH}, Power and Area considerations, CMOS latch-up and its prevention, CMOS logic circuits, CMOS transmission gate.

Overview of CMOS logic structures: CMOS complementary logic, BiCMOS logic, Pseudo-nMOS logic and Dynamic CMOS logic, CMOS Domino logic.

MODULE 4

VLSI Design Methodologies: VLSI Design Flow, Design analysis, Simulation: Circuit, Timing, Switch – level, Gate – level (or logic), functional – (using **VHDL**

Design Verification: Electrical, Timing, Functional (Formal).

Implementation Approaches: Custom circuit design.

Cell based Design Methodology: Standard cell, Macrocell place and route.

Array based Implementation Approaches: Mask – Programmable arrays, Prewired Arrays (FPGA), Ramed based (Volatile FPGAs).

Design Synthesis: Circuit and logic Synthesis.

Validation and Testing: Test procedure, Design for Testability (DFT), AD-HOC testing, Scan – Based Test, Boundary – Scan Design, Built in self test (BIST), Test – Pattern Generation, Fault models, Automatic Test _ Patterns generation (ATPG), Fault Simulation.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits (Analysis and Design) – Yusuf and Kong.
2. Principles of CMOS VLSI Design – Neil H.E. Weste, Kamran Eshranghian.
3. Digital Integrated Circuits (Design perspective) – Jan M. Rabaey.

REFERENCES:

1. Basic VLSI Design – Douglas Pucknell, Kamran Eshranghian, PHI
2. Fundamentals of Digital logic with VLSI design – Stephen Brown, Zvonco Vranesic.
3. Modern VLSI design (Systems on Silicon) – Wayne Wolf
4. Introduction to VLSI Design – Eugene D. Fabricius
5. SPICE – Gordon W. Roberts, AdelS. Sedra.
6. VHDL – Douglas Perry
7. VHDL Primer – J. Bhasker.

CE 7.4 Elective I (d) FUZZY LOGIC AND NEURAL NETWORKS

Lectures per week : (3 + 1 + 2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2

Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Neural Networks and Fuzzy Systems: Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, Brain as a Dynamical System, Intelligent behavior as Adaptive Model-free Estimation

Neural Dynamics: Activations and Signals, Activation Models

MODULE 2

Unsupervised Learning: Learning laws, Stochastic Unsupervised Learning and Stochastic Equilibrium, Hebbian Learning, Competitive Learning, Differential Hebbian Learning, Differential Competetive Learning.

Supervised Learning: Supervised Function Estimation, Supervised Learning as Operand Conditioning, Stochastic Pattern Learning and Stochastic Approximation, The Backpropagation Algorithm

MODULE 3

Architectures and Equilibria: Neural Networks as Stochastic Gradient Systems, Global Equilibria, Synaptic Conversion to Centroids, Global Stability of Feedback Neural Networks, Structural Stability of Unsupervised Learning, Random Adaptive Bidirectional Associative memories (RABAM)

Fuzziness v/s Probability

Fuzzy Associative Memories(FAMs): Fuzzy and Neural Function Estimators, Fuzzy Hebb FAMs, Adaptive FAMs

MODULE 4

Control Systems: Fuzzy and Neural Truck Backer – Upper Control Systems, Fuzzy and Kalman – Filter target Tracking Control Systems

Image Transform Coding with Fuzzy Systems

TEXT BOOKS

1. Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence, - By Bart Kosko, PHI
2. Fundamentals of Artificial Neural Networks, - By Mohamad H. Hassoun, PHI

REFERENCE BOOKS

1. Neural Networks: A comprehensive Foundation, - By Simon Haykin, Pearson Education
2. Introduction to Artificial Neural Networks, - By Jacek M. Zurada, Jaico Publishing House

CE 7.5 Elective II(a) DATA MINING .

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals :50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction: Motivation, definition, data ware housing-architecture, data ware house implementation-OLAP; Data processing-data integration and transformation, data reduction.

MODULE 2

Data mining primitives, languages and system architecture: DMQL, Mining association rules in large data bases. Single dimension Boolean association rule, multilevel association rules, constraint based association mining.

MODULE 3

Cluster analyses: Definition of cluster, clustering methods- portioning methods, hierarchical methods,density based methods, grid based methods, model based clustering methods, online analysis.

MODULE 4

Mining the world wide web. Application and trends in data mining .

Data mining and privacy issues-social context.

TEXT BOOKS:

1.Data mining concepts and techniques.- Jiawei Han and Micheline Kamber.

-Morgan Kuaffman publisher

2.Modern data base management- Fred.R. Mcfadden. PEA

REFERENCES:

1.Mastering Data Mining-Michel. J. A. Berry. Gordon S.Linoff. Wiley

2.Data Mining-Pieter Adriaans and Dolf Zantinge.-PEA.

CE 7.5 Elective II (b) DISTRIBUTED OPERATING SYSTEMS

Lectures per week : (3 + 1 + 2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Distributed Systems: Goals, Hardware and Software Concepts in Distributed Systems, Design issues/ Communication in Distributed Systems**:** Layered protocol, ATM networks, Client-Server model, Sockets, Remote Procedure Call, Group Communication

MODULE 2

Synchronization in Distributed Systems: Clock Synchronization, Mutual Exclusion, Election algorithm, Atomic Transactions, Dead lock in Distributed Systems.

Processes in Distributed Systems: Threads, System model, Processor allocation and scheduling in Distributed systems.

MODULE 3

Concepts of Fault Tolerance and Real Time Systems.

Distributed File System: Distributed File System Design, Distributed File system Implementation, Trends in Distributed File system. Case study of a File system.

MODULE 4

Distributed shared Memory: What is shared memory, consistancy model, Page based Distributed, shared memory, object based Distributed Shared memory.

Protection & Security in Distributed systems: A case study of distributed system.

TEXT BOOKS

1. Distributed Operating Systems - By A.S. Tanenbaum, Pearson Education.

2. Distributed Systems: Concepts and Design - By G.Coulouris, J. Dollimore and T.King Berg., Addison Wesley.

REFERENCE BOOKS

1. Advanced Concepts in Operating Systems, - By M.Singhal and N.G.Shivaratri, TMH
2. Computer Networks and Internet - By D.E.Comer, Pearson Education.

CE 7.5 Elective II (c) WEB TECHNOLOGIES

Lectures per week	: (3 + 1 +2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	: 3 hours
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Internet: Basics, web objects, sites, e-mail, WWW, File transfer, TELNET etc.

Web servers, browsers and security: Web server, proxy server, web browsers, firewalls, data security

Creating a website and Markup languages: HTML, DHTML

XML: SGML, XML basics, XML parsers

Searching and Web-casting techniques: Search engines, search tools, etc.

MODULE 2

Dynamic web pages: Overview, Common Gateway Interface, Active server page technology, Java and the concept of a virtual machine, Java Servlets, JSP

Active web pages: Java applets, Java Beans

MODULE 3

COM, DCOM, COM+: Overview, Building ActiveX controls, internet COM components, building COM, DCOM, COM+ components, Services, Security

MODULE 4

E-Commerce: Introduction, User sessions in e-commerce applications, Transaction management and Security issues

Introduction to Wireless Access Protocol (WAP)

TEXT BOOKS

1. Web technologies – By Godbole, TMH
2. Web technologies – By Rajkumar, TMH

REFERENCE BOOKS

1. Using HTML, XML and Java 1.2 – By Eric Ladd and Jim O' Donnel, PHI
2. Professional DCOM – By Dr. Richard Grimes
3. The Java FAQ – By Jonni Kanerva

CE 7.5 Elective II (d) DIGITAL SIMULATION AND MODELING

Lectures per week : (3 + 1 + 2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Simulation and System Modeling concepts, System Specification formalisms, System Specifications, Framework for Modeling and Simulation, Simulation examples, Hierarchy of System Specifications

Introduction to Discrete Event System Specifications (DEVS)

MODULE 2

Modeling Formalisms and Simulation Algorithms

Basic formalisms: DEVS, DTSS, DESS, Coupled multicomponent systems

Simulators for Basic Formalisms

Multiformalism Modeling and Simulation

MODULE 3

DEVS – Based Extended Formalisms

Parallel and Distributed Discrete Event Simulation System Morphisms: Hierarchy of System Morphisms, Constructing Model families, Verification, Validation, Approximate morphisms

MODULE 4

System Design Modeling and System Environments: DEVS Based Design Methodology Simulation Software, Simulation of a Computer System.

TEXT BOOKS

1. Theory of Modeling and Simulation – Integrationg Discrete Event and Continuous Dynamic Systems – By Bernard P. Zeigler, Herbert Praehofer, Tag Gon Kim, Academic Press
2. Simulation and Modeling Analysis – By A. M. Law, W. D. Kelten, McGraw Hill

REFERENCE BOOKS

1. System Simulation with Digital Computers – By N. Deo, PHI
2. Concepts and Methods in Descrete Event Digital Simulation – By G. S. Fishman, - John Wiley & sons
3. System Simulation – By G. Gorden, PHI
4. Discrete Event System Simulation – By Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicol, Pearson Education

CE 8.1 – ADVANCED DATA STRUCTURES & ALGORITHMS

Lectures per week : (3 + 1 + 2)
Max. marks for theory paper : 100
Max. marks for sessionals : 25
Max. marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one questions from each module with two compulsory question from any one module.)

MODULE 1

B-trees: definitions, basic operation on the B-trees, deleting a key from a B-tree.

Heaps: B-heaps and operations on B-heaps. Fibanocci heaps: heap structure, operations decreasing a key and deleting a node.

Data structures for disjoint sets. Disjoint set operations, Linked list representation of disjoint sets, disjoint set forests.

MODULE 2

Hoffman coding: error detection and correction.

Polynomials and FFT: Representation of polynomials, DFT and FFT. Efficient FFT implementation.

RSA public key cryptic algorithms.

MODULE 3

Introduction to parallelism models, simple algorithms for parallel computers.

CRCW and EREw algorithms, Brent's theorem and work efficiency. Handling write conflicts, merging and sorting, finding connected components, lower bound for adding n integers.

MODULE 4

Probabilistic Algorithms: Introduction; Expected versus average time, Pseudorandom generation, Buffon's needle numerical integration, Probabilistic counting, Monte Carlo algorithms – verifying matrix multiplication, primality testing, probabilistic selection and sorting, Universal hashing, Factorizing large integers.

TEXT BOOKS:

1. Introduction to algorithms – Thomas H cormen, Charles E Leiserson, Ronald L Rivest. PHI.
2. Computer Algorithms – Saar Baase. PHI

REFERENCES:

1. graph Theory with application to engineering and computer science – Deo Narsingh, Charles E Millican. MGh
2. Fundamentals of Algorithms – Gilles Brassard and Paul Bratly. PHI.
3. Computer Algorithms – Horowitz, Sartaj Sahni. Rajasekharan – Galgotia.

CE 8.2 Elective III (a) MULTIMEDIA SYSTEMS

Lectures per week : (3 + 1 + 2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals :50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Multimedia: Content structure and literature. **Media and Data Streams:** Medium , properties, multimedia and data string characteristics. **Sound/Audio:** Basic concepts, music and speech.**Images and Graphics:** Basic concepts and computer image processing . **Video and Animation:** Basic concepts , television and computer based animation. **Data Compression:** Storage space, coding requirements, compression techniques, JPEG, H.261, MPEG, DVI **Optical Storage Media:** CD , digital audio, CD-ROM, CD-WO, CD-MO.

MODULE 2

Computer Technology: Communication Architecture, Multimedia Workstation. **Multimedia Operating Systems:** Real time systems, Resources and Process Management, File Systems, Interprocess Communication and Synchronization, Memory and Device Management, Systems Architecture. **Networking Systems:** local ATM networks, distributed queue Dual bus(DQDB), MAN connectivity to ATM networks, B-ISDN: ATM.

MODULE 3

Multimedia Communication Systems: Application subsystem, transport subsystem, Quality of Service and Resource Management. **Multimedia Database Management Systems:** Characteristics, data analysis and structure, operations on data, integration in a database model. **Documents Hypertext and MHEG:** Documents architecture, Hypertext, Hypermedia and multimedia, Hypermedia systems architecture, nodes and pointers, ODA and multimedia, Document architecture SGML. **Interactive multimedia presentation:** Class hierarchy , contents , behavior of user interaction, container.

MODULE 4

User Interfaces: General design issue, video at user interface, audio at user interface , user friendliness. Synchronization: Introduction, notion, presentation requirements, reference model, specification, case study. Abstractions for Programming: Abstraction levels, libraries, system software, toolkits, higher programming languages, object oriented approaches. Multimedia Applications: Media Preparation, Media Composition, Media Integration, Media Communication, Media Consumption, Media Entertainment.

TEXT BOOKS

1. Multimedia: Computing Communication and Applications, - By Ralf Steinmetz and Klara Nahrstedt, Pearson Education

REFERENCE BOOKS

1. Multimedia Systems, - By John F. Koegel Buford, Pearson Education

2. Multimedia: Making it Work, - By Tay Vaughan, TMH

3. Principles of Interactive Multimedia, - By Mark Elsom-Cook, TMH

CE 8.2 Elective III (b) SOFTWARE TOOLS FOR CAD/CAM

Lectures per week	: (3 + 1 + 2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	**: 3 hours**
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to CAD/CAM, Review of CAD/CAM Hardware, Basics of Computer Graphics: Database structures for Graphic modeling, Transformation of Geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal etc.

MODULE 2

Design of Industrial products: Geometric Modeling, CAD standards, case study of a drafting system, modeling system: Unigraphics and solid modeling, finite element Modeling ad software.

MODULE 3

Manufacturing aspects of Industrial products: Computer Numeric Control, CNC hardware basics, CNC tooling, CNC tools and control system; CNC programming

MODULE 4

Turning center programming, Advanced part programming methods, computer Aid part Programming, Roll of information systems: Information Requirements of manufacturing, group technology and Computer aid process planning, Product planning and control.

TEXT BOOKS

1. CAD/CAM ,Principles and Applications - By P.N.Rao, TMH

REFERENCE BOOKS

1. CAD/CAM - By M.P. Groover and E.W. Zimmers, PHI

2. Computer Aided Design and Manufacturing - By C.B.Basant and C.W.K. Ellis horward John Wiley and son

CE 8.2 Elective III (c) ROBOTICS

Lectures per week : (3 + 1 + 2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Robotics

Robot Arm Kinematics: The Direct Kinematics problem, The Inverse Kinematics Solution

Robot Arm Dynamics: Introduction, Lagrange-Euler Formulation, Newton-Euler Formulation, Generalized D'Alembert Equations of Motion

MODULE 2

Planning of Manipulator Trajectories: General considerations of trajectory planning, Joint –interpolated trajectories, Planning of Manipulator Cartesian Path trajectories

Control of Robot Manipulators: Control of the Puma Robot Arm, Computed Torque technique, Near - minimum time control, Variable Structure Control, Non linear decoupled feedback Control, Resolved Motion Control, Adaptive Control

MODULE 3

Sensing: Range, Proximity, Touch, Force and Torque sensing

Lower level Vision: Image Acquisition, Illumination techniques, Imaging Geometry, Relationships between pixels, Preprocessing

MODULE 4

Higher level vision: Segmentation and Description of 3D structures, Recognition, Interpretation

Robot Intelligence and Task Planning

TEXT BOOKS

1. Robotics: Control, Sensing, Vision and Intelligence, By K. S. Fu, R. C. Gonzalez, C.S.G Lee, TMH

2. Fundamentals of Robotics: Analysis and Control, By Robert J. Schilling

REFERENCE BOOKS

1. Industrial Robotics: Technology, Programming and Applications, By Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, TMH

2. Introduction to Robotics: Mechanics and Control, By John J. Craig

3. Robotics Technology and Flexible Automation, By S. B. Deb, TMH

4. Modeling and Control of Robot Manipulators, By Lorenzo Sciavicco, Bruno Siciliano, TMH

CE 8.2 Elective III (d) ADVANCED COMPUTER ARCHITECTURES

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to parallel processing: Evolution of computer systems, parallelism in uniprocessors, parallel computer modes, Architectural classification schemes, Parallel processing applications. Conditions of parallelism, Hardware and Software parallelism, Types of parallelism, Introduction to pipelining, Linear pipeline processor, Non-linear pipeline processors, Instruction and Arithmetic pipeline design, principles of designing pipelined processors.

Hierarchical memory technology, Addressing schemes, Locality of References, Hierarchy optimization.

MODULE 2

Vector processing principles, Vector loops and chaining, pipelined vector processing methods, Architecture or Cray-1,Vectorization and Optimization methods.
SIMD Computer Organization: Introduction, Interconnection networks,parallel algorithms for array processors, The Illiac-IV System architecture and applications
Associative array processing: Associative memory organization, PEPE and STARAN associative processors, associative search algorithms.

MODULE 3

Multiprocessors: Functional structures, Interconnection networks, Cache coherence and solutions, Interleaved memory organization, Multiprocessor operating systems, Language features to exploit parallelism, Detection of parallelism using Bernstein's conditions, Process synchronization mechanisms, system deadlocks and protection.

Parallel algorithms for multiprocessors-Classifications and performance of algorithms.

Cray X-MP system architecture and multitasking.

MODULE 4

Dataflow computers: Control flow versus data flow computers, Data flow architectures, Static and Dynamic data flow computers, study of Arvind's machine and Dennis Machine, demand-driven mechanism, Data flow graphs and languages, Advantages and potential problems in data flow computers.

VLSI computing structures-systolic array architecture, VLSI chip implementation of matrix multiplication.

RISC processor: RISC architecture, Instruction set of RISC, distinction between RISC and CISC, overlapping windows in RISC, Study of a RISC processor called SPARC, Advantages and disadvantages of RISC processor.

TEXT BOOKS

1. Advanced computer architecture by Kai Hwang, TMH.

2. Computer architecture and parallel processing by Hwang and Briggs, TMH.

REFERENCE BOOKS

1. Computer Architecture by Nicholas Carter, TMH

CE 8.3 Elective IV (a) IMAGE PROCESSING AND PATTERN RECOGNITION

Lectures per week	: (3 + 1 + 2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	**: 3 hours**
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Fundamentals of Images: Digital Image representation, Elements of Image processing systems and simple image model, sampling and Quantisation, Basic relationship between pixels, Image Geometry.

Image Transforms: Fourier transforms, Properties , Fast Fourier transforms, Other separable transforms.

MODULE 2

Image Enhancement: Enhancement by point processing, Spatial filtering, Enhancement in frequency domain, Color Image Processing

Image Restoration: Degradation model, Algebraic approach to Restoration problem Inverse filtering.

MODULE 3

Image Compression: Fundamentals, Image Compression models, error free compression, lossy compression.

Image segmentation: Detection of discontinuities, linking and boundary detection, Thresholding, Region oriented segmentation.

MODULE 4

Representation and description: Representation schemes, boundary descriptors, Regional descriptors and morphology.

Recognition: elements of image analysis pattern and pattern classes, Decision theoretic methods.

TEXT BOOKS

1. Digital Image Processing - By R.C. Gonzalez and R.E. Woods, Addision Wesley.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing - By A.K.Jain, PHI.
2. Digital Image Processing - By W.K.Pralt, McGraw Hill
3. Digital Image Processing - By C.C. Rafeil, Paul Wintez, Addison Wesley.

CE 8.3 Elective IV(b) CRYPTOGRAPHY AND NETWORK SECURITY

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for sessionals : 25
Max marks for orals :50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2

Total no. of questions to be answered : 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

CRYPTOGRAPHY 1: Introduction: Attacks, Services, and Mechanisms, Security Attacks, Security Services, A model of Internetwork Security. Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified DES, Block Cipher Principles The Data Encryption Standard, The strength of DES, Differential and Linear Cryptanalysis. Algorithms: Triple DES, International Data Encryption Algorithm, Blowfish, Confidentiality Using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

MODULE 2

CRYPTOGRAPHY 2: Public key cryptography : Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, Testing for Primality, Euclid's Algorithm, The Chinese Remainder Theorem, Discrete Logarithms, Message Authentication and Hash functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, MDs Message Digest Algorithm, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standard.

MODULE 3

Network Security-I Authentication Applications: Kerberos, X.509 Directory Authentication Service, Electronic Mail Security: Pretty Good Privacy, S/MIME.IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

MODULE 4

Network Security-II Web Security: Web security Requirements, Secdure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. Intruders, Viruses, and Worms: Intruders, Viruses and Related Threats, Firewalls: Firewall Design Principles, Trusted Systems.

TEXT BOOKS:

1.Cryptography and Network security 2nd ed.—William Stallings PEA

REFERENCES:

1.Internet Cryptography, Addison Wesley 1997—Richard E Smith PEA.

2. Building Internet Firewalls, O'Reilly 1995.-Chapmaw, D and Zwicky, E
3. Internet SEcurity, Professional Reference(Second Edition), TechMedia, 1997: Derek Atkins et al
4. Mastering Network Security, BPB 1995: Chris Brenton
5. Network Security, Private Communication in a Public World, PTR Prentice Hall, 1995: Charlie Kaufman, Radia Perlman, Mike Speciner

CE 8.3 Elective IV (c) NATURAL LANGUAGES PROCESSING

Lectures per week	: (3 + 1 + 2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for orals	: 50
Duration of paper	: 3 hours
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Natural Languages Processing

Words: Regular Expressions and Automata, Morphology and Finite State transducers, Computational Phonology and Text to speech, Probabilistic models of Pronunciation and Spelling, N-Grams, HMM's and Speech Recognition

MODULE 2

Syntax: Word classes and Part of speech tagging, Context Free Grammars(CFGs) for English, Parsing with CFGs, Features and Unification, Lexicalized and Probabilistic parsing, Languages and Complexity

MODULE 3

Semantics: Representing meaning, Semantic Analysis, Lexical Semantics, Word Sense Disambiguation and Information Retrieval

MODULE 4

Pragmatics: Reference resolution and Phenomena, Syntactic and Semantic Analysis, Constraints on coreference, Pronoun interpretation, Text Coherence, Dialogue and Conversational Agents, Natural Language Generation, Machine Translation

TEXT BOOKS

1. Speech and Language Processing – Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition – By Daniel Jurafsky, James H. Martin, Pearson Education

2. Natural Language Understanding – By Allien James, Benjamin, Cummin

REFERENCE BOOKS

1. Language as a Cognitive Process

3. Readings in Natural Language Processing – By Morgan Kauffman

4. A theory of syntactic Recognition for Natural Languages – By Marcus M., MIT Press

CE 8.3 Elective IV(d) GENETIC ALGORITHMS

Lectures per week	: (3 + 1 +2)
Max marks for theory paper	: 100
Max marks for sessionals	: 25
Max marks for Orals	: 50
Duration of paper	: 3 hours
Total no. of modules	: 4
No. of questions from each module	: 2
Total no. of questions to be answered	: 5 (At least one question from each module with two compulsory questions from any one module.)

MODULE 1

GENETIC ALGORITHMS: robustness of traditional optimization and search techniques, goals of optimization, A Simple Genetic Algorithm, Similarity Templates

MATHEMATICAL FOUNDATIONS: Fundamental theorem, Schema Processing, 2 armed and K armed bandit problem, building block hypothesis, minimal deceptive, similarity templates as hyper planes

MODULE 2

COMPUTER IMPLEMENTATION OF GENETIC ALGORITHMS: Data structure, reproduction, crossover and mutation, mapping objective functions to fitness form, fitness scaling

MODULE 3

ADVANCED OPERATORS AND TECHNIQUES IN GENETIC ALGORITHM SEARCH: Dominance, Diploidy and abeyance, inversion and other re-ordering operators, Macro operators, niche and special speciation, multi objective optimization, knowledge based techniques, Genetic Algorithms and Parallel processors, Genetic Based machine learning, Classifier systems

MODULE 4

INDUSTRIAL APPLICATION OF GENETIC ALGORITHMS: Datamining using genetic Algorithms, using genetic operators to distinguish chaotic behavior from Noise in a time serie

TEXT BOOKS:

1.David Goldberg, Genetic Algorithms in search, optimization machine leaning , Addison Wesley International student exition, 1999.(chapter 1,2,3(pages 59 to 79 both inclusive), 5,6)

2. Charles L Karr and L.Michael Freeman, Industrial applications of Genetic Algorithms, CRC Press, Washington DC, 1998(chapter 9,13)

REFERENCES:

1. Industrial applications of genetic algorithms—Charles l Karr and Michael Freeman—CRC .