ANNA UNIVERSITY
Chennai-25.
Syllabus for
M.E.(Full Time) Computer Science and Engineering

CP131 Data Structures and Algorithms   3   0   0   100

1.   INTRODUCTION   9

Basic concepts of object oriented programming - Abstract Data types - List - Implementation - Arrays - Cursors, Pointers.

2.   BASIC DATA STRUCTURES   12

Stack, Queue - Implementation - Applications. Trees - Traversals - General - Binary - Expression Search Tree - AVL Trees - Splay Trees - B trees.

3.   ADVANCED DATA STRUCTURES   9

Set - Basic operations - Advanced Set representations - Priority Queue - Applications - Graphs - Traversals - Representation.

4.   MEMORY MANAGEMENT   7

Issues - Storage allocation - Dynamic - Compaction, Garbage collection - Buddy systems.

5.   ALGORITHM ANALYSIS AND DESIGN   8

Algorithm Analysis - Sorting - Searching . Design Techniques - Divide & Conquer - Greedy - Dynamic Programming - Backtracking - Branch and Bound Knapsack - Travelling Salesman Problem - Graph coloring- 8 Queens problem.

                                                      Total No of periods: 45

CP131 Data Structures and Algorithms   3   0   0   100

References:

1. Aho, Hopcroft, Ullman, Data Structure & Algorithms, Addison Wesley pub Company 1985.
2. M.A. Weiss, Data Structures & Algorithm analysis in C++, Benjamin Cummings, 1994.
3. Sara Baase, Computer algorithms - Introduction to design and analysis, AW, 1988.
4. Sahni, Data Structures, Algorithms and applications in Java, McGraw Hill, 2000.

CP132 Computer Architecture   3   0   0   100

1.   REVIEW OF FUNDAMENTALS   6

CPU, Memory, I/O Design - Performance evaluation.

2.   CPU ARCHITECTURE   10

Instruction sets of different machines - CISC Vs RISC - Pipelining issues - Super Scalar Architectures.

3.   MEMORY DESIGN   10

Virtual memory - Cache design for different architectures and multiprocessor environments - Evaluating Memory Performance.

4.   I/O DESIGN   9

Speed limits - Interfacing to different types of I/O devices - Performance measures.

5.   PARALLEL ARCHITECTURES   10

Data flow - Vector processors - EPIC - Case Studies.

Total No of periods: 45

CP132 Computer Architecture   **3   0   0   100**

References:

1. D.A Patterson and J.L. Hennessy, Computer Architecture - A Quantitative Approach, Morgan Kaufmann Publishers, 2nd edition 1996.

2. Vincent P. Heuring, Harry F. Jordan Computer Systems Design and Architecture, Addison Wesley, 1999.

CP133 Software Engineering Methodologies   3   0   0   100

1.   INTRODUCTION   11

Software Engineering Process paradigms - Project management - Process and Project Metrics - software estimation - Empirical estimation models - planning - Risk analysis - Software project scheduling.

2.   REQUIREMENTS ANALYSIS   6

Prototyping - Specification - Analysis modeling.

3.   SOFTWARE DESIGN   8

Software design - Abstraction - Modularity - Software Architecture - Effective modular design - Cohesion and Coupling - Architectural design and Procedural design - Data flow oriented design.

4.   USER INTERFACE DESIGN AND REAL TIME SYSTEMS   7

User interface design - Human factors - Human computer interaction - Human - Computer Interface design - Interface design - Interface standards. Programming languages and coding - Language classes - Code documentation - Code efficiency - Software Configuration Management.

5.   SOFTWARE QUALITY AND TESTING   13

Software Quality Assurance - Quality metrics - Software Reliability - Software testing - Path testing - Control Structures testing - Black Box testing - Integration, Validation and system testing - Software Maintenance - Reverse Engineering and Re-engineering. CASE tools - projects management, tools - analysis and design tools - programming tools - integration and testing tool - Case studies.

Total No of periods: 45

CP133 Software Engineering Methodologies **3** **0** **0** **100**

References:

1. Roger Pressman.S., Software Engineering : A Practitioner's Approach, (4th Edition), McGraw Hill, 1997.
2. I. Sommerville, Software Engineering, V edition: Adison Wesley, 1996.
3. Pfleeger, Software Engineering, Prentice Hall, 1999.
4. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli Fundamentals of Software Engineering, Prentice Hall of India 1991.

CP134 Computer Networks Engineering and Management   3   0   0   100

1.   NETWORK ARCHITECTURE   9

Layering & Protocols - OSI & Internet Architecture - Network topology - Link & Medium Access protocols - IEEE 802 standards - Performance issues - Network Adaptors.

2.   NETWORK LAYER   9

Circuit switching - packet switching - Internetworking - bridges - Internet protocol - Addressing - Routing Protocols.

3.   END - TO - END PROTOCOL   9

UDP - TCP- Congestion Control - Presentation aspects.

4.   APPLICATIONS   9

Telnet, FTP - e-mail - DNS - Multimedia Applications - Security.

5.   NETWORK MANAGEMENT   9

Monitoring & Control - SNMP,V2,V3,RMON,RMON2.

Total No of periods: 45

CP134 Computer Networks Engineering and Management   **3**   **0**   **0**   **100**

References:

1. Peterson Davie - Computer Networks - A Systems approach, Morgan Kauffman -Harcourt Asia,
   2nd Edition, 2000.
2. William Stallings, SNMP,SNMPV2,SNMPV3,RMON1 and 2, 3rd Edition , Addison Wesley - 1999.
3. J.F. Kurose & K.W. Ross, Computer Networking - A top - down approach featuring the internet,
   Addison Wesley, 2001.

MA153 Mathematical Structures of Computer Science   3   1   0   100

1.   LOGIC   12

Statements - Connectives - Truth Tables - Normal forms - Predicate calculus - Inference - Theory for Statement Calculus and Predicate Calculus - automata theorem proving.

2.   COMBINATORICS   12

Review of Permutation and Combination - Mathematical Induction - Pigeon hole principle - Principle of Inclusion and Exclusion - generating function - Recurrence relations.

3.   ALGEBRAIC STRUCTURES   12

Semi goup - Monoid - Groups(Definition and Examples only) Cyclic group - Permutation group(Sn and Dn) - Substructures - Homomorphism of semi group,monoid and groups - Cosets and Lagrange Theorem - Normal Subgroups - Rings and Fields (Definition and examples only)

4.   RECURSIVE FUNCTIONS   12

Recursive functions - Primitive recursive functions - computable and non - computable functions.

5.   LATTICES   12

Partial order relation,poset - Lattices, Hasse diagram - Boolean algebra.

Total No of periods: 60

MA153 Mathematical Structures of Computer Science   3   1   0   100

References:

1. Gersting J.L., Mathematical Structure for Computer Science, 3rd Edition W.H. Freeman and Co., 1993.
2. Lidl and pitz., Applied Abstract Algebra, Springer - Verlag, New York, 1984.
3. K.H. Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill Book Company, 1999.
4. http://www.mhhe.com//rosen.

CP143 Data Base Technology   3   0   0   100

1.   **DATA BASE SYSTEM CONCEPT**   **10**

File systems - Database systems - Database systems architecture - Data models - Relational model - Hierarchial model - Network model - Entity-Relationship model - Data Dictionary - Database Administration and control.

2.   **RELATIONAL DATABASES**   **10**

Codd's rules - Base tables - Views - Domains and key concept - Integrity rules - Relational Algebra - Relational calculus - Commercial query languages - Embedded SQL - Normalization and database design.

3.   **DATABASE SYSTEM DESIGN**   **10**

File and storage structures - Indexing and Hashing - Query processing - Database recovery - Concurrency control - Transaction processing - Security and Integrity - Triggers.

4.   **DISTRIBUTED DATABASES**   **10**

Centralized versus distributed databases - Fragmentation - Distributed database architecture - Client / Server databases - Distributed transactions - Locking and Commit protocols - Distributed concurrency Control - Securtiy and reliability - Parallel databases.

5.   **WEB DATABASES**   **5**

The World Wide Web - HTML - Architecture -XML, XML/QL - Database Connectivity.

Total No of periods: 45

References:

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 3rd Edition,
   Addison Wesley, 2000.
2. Abraham Silberschatz, Henry. F. Korth, S.Sudharsan, Database System Concepts, 3rd Edition,
   Tata McGraw Hill, 1997.
3. Stefano Ceri & Giuesppe Pelagatti, Distributed Databases - Principles and Systems,
   McGraw Hill Book Company, 1987.
4. M.Tamer Ozsu and Patric Valduriez, Principles of Distributed Database Systems,
   Prentice Hall International Inc, 1999.

CP141 Operating System Design   3   0   2   100

1.   INTRODUCTION   18

Introduction - Operating Systems and services - CPU Scheduling approaches - Process synchronization - Semaphores - Deadlocks - Handling deadlocks - Multithreading.

2.   MEMORY MANAGEMENT   16

Memory management - Paging - Segmentation - Virtual Memory - Demand paging - Replacement Algorithms.

3.   DISK SCHEDULING APPROACHES   14

Disk Scheduling approaches - File systems - Design issues - User interfaces to file systems - I/O device management.

4.   DISTRIBUTED OS   11

Distributed OS - Design issues in Distributed OS.

5.   CASE STUDY   16

Case study - Design and implementation of the UNIX OS, Process model and structure - Memory management - File system - UNIX I/O management and device drivers.

Total No of periods: 75

CP141 Operating System Design   **3   0   2   100**

References:

1 Abraham Silberschatz Peter B. Galvin , Operating System Concepts, 5th Edition,
Addison Wesley Publishing co.,1998.
2. M.J.Bach, Design of the UNIX Operating system , Prentice Hall,1986.
3. Leffler, Mckusick,Karcls and Quarterman, The Design and Implementation of 4.3
BSD UNIX Operating System, Addison Wesley,   1989.

CP142 Advanced System Software   3   0   2   100

1. INTRODUCTION   15

Basic concepts - Grammar - Language - Parts of a compiler - Compiler construction tools.

2. LEXICAL ANALYZER   15

Role of a lexical analyzer - Specification and recognition of tokens - Finite automata - Regular expression to finite automation - Use of a tool for generating lexical analyzer.

3. SYNTAX ANALYZER   15

Role of a parser - Context-free grammars - Top-down parsing - Bottom-up parsing - Use of a tool to generate parsers.

4. INTERMEDIATE CODE GENERATION   15

Intermediate languages - Declaration - Assignment statements - Boolean expressions - Flow control statements - Back patching.

5. CODE GENERATION   15

Introduction to optimization techniques - Issues in the design of a code generator - Run-time storage management - Design of a simple code generator.

Total No of periods: 75

CP142 Advanced System Software **3** **0** **2** **100**

References:

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison-Wesley Publishing Company, 1988.
2. Allen I. Holub,Compiler Design in C, Prentice Hall of India, 1993.
3. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.

CP144 Internet Programming and Tools   3   0   2   100

1.   BASIC INTERNET CONCEPTS   12

History of Internet - Internet addressing - TCP/IP - DNS and directory services - Internet resources - Applications - Electronic mail, Newsgroups, UUCP, FTP, Telnet, Finger.

2.   WORLD WIDE WEB   10

Overview - Hyper Text Markup Language - Uniform Resource Locators - Protocols - MIME Types - Browsers - Plug-ins - Net meeting and chat - Search Engines.

3.   SCRIPTING LANGUAGE   16

JavaScript programming - Dynamic HTML - Cascading style sheets - Object model and collections - Event model - Filters and Transitions - ActiveX controls - Multimedia - Client side scripting.

4.   JAVA   21

Java fundamentals - IO Streaming - Object Serialization - Applications - Applets - Networking - Threading - Native Interfaces - Image Processing.

5.   ADVANCED JAVA   16

Remote method invocation - Multicasting - JDBC - Server side programming - Enterprise Applications - Automated Solutions.

Total No of periods: 75

CP144 Internet Programming and Tools   3   0   2   100

References:

1. D. Norton and H. Schildt - Java2: The complete reference - TMH 2000.
2. Deitel & Deitel, Internet & World Wide Web How to program, Prentice Hall 2000.
3. Deitel & Deitel, Java How to program, Prentice Hall 1999.
4. Gary Cornell and Cay S. Horstmann, Core Java Vol. 1 and Vol. 2, Sun Microsystems Press 1999.
5. Ted Coombs, Jason Coombs and Don Brewer, Active X source Book, John Wiley & sons 1996.

| **CP145 Network Security** | 2 | 0 | 2 | 100 |

1.   INTRODUCTION   12

Attacks - Services - Mechanisms - Conventional Encryption - Classical and Modern Techniques - Encryption Algorithms - Confidentiality.

2.   PUBLIC KEY ENCRYPTION   12

RSA - Elliptic Curve Cryptography - Number Theory Concepts

3.   MESSAGE AUTHENTICATION   12

Hash Functions - Digest Functions - Digital Signatures - Authentication protocols.

4.   NETWORK SECURITY PRACTICE   12

Authentication, Applications - Electronic Mail Security - IP Security - Web Security.

5.   SYSTEM SECURITY   12

FireWalls - Current Standards.

Total No of periods: 60

CP145 Network Security   2   0   2   100

References:

1. Stallings, Cyptography & Network Security - Principles & Practice, Prentice Hall, 1998.
2. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.
3. Douglas R. Stinson, Cryptography - Theory and Practice, CRC Press, 1995.

CP031 Microprocessor Based System Design   3   0   0   100

1.   REVIEW OF 8086   12

Architecture and Programming - Architectural features of the advanced processors of the intel family - i386, i486, Pentium processors and Multimedia extensions - Applications.

2.   PROGRAMMING ISSUES   8

Programming aspects of the above processors - IA64 architecture.

3.   CONTROL APPLICATIONS   8

Microprocessors for control applications - Micro controller based design of a system - Real time control using micro controllers.

4.   INTERFACING   8

Interfacing with peripheral devices - Peripheral controllers - Bus concepts - Bus standards - Examples - Choosing a bus standard for an application.

5.   SPECIAL PURPOSE PROCESSORS   9

Coprocessors, DSP processors, Graphic processors and their applications.

Total No of periods: 45

CP031 Microprocessor Based System Design   3   0   0   100

References:

1. Barrey B. Brey, The INTEL Microprocessor 8086/8088,80186,286,386,486, Pentium and Pentium
   Proprocessor - Architecture, Programming and Intefacing, PHI, 1998.
2. Barrey B. Brey, Programming the 80286,80386,80486 and Pentium - based Personal Micro Processor
   Manuals(available at Websites)
3. Micro Processor Manuals(available at Websites)
4. Texas Instruments / Analog Devices Manuals for Graphics Processors and DSP Processors.

CP032 Object Oriented System Design   3   0   0   100

1.   OBJECT ORIENTED DESIGN FUNDAMENTALS   9

The object Model - Classes and Objects - Complexity - Classifiation - Notation - Process - Pragmatics - Binary and entity relationship - object types - object state - OOSD life cycle.

2.   OBJECT ORIENTED ANALYSIS   9

Overview of object orineted analysis - Shaler/Mellor, Coad/ Yourdon, Rumbaugh, Booch - UML - Usecase - Conceptual model - behaviour - class - analysis patterns -overview -diagrams -aggregation.

3.   OBJECT ORIENTED DESIGN METHODS   9

UML - diagrams - collaboration - Sequence - Class - design patterns and frameworks - comparison with other design methods.

4.   MANAGING OBJECT ORIENTED DEVELOPMENT   9

Managing analysis and design - Evaluation testing - coding - Maintenance - Metrics.

5.   CASE STUDIES IN OBJECT ORIENTED DEVELOPMENT   9

Design of Foundation class libraries - Object Oriented Databases - Client/Server Computing - Middleware.

Total No of periods: 45

CP032 Object Oriented System Design   **3   0   0   100**

References:
1. Craig Larman, Applying UML   and patterns, Addison Wesley, 2000.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison -
Wesley Longman, 1999, ISBN 0-201-57 168 -4.
3. Ali Bahrami, Object Oriented System Development, Mc Graw Hill International Edition, 1999.
4. Fowler, Analysis Patterns, Addison Wesley, 1994.
5. Erich Gamna, Design Patterns, Addision Wesley, 1994.

CP033 Theory of Computation   3   0   0   100

1.   BASIC MATHEMATICAL NOTATIONS   9

Basic Mathematical notation and Technique - Mathematical Induction and recursive definitions - Chomsky hierarchy of languages - Recognizers - Introduction.

2.   FINITE AUTOMATA AND REGULAR LANGUAGES   9

Finite Automata and Regular languages - Regular expressions and Regular languages - Memory required to recognize a language - Non-determinism and Kleenes theorem - Pumping lemma - Decision problems.

3.   PUSH DOWN AUTOMATA AND CONTEXT FREE LANGUAGES   9

Push down Automata and context free languages - Context free grammars - Definition - Examples - Operations - Derivation trees - Ambiguity - PDA & CFG - Context Free and non - context free languages.

4.   TURING MACHINES   9

Turing machines - Church turing hypothesis - TM as language acceptors - Partial function - Non-deteministic TM - Universal Turing Machines - Applications.

5.   UNSOLAVABLE PROBLEMS AND COMPUTABLE FUNCTIONS   9

Unsolvable problems and computable functions - Rice Theorem - Halting Problem - Post's correspondence Problem - Primitive recursive functions - Godel Numbering - Recursive and recusively enumerable languages.

Total No of periods: 45

CP033 Theory of Computation   **3   0   0   100**

References:
1.John C. Martin, Introduction to Languages and the Theory of Computation,
 2nd Edition, McGraw Hill, 1997.
2. Hopcroft and Ullman, Introduction to Automata, Languages and Computation,
 Narosa Publishers, 1986.
3. K.L.P Mishra, N. Chandrasekaran, Theory of Computation, EEE,
 Prentice Hall of India, 2nd Edition, 1998.

CP034 Advanced Algorithms   **3   0   0   100**

1.   INTRODUCTION   5

Mathematical Background - Design and Analysis of algorithms - Basic concepts.

2.   SORTING AND ORDER STATISTICS   10

Internal sort algorithms - Analysis - Worstcase - Average case - Sorting in Linear Time - Medians and order statistics - Augmenting Data Structures - Red Black Trees - Dynamic - Order Statistics - FFT - Algorithm - Implementation.

3.   DESIGN TECHNIQUES   10

Divide and Conquer - Dynamic Programming - Greedy method - Backtracking -- Branch & Bound - Classical examples - Analysis.

4.   GRAPH AND PARALLEL ALGORITHMS   9

Graphs - Representation - Traversals - Topological sort - Minimum spanning tree - Shortest paths - Biconnected and strongly connected components - Parallel algorithms - Sorting - Matrix multiplication - Numerical - Graph.

5.   SELECTED TOPICS   11

NP Completeness - Approximation alogorithms - Matrices - Transitive closure - Warshall's - Kronrod's algorithm - Computaional Geometry.

Total No of periods: 45

CP034 Advanced Algorithms　　　　　　　　　**3　　0　　0　　100**

References:
1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, Introduction to Algorithms, McGraw Hill Book Company, 1994.
2. Sara Baase, "Computer Algorithms : Introduction to Design and Analysis, Addison Wesley Publishing Company, 1998.
3. M.J. Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw Hill Book Company, 1998.

CP035 Distributed Computing   3   0   0   100

1.   THE HARDWARE INFRASTRUCTURE   9

Broad Band Transmission Facilities - Open Interconnection Standards - Local Area Networks - Wide Area Networks - Network Management - Network Security - Cluster Computers.

2.   SOFTWARE ARCHITECTURES   9

Client - Server Architectures - Challenges - Design Methodology - Intranets and Groupware - Hardware and Software for Intranet - Groupware and Features - Network as a Computer - The Internet - IP Addressing - Internet Security - Open Systems - Concepts and Reality.

3.   OPERATING SYSTEM ISSUES   9

Distributed Operating Systems - Transparency - Inter-Process Communication - Client - Server Model - Remote Procedure Call - Group Communications - Threads - System Models - Process Synchronisation - Deadlocks - Solutions - Load Balancing - Distributed File Systems - Distributed Shared Memory Systems - Micro-Kernels.

4.   FUNDAMENTAL DISTRIBUTED COMPUTING ASPECTS   9

Theoretical Foundations - Logical Clocks - Vector Clocks - Global State - Termination - Correctness - Election Algorithms - Termination Detection - Fault Tolerance - Missing Token - Consensus Algorithms - Byzantine - Consensus - Interactive Consistency.

5.   MANAGING DISTRIBUTED DATA   9

Distributed Databases - Distribution Transparency - Distributed Database Design - Query Translation - Query Optimisation - Concurrency Control - Object-Oriented Databases - Strategic Considerations - Applications of Object-oriented Databases.

Total No of periods: 45

CP035 Distributed Computing   3   0   0   100

References:
1. Sape Mullender, Distributed Systems, Addison-Wesley, 1993.
2. Albert Fleishman, Distributed Systems - Software Design & Implementation, Springer-Verlag, 1994.
3. Mukesh Singal and Shivaratu N.G., Advanced Concepts in Operating Systems, McGraw Hill, Newyork 1994.
4. George Coulouris and Jean Dollimore, Distributed Systems - Concepts and Design, Addison-Wesley, 1988.
5. Gerard Tel, Introduction to Distributed Algorithms, Cambridge University Press, 1994.

CP036 Agent Based Intelligent Systems   3   0   0   100

1.   INTRODUCTION   9

Definitions - History - Intelligent Agents - Structure-Environment - Basic Problem Solving Agents- Formulating - Search Strategies - Intelligent search - Game playing as search.

2.   KNOWLEDGE BASED AGENTS   9

Representation - Logic-First order logic - Reflex Agent - Building a knowledge Base - General Ontology - Inference - Logical Recovery.

3.   PLANNING AGENTS   9

Situational Calculus - Representation of Planning - Partial order Planning- Practical Planners - Conditional Planning - Replanning Agents.

4.   AGENTS AND UNCERTAINITY   9

Acting under uncertainty - Probability Bayes Rule and use - Belief Networks - Utility Theory - Decision Network - Value of Information - Decision Theoretic Agent Design.

5.   HIGHER LEVEL AGENTS   9

Learning agents - General Model - Inductive Learning - Learning Decision Trees-Reinforcement Learning - Knowledge in Learning - Communicative agents -Types of Communicating agents - Future of AI.

Total No of periods: 45

CP036 Agent Based Intelligent Systems   3   0   0   100

References:
1. *Stuart Russell and Peter Norvig Artificial Intelligence - A Modern Approach, Prentice Hall, 1995.*
2. *Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.*
3. *Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1992.*

CP037 Digital Imaging   **3   0   0   100**

1.   DIGITAL IMAGE FUNDAMENTALS   9

Image Transforms - Walsh, Hadamard, Discrete cosine, Hotelling Transforms, Image formation, File formats.

2.   IMAGE ENHANCEMENT   9

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - degradation Model - Diagonalization of Circulant and block circulant matrices - Algebraic approach to restoration.

3.   IMAGE COMPRESSION & SEGMENTATION   9

Compression Models - Elements of information theory - Error free Compression -Image segmentation - Detection of Discontinuties - Edge linking and boundary detection - Thresholding - Regions Oriented Segmentations - Morphology.

4.   FEATURE EXTRACTION   9

Image feature description - Interpretation of Line drawings, Image pattern recognition algorithms.

5.   KNOWLEDGE REPRESENTATION AND USE   9

Knowledge representations and use - Image analysis using Knowledge about scenes - Image understanding using two dimensional methods.

Total No of periods: 45

CP037 Digital Imaging   3   0   0   100

References:
1. Gonzalez.R & Woods B.E., Digital Image Processing, Iind Ed., Addison Wesley, 1998.
2. Anil Jain.K, Fundamentals of Digital image Processing, Prentice Hall of India, 1989.
3. Sid Ahmed., Image Processing , McGraw Hill , New York , 1995.

CP038 Visualization Techniques   **3   0   0   100**

1.   INTRODUCTION   9

What is Visualisation? - Principles of 2D & 3D Computer Graphics - Models and Simulation strategies.

2.   POPULAR TECHNIQUES   9

Surface Plots - City scopes - Fish eye views - Benediktine Space - Perspective walls - Cone trees and Cam trees - Sphere Visualisation - Rooms - Emotical icons.

3.   ADVANCED TECHNIQUES   9

Self-Organising graphs - Spatial Data arrangements - Benediktine Cyberspace - Statistical Clustering and Proximity measures - Hyper Structures - Human Centered Approaches - Information Cube.

4.   VISUALIZATION SYSTEMS   9

Database Visualisation - Populated Information Terrains - Legibility enhancement - Hyper structure Visualisation - Information Visualisation.

5.   SOFTWARE VISUALIZATION   9

Rapid Prototyping - Models for user interaction - Formal Specification of Software - DFD - Software Architecture.

Total No of periods: 45

CP038 Visualization Techniques   3   0   0   100

References:
1. Benedikt. M, Cyberspace : Firot Steps, MIT Press,1991.
2. Chaomei Chan, Information Visualisation and Virtual Environment, Springer - Verlag,1999.
3. Pauline Wills, Visualisation: A Beginner's Guide, Hodd4er & Stoughlon, 1999.
4. Sheryl A Sorby exal, 3D Visualisation for Engineering Graphics, Prentice Hall,1998.

CP039 Creative Thinking   3   0   0   100

1.   **FUNDAMENTALS OF CREATIVITY**   10

Need for Creativity and Innovations - Challenges on the road to innovation - Quality Management in Creativity and Innovation - Mechanics of mind - Definition of Creativity and Innovation - Perception in Creative thinking - Memory in creative thinking - Judgement in creative thinking - Mental process.

2.   **DIRECTED CREATIVITY**   8

Heuristics for creativity - Heuristics for Directed Creativity - Models for creative thinking and innovation - Tools for creative thinking - Basic Principles for the methods of creative thinking - Inventing methods for directed creativity.

3.   **ANALYZING ORGANIZING CREATIVITY**   10

Directed Creativity cycle - Classification of tools - Pausing and Noticing - Refocusing a topic - Analyzing - Searching for analogies - Creating new world imagination - Activities and Heuristics - Tools for imagination - Brain storming - Analogies - Provoking Imagination - Combining concepts - Organizing and Displaying ideas.

4.   **INNOVATION**   8

Activities and Heuristics related to Development and action - Models for organizational change - Tools for development and Action phases - Reengineering - Directed creativity for redesign processes.

5.   **QUALITY**   9

Quality management - Customer needs Analysis - Design of new products and services - Creative versus Analytical methods - Symptoms of struck thinking - Creative Thinking in Quality management.

                                                            Total No of periods: 45

CP039 Creative Thinking   **3   0   0   100**

References:
1. Paul. E. Plsek. , Creativity, Innovation and Quality , PHI 2000.
2. Harry Nystrom, Creativity and Innovation, John Wiley and Sons, 1979.
3. Brain Twiss, Managing technological Innovation, Pitman Publishing Ltd., 1992.

CP040 Neural Networks, Architectures and Applications   3   0   0   100

1.   BACK PROPAGATION   9

Introduction to Artificial Neural Systems - Perceptron - Representation - Linear separability - Learning - Training algorithm - The back propagation network - The generalized delta rule - Practical considerations - BPN applications.

2.   STATISTICAL METHODS   9

Hopfield nets - Cauchy training - Simulated annealing - The Boltzmann machine. Associative memory - Bidirectional associative memory - Applications.

3.   COUNTER PROPAGATION NETWORK AND SELF ORGANIZING MAPS   9

CPN building blocks - CPN data processing. SOM data processing - Applications.

4.   ADAPTIVE RESONANCE THEORY AND SPATIO TEMPORAL PATTERN   9
CLASSIFICATION

ART network description - ART1 - ART2 - Application. The formal avalanche - Architecture of spatio temporal networks - The sequential competitive avalanche field - Applications of STNs.

5.   NEO - CONGNITRON   9

Cognitron - Structure & training - The neocognitron architecture - Data processing - Performance - Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks - Holographic correlators.

Total No of periods: 45

CP040 Neural Networks, Architectures and Applications   3   0   0   100

References:
1. James Freeman A. and David Skapura M., Neural Networks - Algorithms, Applications & Programming Techniques Addison Wesley,1992.
2. Yegnanarayana B., Artificial Neural Networks, Prentice Hall of India Private Ltd., New Delhi, 1999.

CP041 Performance Evaluation of Computer Systems and   3   0   0   100
Networks

1.   **INTRODUCTION**   9

Introduction to performance evaluation - Metrics - Workload - Problem of workload characterization - Representativeness of a workload model - Test workloads - Workload model implementation techniques - Measurement - Hardware - software monitors.

2.   **QUEUING NETWORK MODELING**   9

Overview - Modeling cycle - Understanding the objectives of a study - Workload characterization - Sensitivity analysis - Sources of insight - Fundamental laws - Queueing network model inputs & outputs.

3.   **BOUNDS ON PERFORMANCE**   9

Asymptotic bounds - Using asymptotic bounds - Balanced system bounds - Models with one job class -Workload representation - Solution techniques.

4.   **MEMORY**   9

System with known average multiprogramming level - Memory constraints - Swapping- Paging - Disk I/O - Channel in NON - RPS I/O subsystems - Channel contention in RPS I/O subsystems -Additional path elements - Multipathing - Other architectural characteristics - Processors.

5.   **PARAMETERIZATION**   9

Existing systems - Evolving systems - Proposed systems - Simulation - Analysis of Simulation Results - Simulation of General and extended queueing networks - Response time distributions - Local area networks - Models - Link performance - Transaction response, Link throughput, Multiplexed link Capacity - Ethernet, token ring performance analysis.

Total No of periods: 45

CP041	Performance Evaluation of Computer Systems and Networks	3	0	0	100

References:

1 . Edward D.Lazawska, John zahorjan, G.Scott Graham, Kenneth C.Sevcik , Quantitative system performance -Computer system analysis with queueing network models, Prentice Hall Inc ,1984.

2. Domenico Ferrari , Giuseppe Serazzi ,Alexandro Zeijher, Measurement & Tuning of Computer Systems - Prentice Hall Inc,1983.

3. Michael F.Mories and Paul F.Roth,. Tools and techniques, Computer Performance Evaluation, Van Nostrand, New York, 1982.

4. John Freer R., Computer Communications and networks, Affiliated East-West press Pvt, Ltd., 1990.

CP042 Advanced Networks	3	0	0	100

1.   CIRCUIT SWITCHED NETWORKS   9

SONET - DWDM -Fibre to the Home - DSL - CATV - ISDN - BISDN.

2.   ATM   9

Addressing Signalling & Routing - Header Structure - ATM Adaptation layer - Management control.

3.   INTERNETWORKING WITH ATM   9

LAN - IP over ATM - Multiprotocol over ATM - Frame Relay over ATM.

4.   WIRELESS NETWORKS   9

The   wireless channel - Link level design - Channel access - Network design - Standards.

5.   RECENT TRENDS   9

Optical Networks - Cross connects - LANS - Voice Over IP -- Multimedia
 Networks.

Total No of periods: 45

CP042 Advanced Networks 3 0 0 100

References:
1. Walrand.J. Varaiya, High Performance Communication Network, Morgan Kauffman - Harcourt Asia Pvt Ltd,
   2nd Edition, 2000.
2. William Stallings ISDN & Broadband ISDN with frame Relay & ATM, PHI 4th Edtion 2000.
3. Bates & Donald W.Gregory Voice & Data Communications Handbook,Mc-Graw Hill Edition, 3rd edition, 2000.

CP043 Soft Computing   **3   0   0   100**

1.   ARTIFICIAL NEURAL NETWORKS   9

Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back propagation networks - Kohnen's self organizing networks - Hopfield network.

2.   FUZZY SYSTEMS   9

Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

3.   NEURO - FUZZY MODELING   9

Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing - Evolutionary computation.

4.   GENETIC ALGORITHMS   9

Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

5.   SOFTCOMPUTING AND CONVENTIONAL AI   9

AI search algorithm - Predicate calculus - Rules of interference - Semantic networks - Frames - Objects - Hybrid models - Applications.

Total No of periods: 45

CP043 Soft Computing   **3   0   0   100**

References:
1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall 1998.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
3. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
4. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
5. Nih J.Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
6. D.E . Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.

CP044 Pattern Recognition   **3   0   0   100**

1.   PATTERN CLASSIFIER   10

Overview of pattern recognition - Discriminant functions - Supervised learning - Parametric estimation - Maximum likelihood estimation - Bayesian parameter estimation - Perceptron algorithm - LMSE algorithm - Problems with Bayes approach - Pattern classification by distance functions - Minimum distance pattern classifier.

2.   UNSUPERVISED CLASSIFICATION   8

Clustering for unsupervised learning and classification - Clustering concept - C-means algorithm - Hierarchical clustering procedures - Graph theoretic approach to pattern clustering - Validity of clustering solutions.

3.   STRUCTURAL PATTERN RECOGNITION   8

Elements of formal grammars - String generation as pattern description - Recognition of syntactic description - Parsing - Stochastic grammars and applications - Graph based structural representation.

4.   FEATURE EXTRACTION AND SELECTION   7

Entropy minimization - Karhunen - Loeve transformation - Feature selection through functions approximation - Binary feature selection.

5.   RECENT ADVANCES   12

Neural network structures for Pattern Recognition - Neural network based Pattern associators - Unsupervised learning in neural Pattern Recognition - Self organizing networks - Fuzzy logic - Fuzzy pattern classifiers - Pattern classification using Genetic Algorithms.

                                                    Total No of periods: 45

CP044 Pattern Recognition   3   0   0   100

References:
1. Robert J.Schalkoff, Pattern Recognition : Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
3. Duda R.O., and Hart.P.E., Pattern Classification and Scene Analysis, Wiley, New York, 1973.
4. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993.

CP045 Multimedia Systems   **3   0   0   100**

1.   INTRODUCTION   6

Multimedia applications - System architecture - Objects of Multimedia Systems -Multimedia databases.

2.   COMPRESSION AND FILE FORMATS   12

Types of compression - Image compression - CCITT - JPEG - Video image compression - MPEG-DVI
Technology - Audio compression - RTF format - TIFF file format - RIFF file format - MIDI - JPEG DIB -
TWAIN.

3.   INPUT/OUTPUT TECHNOLOGIES   9

Traditional devices - Pen input - Video display systems - Scanners - Digital audio - Video images and animation.

4.   STORAGE AND RETRIEVAL   9

Magnetic Media - RAID - Optical media - CD-ROM - WORM - Juke box - Cache management.

5.   APPLICATION DESIGN   9

Application classes - Types of systems - Virtual reality design - Components - Databases - Authoring Systems -
Hyper media - User interface design - Display/Playback issues - Hypermedia linking and embedding.

Total No of periods: 45

CP045 Multimedia Systems   **3   0   0   100**

References:

1. Andleigh PK and Thakrar K, Multimedia Systems Design, Prentice Hall, 1996.

2. Vaughan T, Multimedia, Tata McGraw Hill, 1999.

3. Koegel Buford JFK, Multimedia Systems, Addison Wesley Longman, 1999.

4. Mark J.B., Sandra K.M., Multimedia Applications Development using DVI technology, McGraw Hill, 1992.

CP046 Mobile Computing   3   0   0   100

1.   INTRODUCTION   9

Medium access control - Telecommunication systems - Satellite systems - Broadcast systems.

2.   STANDARDS   9

Wireless LAN - IEEE 802.11 - HIPERLAN - Bluetooth.

3.   ADHOC NETWORKS   9

Characteristics - Performance issues - Routing in mobile hosts.

4.   NETWORK ISSUES   9

Mobile IP - DHCP - Mobile transport layer - Indirect TCP - Snooping TCP - Mobile TCP - Transmission / time-out freezing - Selective retransmission - Transaction oriented TCP.

5.   APPLICATION ISSUES   9

Wireless application protocol - Dynamic DNS - File systems - Synchronization protocol - Context-aware applications - Security - Analysis of existing wireless network .

Total No of periods: 45

CP046 Mobile Computing   **3**   **0**   **0**   **100**

References:
1. J. Schiller, Mobile Communications, Addison Wesley,2000.
2. http://www.bluetooth.com/
3. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley,1993.

CP050 Advanced Web Design   3   0   0   100

1.   FUNDAMENTALS   9

Introduction to the web - Web- enabling Technologies - Web service Protocol - Web Design concepts - Examining good and bad web design - Page Design Resources.

2.   SIMPLE DESIGN ISSUES   9

Page Design - HTML - Web page style considerations - Page composition - Type faces - Tag parameters - Color and graphics for web pages - WYSIWYG web page editor - Dreamweaver.

3.   ADVANCE DESIGN ISSUED   9

Advanced Page design - tables and frames - preparing graphics and animations forms - cascading style sheets - user interface design - page grid - page templates - usability testing.

4.   SCRIPTING IN DESIGN   9

Typography and Graphic design for the web - Creating transparent GIF - Lean graphics - Image maps - Palette map - Web programming - Web site Garage - W3C HTML validation services - Net mechanic - DHTML - XML.

5.   TOOLS AND APPLICATIONS   9

Online Applications - Developing an on-line shopping application - Data Base design issues - connecting Data Base with tools such as Java, ASP, Cold Fusion- Designing Portals and Vortals.

Total No of periods: 45

CP050 Advanced Web Design   **3   0   0   100**

References:

1. Deitel and Deitel, Internet and World Wide Web how to program, Prentice Hall, 2000.

2. Bob Breed Love, Web Programming Unleashed, Sams net Publications, 1996.

3. DHTML `O' Reiley Publications, 2000.

| **CP051** | **Advanced Databases** | | **3** | **0** | **0** | **100** |

1. RELATIONAL DATABASES 5

Relational Model - Querying - Storage Structures - Query Processing - Normalization.

2. OBJECT ORIENTED DATABASES 10

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence - Transaction - Concurrency - Recovery - Database Administration.

3. EMERGING SYSTEMS 10

Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases - Mobile Databases.

4. CURRENT ISSUES 10

Rules - Knowledge Bases - Active and Deductive Databases - Distributed Databases and Parallel databases.

5. DATABASE DESIGN ISSUES 10

Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues.

Total No of periods: 45

CP051 Advanced Databases   **3   0   0   100**

References:
1. Gary W. Hanson and James V. Hanson, Database Management and Design, Prentice Hall of India Pvt Ltd, 1999.
2 Alex Benson, Stephen Smith and Kurt Thearling, Building Data Mining Applications for CRM, Tata McGraw-Hill, 2000.
3   R. Elmasri and S.B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2000.
4. N.Tamer Ozsu & Patrick Valduriez, Principles of Distributed Database Systems, Prentice Hall International Inc., 1999.

CP052 E-Commerce Technology   3   0   0   100

1.   INTRODUCTION   8

Infrastructure for Electronic Commerce - Networks - Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs - Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.

2.   CORE TECHNOLOGY   8

Electronic Commerce Models - Shopping Cart Technology - Data Mining - Intelligent Agents - Internet Marketing - XML and E-Commerce.

3.   ELECTRONIC PAYMENT SYSTEMS   8

Real world Payment Systems - Electronic Funds Transfer - Digital Payment -Internet Payment Systems - Micro Payments - Credit Card Transactions - Case Studies.

4.   SECURITY   9

Threats to Network Security - Public Key Cryptography - Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.

5.   INTER/INTRA ORGANIZATIONS ELECTRONIC COMMERCE   12

EDI - EDI application in business - legal, Security and Privacy issues - EDI and Electronic commerce - Standards - Internal Information Systems - Macro forces - Internal commerce - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.

Total No of periods: 45

CP052 E-Commerce Technology   3   0   0   100

References:
1. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, AddisonWesley, 1996
2. Pete Loshin, Paul A Murphy , Electronic Commerce, II Edition , Jaico Publishers1996.
3. David Whiteley, e - Commerce : Strategy, Technologies and Applications - McGraw Hill , 2000.

CP053 Data Mining and Data Ware Housing   3   0   0   100

1.   INTRODUCTION   9

Relation to statistics, databases, machine learning - Taxonomy of data mining tasks - Steps in data mining process - Overview of data mining techniques.

2.   VISUALIZATION AND STATISTICAL PERSPECTIVES   9

Visualization - Dimension reduction techniques - Data summarization methods - Statistical Perspective - Probabilistic - Deterministic models - Clustering - Regression analysis - Time series analysis - Bayesian learning.

3.   PREDICTIVE MODELING   9

Predictive Modelling - Classification - Decision trees - Patterns - Association rules - Algorithms.

4.   DATA WAREHOUSING   9

Design - Dimensional Modeling - Meta data - Performance issues and indexing -VLDB issues - Development life cycle - Merits.

5.   APPLICATIONS   9

Tools - Applications - Case Studies.

Total No of periods: 45

CP053 Data Mining and Data Ware Housing   3   0   0   100

References:
1. Usama M.Fayyad, Geogory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
2. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kauffmann Publishers,2000.
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
4. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.

CP047 ASIC Design   2   0   2   100

1.   INTRODUCTION TO VLSI DESIGN   5

CMOS logic and digital circuits.

2.   ASIC TECHNOLOGY   18

ASIC library design - Cell design - Architecture - Gate array   design - PLDs and FPGAs - ASIC families.

3.   DESIGN AUTOMATION TOOLS   13

CAD for ASIC design - Design entry - VHDL/Verilog - Netlist extraction -
Functional simulation - Synthesis - Layout, Placement, Floor planning - Routing.

4.   ALGORITHMS   13

Techniques for Simulation, Synthesis, Layout, Placement, Positioning, Floor planning, Routing.

5.   TESTING   11

Design for testability - Applications of ASICs - Case studies.

                                                Total No of periods: 60

CP047 ASIC Design   2   0   2   100

References:
1. Michael John Smith Sebastian, Application Specific Integrated Circuits, Addison Wesley, 1997.
2. S.H.Gerez, Algorithms for VLSI Design Automation, John Wiley, 1998.
3. Alfred L.Grouch, Design for Test, PTR-PH, 1999.

| **CP049 Web Technology** | **3** | **0** | **2** | **100** |

1.   INTRODUCTION   9

Internet Principles - Basic Web Concepts - Client/Server model - Retrieving data from Internet - HTML and Scripting Languages - Standard Generalized Markup Language - Next Generation Internet - Protocols and applications.

2.   COMMON GATEWAY INTERFACE PROGRAMMING   9

HTML forms - CGI Concepts - HTML tags Emulation - Server-Browser communication - E-mail generation - CGI Client side Applets - CGI Server Side Applets - Authorization and security.

3.   SOCKET PROGRAMMING   9

Streaming - Networking principles - sockets - protocol handlers - content handlers - multicasting - Remote Method Invocation - activation - Serialization - Marshal streams.

4.   SERVER SIDE PROGRAMMING   9

Dynamic web content - cascading style sheets - XML - Structuring Data - VRML - Server side includes - communication - Active and Java Server Pages - Firewalls - proxy servers - XML with HTML

5.   ON-LINE APPLICATIONS   9

Simple applications - On-line databases - monitoring user events - plug-ins - database connectivity - Internet Information Systems - EDI application in business - Internet commerce - Customization of Internet commerce.

Total No of periods: 45

CP049 Web Technology   **3   0   2   100**

References:
1. Jason Hunter, William Crawford, Java Servlet Programming, O' Reilly Publications, 1999.
2. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic Commerce, Addison Wesley, 1996.
3. Eric Ladd, Jim O' Donnel, Using HTML 4, XML and Java, Prentice Hall of India - QUE, 1999.
4. Jeffy Dwight, Michael Erwin and Robert Niles, Using CGI, Prentice Hall of India - QUE, 1999.
5. Scot Johnson, Keith Ballinger, Davis Chapman, Using Active Server Pages, Prentice Hall of India, 1999.