I-SEMESTER

OPERATING SYSTEMS

Subject Code	:	**08SCE11**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction to Operating Systems, System structures
What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments.
Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

Process Management
Process concept; Process scheduling; Operations on processes; Inter-process communication.
Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues.
Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling.

Process Synchronization
Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Deadlocks
Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Memory Management
Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

File System, Implementation of File System
File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection.
Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Secondary Storage Structures, Protection
Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management.
Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix , Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

Case Study: The Linux Operating System
Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: "**Operating System Principles"**, 7th Edition, Wiley-India, 2006.

REFERENCE BOOKS:

1. D.M Dhamdhere: "**Operating systems - A concept based Approach"**, Tata Mcgrawhill 2002.
2. P.C.P. Bhatt: "**Operating Systems"**, 2nd Edition, PHI, 2006.
3. Harvey M Deital: "**Operating systems"**, Addison Wesley, 1990.

ADVANCED DIGITAL DESIGN

Subject Code	:	**08SCE12**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
Design methodology – An introduction; IC technology options.

Logic Design with Verilog
Structural models of combinational logic; Logic simulation, Design verification, and Test methodology; Propagation delay; Truth-Table models of Combinational and sequential logic with Verlog.

Logic Design with Behavioral Models
Behavioral modeling; A brief look at data types for behavioral modeling; Boolean-Equation – Based behavioral models of combinational logic; Propagation delay and continuous assignments; Latches and Level – Sensitive circuits in Verilog; Cyclic behavioral models of Flip-Flops and Latches; Cyclic behavior and edge detection; A comparison of styles for behavioral modeling; Behavioral models of multiplexers, encoders, and decoders; Dataflow models of a Linear-Feedback Shift Register; Modeling digital machines with repetitive algorithms; Machines with multi-cycle operations; Design documentation with functions and tasks; Algorithmic state machine charts for behavioral modeling; ASMD charts; Behavioral models of counters, shift registers and register files; Switch debounce, metastability and synchronizers for asynchronous signals; Design example.

Synthesis of Combinational and Sequential Logic
Introduction to synthesis; Synthesis of combinational logic; Synthesis of sequential logic with latches; Synthesis of three-state devices and bus interfaces; Synthesis of sequential logic with flip-flops; Synthesis of explicit state machines; Registered logic; State encoding; Synthesis of implicit state machines, registers and counters; Resets; Synthesis of gated clocks and clock enables; Anticipating the results of synthesis; Synthesis of loops; Design traps to avoid; Divide and conquer: Partitioning a design.

Programmable Logic and Storage Devices
Programmable logic devices; Storage devices; PLA; PAL; Programmability of PLDs; CPLDs; FPGAs; Verlog-Based design flows for FPGAs; Synthesis with FPGAs.

TEXT BOOKS:

- Michael D. Celetti: "**Advanced Digital Design with the Verilog HDL"**, PHI, 2006.

REFERENCE BOOKS:

- Relevant Web Sites

MICROCONTROLLER-BASED SYSTEMS

Subject Code	:	**08SCE13**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction,
Microcontrollers and embedded processors; Overview of the 8051 family.

8051 Assembly Language Programming
Inside the 8051; Introduction to 8051 ALP; Assembling and running an 8051 program; The PC and ROM space in 8051; Data types, directives, flag bits, PSW register, register banks, and the stack, Jump and loop instructions; Call instructions; Time delay for various 8051 family members; I/O programming; I/O bit manipulation programming. Immediate and register addressing modes; Accessing memory using various addressing modes. Bit addresses for I/O and RAM; Extra 128 bytes of on-chip RAM in 8052.
Arithmetic instructions; Signed numbers and arithmetic operations; Logic and compare instructions; rotate instruction and serialization; BCD, ASCII, and other application programs.

Programming in C
Programming in C: Data types and time delays; I/O programming; Logic operations; Data conversion programs; Accessing code ROM space; Data serialization.

Pin Description, Timer Programming
Pin description of 8051; Intel Hex file; Programming the 8051 timers; Counter programming; Programming Timers 0 and 1 in C.

Serial Port Programming, Interrupt Programming
basics of serial communications; 8051 connections to RS232; Serial port programming in assembly and in C.
8051 interrupts; Programming timer interrupts; Programming external hardware interrupts; Programming the serial communications interrupt; Interrupt priority in 8051 / 8052; Interrupt programming in C.

Interfacing LCD, Keyboard, ADC, DAC and Sensors
LCE interfacing; Keyboard interfacing; Parallel and serial ADC; DAC interfacing; Sensor interfacing and signal conditioning.

Interfacing to External Memory, Interfacing with 8255
Memory address decoding; Interfacing 8031 / 8051 with external ROM; 8051 data memory space; Accessing external data memory in C.
Interfacing with 8255; Programming 8255 in C.

DS12887 RTC Interfacing and Programming, Applications
DS12887 RTC interfacing; DS12887 RTC programming in C; Alarm, SQW, and IRQ features of DS12886.
Relays and opto-isolators; Stepper motor interfacing; DC motor interfacing and PWM.

TEXT BOOKS:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay: "**The 8051 Microcontroller and Embedded Systems using Assembly and C"**, 2nd Edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. Raj Kamal: "**Microcontrollers Architecture, Programming, Interfacing and System Design"**, Pearson Education, 2007.
2. Dr. Ramani Kalpathi, Ganesh Raja: "**Microcontrollers and Applications"**, 1st Revised Edition,
3. Sanguine Technical Publishers, 2007.

COMPUTER SYSTEMS PERFORMANCE ANALYSIS

Subject Code	:	**08SCE14**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
The art of Performance Evaluation; Common mistakes in Performance Evaluation; A systematic approach to Performance Evaluation; Selecting an evaluation technique; Selecting performance metrics; Commonly used performance metrics; Utility classification of performance metrics; Setting performance requirements.

Workloads, Workload Selection and Characterization
Types of work loads: addition instructions; Instruction mixes; Kernels; Synthetic programs; Application benchmarks; Popular benchmarks.
Work load selection: Services exercised; Level of detail; Representativeness; Timeliness; Other considerations in workload selection.
Work load characterization techniques: Terminology; Averaging; Specifying dispersion; Single-parameter histograms; Multi-parameter histograms; Principle-component analysis; Markov models; Clustering.

Monitors, Program Execution Monitors, and Accounting Logs
Monitors: Terminology and classification; Software and hardware monitors; Software versus hardware monitors; Firmware and hybrid monitors; Distributed system monitors.
Program execution monitors and accounting logs: Program execution monitors; Techniques for improving program performance; Accounting logs; Analysis and interpretation of accounting log data; Using accounting logs to answer commonly asked questions.

Capacity Planning and Benchmarking
Steps in capacity planning and management; Problems in capacity planning; Common mistakes in benchmarking; Benchmarking games; Load drivers; Remote-terminal emulation; Components of an RTE; Limitations of RTEs.

Experimental Design and Analysis
Introduction: Terminology; Common mistakes in experiments; Types of experimental designs.
2^k Factorial Designs: Concepts; Computation of effects; Sign table method for computing effects; Allocation of variance; General 2^k Factorial Designs.
General full factorial designs with k factors: Model; Analysis of a general design; Informal methods.

Queuing Models
Introduction: Queuing notation; Rules for all Queues; Little's law; Types of stochastic processes.
Analysis of Single Queue: Birth-Death processes; M / M / 1 Queue; M / M / m Queue; M / M / m / B Queue with finite buffers; Results for other M / M / 1 Queuing Systems.
Queuing Networks: Open and closed Queuing Networks; Product form networks; Queuing Network models of Computer Systems.
Operational Laws: Utilization law; Forced flow law; Little's law; General response time law; Interactive response time law; Bottleneck analysis.
Mean Value analysis and related techniques: Analysis of open queuing networks; Mean value analysis; Approximate MVA; Balanced job bounds.
Convolution Algorithm: Distribution of jobs in a system; Convolution algorithm for computing G(N); Computing performance using G(N); Timesharing systems.
Hierarchical decomposition of Large Queuing Networks: Load-dependent service centers; Hierarchical decomposition; Limitations of Queuing Theory.

TEXT BOOKS:

1. Raj Jain "**The Art of Computer Systems Performance Analysis"**, John Wiley and Sons, 1991.

REFERENCE BOOKS:

1. Paul J. Fortier, Howard E. Michel: "**Computer Systems Performance Evaluation and Prediction"**, Elsevier, 2003.
2. Trivedi, KS, "**Probability and Statistics with Reliability, Queuing and computer science Applications",** Prentice Hall of India Reprinted in 1990

ELECTIVE-I

DATABASE MANAGEMENT SYSTEMS

Subject Code	:	**08SCE151**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
Overview of Relational Data model and Relational Database constraints; Data modeling using ER and EER models; Relational Database design by ER and EER-to-Relational Mapping.

Database Design
Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.
Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms.

Evaluating Relational Operators and A Typical Query Optimizer The Selection operation; General selection conditions; The Project operation;
The Join operation; The Set operations; Aggregate operations; The impact of buffering
Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries; Other approaches to query optimization.

Transaction Management
The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Lock conversions; Dealing with deadlocks; Specialized locking techniques; Concurrency control without locking; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a

System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Enhanced Data Models, More Recent Applications
Active Database concepts and triggers; Temporal Database concepts; Spatial and Multimedia databases; Deductive databases; Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

TEXT BOOKS:

1. Elmasri and Navathe: "**Fundamentals of Database Systems"**, 5th Edition, Addison-Wesley, 2007
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

REFERENCE BOOKS:

1. Silberschatz, Korth and Sudharshan: *"***Data base System Concepts"**, 5th Edition, McGraw Hill, 2006.

COMPUTER GRAPHICS AND VISUALIZATION

Subject Code	:	**08SCE152**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

INTRODUCTION
Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics.
Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications.

The OpenGL
The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.

Input and Interaction
Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD

program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.

Geometric Objects and Transformations - 1
Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling.
Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

Viewing
Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

Lighting and Shading
Light and matter; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination.

Implementation
Basic implementation strategies; The major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

TEXT BOOKS:

1. Edward Angel: "**Interactive Computer Graphics A Top-Down Approach with OpenGL"**, 5th Edition, Addison-Wesley, 2008. (Chapters 1, 2, 3, 4, 5, 6, 7)

REFERENCE BOOKS:

1. F.S. Hill,Jr.: "**Computer Graphics Using OpenGL"**, 2nd Edition, Pearson education, 2001.
2. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, "**Computer Graphics"**, Addison-wesley 1997.
3. Donald Hearn and Pauline Baker: "**Computer Graphics- OpenGL Version"**, 2nd Edition, Pearson Education, 2003.

DATA STRUCTURES & ALGORITHMS

Subject Code	:	**08SCE153**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Algorithm Analysis
Mathematical Background, Model, What to Analyze, Running Time Calculations,

List , Stacks, and Queues
Abstract Data Types (ADTs),2 The List ADT, vector and list in the STL, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT.

Trees
Preliminaries, Binary Trees, The Search Tree ADT – Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals (Revisited), B-Trees, Sets and Maps in the Standard Library.

Hashing
General Idea, Hash Function, Separate Chaining , Hash Tables Without Linked Lists, Rehashing, Hash Tables in the Standard Library, Extendible Hashing.

Priority Queues (Heaps)
Model, Simple Implementation, Binary Heap, Applications of priority Queues, d-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues, Priority Queues in the standard Library.

Sorting
Preliminaries, Insertion Sort, A Lower Bound for simple Sorting Algorithms, Shellsort, Heaposrt, Mergesort, Quicksort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting,

Graph Algorithms
Definitions, Topological Sort, Shortest-Path Algorithms, Network Flow Problems, Minimum Spanning Tree, Applications of Depth-First Search, Introduction to NP-Completeness.

Algorithm Design Techniques
Greedy Algorithms, Divide and Conquer, Dynamic Programming, Randomized Algorithms, Backtracking Algorithms, The Turnpike Reconstruction Problem, Games.

TEXT BOOKS:

1. Marks Allen Wesis: "**Data Structures and algorithm analysis in C++"**. Pearson Education, 3rd Edition, 2007.

REFERENCE BOOKS:

1. Yedidyah, Augenstein, Tannenbaum: "**Data Structures Using C and C++"**, 2nd Edition, PHI, 2005.
2. Sartaj Sahni: "**Data Structures, Algorithms and Applications in C++"**, McGraw-Hill, 2005.

II-SEMESTER

COMPUTER ARCHITECTURE

Subject Code	:	**08SCE21**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Fundamentals of Computer Design.
Introduction; Classes computers; Defining computer architecture; Trends in Technology; Trends in power in Integrated Circuits; Trends in cost; Dependability, Measuring, reporting and summarizing Performance; Quantitative Principles of computer design; Performance and Price-Performance; Fallacies and pitfalls.

Pipelining: Basic and Intermediate concepts
Introduction; Pipeline hazards; How is pipelining implemented? What makes pipelining hard to implement?

Instruction –Level Parallelism, Its Exploitation and Limits on ILP
Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Dynami scheduling: Examples and Algorithms; Hardware-based Speculation; Exploiting ILP using Multiple issue and Static scheduling; Exploiting ILP using Multiple issue and Dynamic Scheduling; Advanced Techniques for instruction delivery and Speculation; Fallacies and pitfalls.
Limits in ILP: Introduction; Studies of the limitations of ILP; Limitations on ILP for realizable processors; Cross-Cutting issues: Hardware versus software speculation; Using ILP to exploit thread-level parallelism.

Multiprocessors and Thread –Level Parallelism
Introduction; Symmetric Shared-Memory Architectures; Performance of Symmetric Shared-Memory Multiprocessors; Distributed Shared Memory and Directory-based Coherence; Synchronization: The Basics; Models of Memory Consistency.

Memory Hierarchy
Review: Introduction; Cache performance; Cache Optimizations.
Memory Hierarchy design: Introduction; Advanced optimizations of Cache performance; Memory technology and optimizations.

Data Flow Architecture:
Data Flow and Hybrid architecture; Case study: VLIW architecture, Superscalar and RISC architecture.

TEXT BOOKS:

1. Hennessey and Patterson: "**Computer Architecture A Quantitative Approach"**, 4th Edition, Elsevier, 2007.
2. Kai Hwang: "**Advanced Computer Architecture Parallelism, Scalability, Programmability"**, Tata McGraw-Hill, 2003.

VLSI DESIGN AND ALGORITHMS

Subject Code	:	**08SCE22**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Digital systems and VLSI
Why Design Integrated Circuits? Integrated Circuits manufacturing; Integrated Circuit Design Technology.

Transistors and Layout
Fabrication Processes; Transistors; Wires and Vias; Design Rules; Layout design and Tools.

Logic Gates
Combinational logic functions; Static Complementary Gates; Alternative gate circuits; Low power gates; Delay through resistive interconnect; Delay through inductive interconnect.

Combinational Logic Networks
Standard cell-based layout; Simulation; Combinational Network delay; Logic and interconnect design; Power Optimization; Switch Logic networks; Combinational logic testing.

Sequential Machines
Latches and flip-flops; Sequential systems and clocking disciplines; Sequential systems design; Sequential testing.

Floor Planning
Floor planning methods; Off chip connections.

Architecture Design
Register Transfer design; High-level synthesis; Architecture for low power; Architecture testing.

CAD Systems and Design
CAD systems; Switch level simulation; Layout Synthesis; Layout analysis; Timing Analysis and optimization; Logic Synthesis; Test Generation; Sequential machine optimization; Scheduling and bonding; Placement algorithms; partitioning algorithm; Channel routing and global routing algorithms.

TEXT BOOKS:

1. Wayne Wolf: "**Modern VLSI design"**, 3rd edition, Pearson Education, 2007.
2. Sabih H Gerez: "**Algorithms for VLSI Design Automation"**, Wiley India, 2007,

COMPUTER NETWORKS

Subject Code	:	**08SCE23**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Foundation
Building a Network; Applications; Requirements; Network Architecture; Implementing Network software; Performance.

Direct Link Networks
Physically connecting hosts; Hardware building blocks; Encoding; Framing; Error detection; Reliable transmission; Ethernet (802.3); Ring; (802.5,

FDDI, 802.17); Wireless (802.15.1, 802.11, 802.16, Cell Phone Technologies).

Packet Switching
Switching and forwarding; Bridges and LAN Switches; Cell Switching; Implementation and Performance.

Internetworking
Simple internetworking (IP); Routing; Global Internet; Multicast; MPLS.

End –to-End Protocols
Simple demultiplexer (UDP); Reliable byte stream (TCP).

Congestion Control and Resource Allocation
Issues in resource allocation; Queuing discipline; TCP Congestion Control; Congestion-Avoidance mechanisms; Quality of Service.

Applications
Traditional applications; Web services; Multimedia applications; Overlay Networks.

TEXT BOOKS:

1. Larry L. Peterson and Bruce S. David: "**Computer Networks – A Systems Approach"**, 4th Edition, Elsevier, 2007.

REFERENCE BOOKS:

1. Behrouz A. Forouzan: "**Data Communications and Networking"**, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: "**Data and Computer Communication"**, 8th Edition, Pearson Education, 2007.
3. Alberto Leon-Garcia and Indra Widjaja: **Communication Networks -Fundamental Concepts and Key architectures**, 2nd Edition Tata McGraw-Hill, 2004.

EMBEDDED COMPUTING SYSTEMS

Subject Code	:	**08SCE24**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction to Embedded Systems
Embedded systems; Processor embedded into a system; Embedded hardware units and devices in a system; Embedded software in a system; Examples of embedded systems; Embedded System-on-Chip (SoC) and use of VLSI circuit design technology; Complex systems design and processors; Design process in embedded system. Formalization of system design; Design process and design examples; Classification of embedded systems; Skills required for an embedded system designer.

Devices
I/O types and examples; Serial communication devices; Parallel device ports; Sophisticated interfacing features in device ports. Wireless devices; Timer and counting devices; Watchdog timer; Real time clock.

Communication Buses for Device Networks
Networked embedded systems; Serial bus communication protocols; Parallel bus device protocols; Internet enabled systems; Wireless and mobile system protocols.

Device Drivers and Interrupts Service Mechanism
Device access without interrupts; ISR concept; Interrupt sources; Interrupt servicing mechanism; Multiple interrupts; Context and the periods for context-switching, interrupt latency and deadline; Classification of processors' interrupt service mechanism from context-saving angle; Direct memory access; Device drivers programming.

Program Modeling Concepts, Processes, Threads, and Tasks
Program models; DFG models; State machine programming models for event controlled program flow; Modeling of multiprocessor systems.
Multiple processes in an application; Multiple threads in an application; Tasks and task states; Task and data; Distinctions between functions, ISRs and tasks.

Real-time Operating systems
Operating System services; Process management; Timer functions; Event functions; Memory management; Device, file and I/O sub-systems management; Interrupt routines in RTOS environment and handling of interrupt source calls.

Real-Time Operating Systems; Basic design using an RTOS; RTOS task scheduling models, interrupt latency and response times of the tasks as performance metrics; OS security issues.

Embedded Software Development, Tools
Introduction; Host and target machines; Linking and locating software; Getting embedded software in to the target system; Issues in hardware-software design and co-design; Testing on host machine; Simulators; Laboratory tools.

TEXT BOOKS:

1. Rajkamal: "**Embedded Systems Architecture, Programming and Design"**, 2nd Edition, Tata McGraw Hill, 2008.

REFERENCE BOOKS:

1. Wayne Wolf: "**Computers as Components Principles of Embedded Computer System Design"**, Elsevier, 2005.
2. Tammy Noergaard: "**Embedded Systems Architecture"**, Elsevier, 2005.
3. Steve Heath: "**Embedded Systems Design"**, 2nd Edition, Elsevier, 2003.
4. Dr. K.V.K.K. Prasad: "**Embedded/Real-Time Systems ,Concepts, Design and Programming – The Ultimate Reference",** Dreamtech. Press, 2004.
5. Michael J.Point: "**Embedded C"**, Pearson Education, 2002.

ELECTIVE-II
WEB PROGRAMMING

Subject Code	:	**08SCE251**	IA Marks	:	50
No of Practical Hrs/Week	:	04	Exam hours	:	03
Total No of Practical Hours	:	52	Exam Marks	:	100

Fundamentals of Web
Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; The Web Programmers Toolbox.

XHTML
Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup.

Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML.

CSS
Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The and tags; Conflict resolution.

Javascript
Overview of Javascript; Object orientation and Javascript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions; Errors in scripts; Examples.

Javascript and HTML Documents
The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model; The navigator object; DOM tree traversal and modification.

Dynamic Documents with Javascript
Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements.

XML
Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML processors; Web services.

Perl, CGI Programming
Origins and uses of Perl; Scalars and their operations; Assignment statements and simple input and output; Control statements; Fundamentals of arrays; Hashes; References; Functions; Pattern matching; File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

TEXT BOOKS:

1. Robert W. Sebesta: "**Programming the World Wide Web"**, 4th Edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: "**Internet & World Wide Web How to program"**, 3rd Edition, Pearson Education / PHI, 2004.
2. Chris Bates: "**Web Programming Building Internet Applications"**, 3rd Edition, Wiley India, 2006.
3. Xue Bai et al: "**The Web Warrior Guide to Web Programming"**, Thomson, 2003.

DATA MINING

Subject Code	:	**08SCE252**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
What is Data Mining? Motivating Challenges; The origins of data mining; Data Mining Tasks.

Data
Types of Data; Data Quality; Data Preprocessing; Measures of Similarity and Dissimilarity

Classification
Preliminaries; General approach to solving a classification problem; Decision tree induction; Rule-based classifier; Nearest-neighbor classifier.

Association Analysis
Problem Definition; Frequent Itemset generation; Rule Generation; Compact representation of frequent itemsets; Alternative methods for generating frequent itemsets.
FP-Growth algorithm, Evaluation of association patterns; Effect of skewed support distribution; Sequential patterns.

Cluster Analysis
Overview, K-means, Agglomerative hierarchical clustering, DBSCAN, Overview of Cluster Evaluation.

Further Topics in Data Mining
Multidimensional analysis and descriptive mining of complex data objects; Spatial data mining; Multimedia data mining; Text mining; Mining the WWW. Outlier analysis.

Applications
Data mining applications; Data mining system products and research prototypes; Additional themes on Data mining; Social impact of Data mining; Trends in Data mining.

TEXT BOOKS:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: "**Introduction to Data Mining"**, Pearson Education, 2007.
2. Jiawei Han and Micheline Kamber: "**Data Mining – Concepts and Techniques",** 2nd Edition, Morgan Kaufmann, 2006.

REFERENCE BOOKS:

1. K.P.Soman, Shyam Diwakar, V.Ajay: "**Insight into Data Mining – Theory and Practice"**, PHI, 2006.

DIGITAL IMAGE PROCESSING

Subject Code	:	**08SCE253**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Fundamentals
Basic concepts, Examples of fields that use Digital Image processing, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Basic relationships between pixels

Image Enhancement in Digital Spatial Domain
Some basic gray level transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Combining spatial enhancement methods

Image Enhancement in the Frequency Domain
Background, Introduction to the Fourier transform and the frequency domain, Smoothing frequency domain filters, Sharpening frequency domain filters, Homomorphic filtering, Implementation

Image Restoration
A model of the image degradation/restoration process, Noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction by frequency domain filtering, Linear, position-invariant degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error filtering, Constrained least squares filtering, Geometric mean filter, Geometric transformations

Image Compression
Fundamentals, Image compression models, Elements of information theory, Error-free compression, Lossy compression and image compression standards.

Image Segmentation
Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region-based segmentation, Segmentation by morphological watersheds and the use of motion in segmentation.

Object Recognition
Pattern and pattern classes, Recognition based on Decision-Theoretic Methods and Structural Methods.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods: "**Digital Image Processing"**, 2nd Edition, Pearson Education, 2002.

REFERENCE BOOKS:

1. Anil K. Jain: "**Fundamentals of Digital Image Processing"**, Prentice-Hall of India Pvt. Ltd.,1997.
2. B. Chanda , Dutta Majumdeer: "**Digital Image Processing and Analysis"**, Prentice-Hall of India Pvt. Ltd.,2002.

III SEMESTER

FAULT-TOLERANT SYSTEMS

Subject Code	:	**08SCE31**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
Fault classification; Types of Redundancy; Basic measures of Fault Tolerance.

Hardware Fault Tolerance
The rate of hardware failures; Failure rate, Reliability, and Mean Time To Failure; Canonical and Resilient Structures; Other Reliability Evaluation Techniques; Fault-Tolerance – Processor-Level techniques; Byzantine Failures.

Information Redundancy
Coding; Resilient Disk Systems; Data Replication; Algorithm-Based Fault Tolerance.

Fault-Tolerant Networks
Measures of Resilience; Common Network Topologies and Their Resilience; Fault-Tolerant Routing.

Software Fault Tolerance
Acceptance Tests; Single-Version Fault Tolerance; N-Version Programming; Recovery Block Approach; Preconditions, Postconditions, and Assertions; Exception Handling; Software Reliability Models; Fault-Tolerant Remote Procedure Calls.

Checkpointing
What is Checkpointing? Checkpoint Level; Optimal Checkpointing – An Analytical Model; Cache-Aided Rollback Error Recovery; Checkpointing in Distributed Systems; Checkpointing in Shared Memory Systems; Checkpointing in Real-Time Systems; Other uses of Checkpointing.

Defect Tolerance in VLSI Circuits
Manufacturing Defects and Circuit Faults; Probability of Failure and Critical Areas; Basic Yield Models; Yield Enhancement through Redundancy.

Fault Detection in Cryptographic Systems
Overview of Ciphers; Security Attacks through Fault Injection; Countermeasures.

Case Studies
Non-Stop Systems; Stratus Systems; Cassini Command and Data Sub-System; IBM G5; IBM Sysplex; Itanium.

TEXT BOOKS:

1. Israel Koren, C. Mani Krishna: "**Fault-Tolerant Systems"**, Elsevier, 2007.

REFERENCE BOOKS:

1. D. K. Pradhan (Ed): "**fault Tolerant Computer Systems Design"**, Prentice Hall, 1996.
2. K. S. Trivedi: "**Probability, Statistics with Reliability, Queuing and Computer Science Applications"**, John Wiley, 2002.

ELECTIVE-III

OOAD & DESIGN PATTERNS

Subject Code	:	**08SCE321**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction, Modeling Concepts
What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history.
Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling
Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models. Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.

State Modeling
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.
Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

Interaction Modeling
Interaction Modeling: Use case models; Sequence models; Activity models; Use case relationships; Procedural sequence models; Special constructs for activity models.

Process Overview, System Conception,
Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Domain Analysis, Application Analysis
Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.
Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.

System Design
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

Class Design, Implementation Modeling
Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations.

Design Patterns
What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description.
Structural Decomposition: Whole-Part; Organization of Work: Master-Slave; Management : Command processor; View handler; Communication: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

TEXT BOOKS:

1. Michael Blaha, James Rumbaugh: "**Object-Oriented Modeling and Design with UML"**, 2nd Edition, Pearson Education, 2005.

2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: "**Pattern-Oriented Software Architecture"**, A System of Patterns, Volume 1, John Wiley and Sons, 2006.

REFERENCE BOOKS:

1. Grady Booch et al: "**Object-Oriented Analysis and Design with Applications"**, 3rd Edition, Pearson, 2007.
2. Mark Priestley: "**Practical Object-Oriented Design with UML"**, 2nd Edition, Tata McGraw-Hill, 2003.
3. K. Barclay, J. Savage: "**Object-Oriented Design with UML and JAVA"**, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I.: "**The Unified Modeling Language User Guide"**, 2nd Edition, Pearson, 2005.
5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: "**Design Patterns-Elements of Reusable Object-Oriented Software"**, Addison-Wesley, 1995.
6. Simon Bennett, Steve McRobb and Ray Farmer: "**Object-Oriented Systems Analysis and Design Using UML"**, 2nd Edition, Tata McGraw-Hill, 2002.

INFORMATION AND NETWORK SECURITY

Subject Code	:	**08SCE322**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction to Information Security
Introduction; What is security? Critical characteristics of information; NSTISSC security model; Approaches to information security implementation; The Security System Development Life Cycle; Information Security Terminology.
Planning for Security
Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print

Security Technology
Firewalls and VPNs: Introduction, Physical design, Firewalls, Protecting Remote Connections.
Intrusion Detection, Access control and Other Security Tools: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools; Access Control Devices.

Information Security maintenance
Introduction; Security Management Models; The Maintenance Model.

Introduction to Network Security
Attacks , Services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs.

Cryptography
Conventional Encryption Principles and Algorithms; Cipher Block Modes of Operation; Location of encryption devices; Key distribution; Approaches to message authentication; Secure Hash functions and HMAC; Public Key Cryptography Principles and Algorithms; Digital Signatures; Key management.

Authentication Applications
Kerberos, X.509 Directory Authentication Service

Electronic Mail Security
Pretty Good Privacy (PGP), S/MIME

IP Security
IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

Web Security
Web security requirements, Secure Socket layer (SSL) and Transport layer Security (TLS), Secure Electronic Transaction (SET)

Network Management Security
Basic concepts of SNMP, SNMPv1 community facility, SNMPv3

TEXT BOOKS:

1. Michael E. Whitman and Herbert J. Mattord: "**Principles of Information Security"**, 2nd Edition, Thomson, 2005.
2. William Stallings: "**Network Security Essentials Applications and Standards"**, Person Education, 2000.

REFERENCE BOOKS:

1. Behrouz A. Forouzan: "**Cryptography and Network Security"**, Tata McGraw-Hill, 2007.

DIGITAL SIGNAL PROCESSING

Subject Code	:	**08SCE323**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

The Discrete Fourier Transform: Its Properties and Applications
Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear Filtering Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

Efficient Computation of the DFT: Fast Fourier Transform Algorithms
Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.
Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.
A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.
Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

Implementation of Discrete-Time Systems
Structures for the Realization of Discrete-Time Systems.
Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.
Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.
State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.
Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

Quantization of Filter Coefficients: Analysis of Sensuitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters.
Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

Design of Digital Filters
General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.
Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.
Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters Designs based on the Bilinear Transformation.
Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.
Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

TEXT BOOKS:

1. John G. Proakis and Dimitris G. Manolakis: "**Digital Signal Processing"**, 3rd Edition, Pearson Education, 2003.(Chapters 5, 6, 7 and 8)

REFERENCE BOOKS:

1. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: "**Digital Signal Processing: System Analysis and Design"**, Cambridge University Press, 2002.
2. Sanjit K. Mitra: "**Digital Signal Processing"**: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
3. Alan V.Oppenheim and Ronald W.Schafer: "**Digital Signal Processing"**, Pearson Education, 2003.

ELECTIVE-IV

MOBILE COMPUTING

Subject Code	:	**08SCE331**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Overview
Mobile communications; Mobile computing; Mobile computing architecture; Mobile devices; Mobile system networks; Data dissemination; Mobility management; Mobile phones, Digital Music Players, Handheld Pocket Computers, Handheld Devices, Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems.

GSM and Similar Architectures
GSM – Services and System Architectures, Radio Interfaces, Protocols, Localization, Calling, Handover, General Packet Radio Service, High-speed circuit-switched data, DECT.

Wireless Medium Access Control and CDMA – based Communication
Medium Access Control, Introduction to CDMA – based Systems, OFDM

Mobile IP Network Layer
IP and Mobile IP Network Layers Packet Delivery and Handover Management, Registration, Tunneling and Encapsulation, Route Optimization, Dynamic Host Configuration Protocol.

Mobile Transport Layer
Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP – layer Transmission for Mobile Networks.

Databases
Database Hoarding Techniques, Data Caching, Client – Server Computing and Adaptation, Transactional Models, Query Processing, Data Recovery Process, Issues relating to Quality of Service.

Data Dissemination and Broadcasting Systems
Communication Asymmetry, Classification of Data – Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques, Digital Audio Broadcasting, Digital video Broadcasting.

Data Synchronization in Mobile Computing Systems
Synchronization, Synchronization Protocols, SyncML – Synchronization Language for Mobile Computing, Synchronized Multimedia Markup Language (SMIL).

Mobile Devices, Server and Management
Mobile agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems, Security

Wireless LAN, Mobile Internet Connectivity and Personal Area Network
Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0 Architectures, Bluetooth – enabled Devices Network, Zigbee.

Mobile Application languages – XML, Java, J2ME and JavaCard
Introduction, XML, JAVA, Java 2 Micro Edition (J2ME), JavaCard.

Mobile Operating Systems
Operating System, PalmOS, Windows CE, Symbian OS, Linux for Mobile Devices.

TEXT BOOK:

1. Raj Kamal, "**Mobile Computing**", Oxford University Press, 2007.

REFERENCE BOOKS:

1. Asoke Talkukder, Roopa R Yavagal, "**Mobile Computing – Technology, Applications and Service Creation**", Tata McGraw Hill, 2007
2. Reza B'Far, "**Mobile Computing Principles – Designing and Developing Mobile Applications with UML and XML**", Cambridge University press, 5th Edition, 2006.
3. Uwe Hansmann, Lothat Merk, Martin S Nicklous and Thomas Stober, "**Principles of Mobile Computing**", Springer International Edition, Second Edition, 2005
4. Schiller, "**Mobile Communication**", Pearson Publication, 2004.

PATTERN CLASSIFICATION

Subject Code	:	**08SCE332**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Introduction
Machine perception, Pattern Recognition Systems, The Design Cycle; Learning and Adaptation.

Bayesian Decision Theory
Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, Classification, Classifiers, Discriminant Functions, and Decision Surfaces; The Normal Density; Discriminant Functions for the Normal Density, Error Probabilities and Integrals, Error Bounds for Normal Densities, Bayes Decision Theory: Discrete Features.

Maximum-Likelihood and Bayesian Parameter Estimation
Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian Parameter Estimation: Gaussian Case, general theory; Sufficient Statistics; Problems of Dimensionality; Component Analysis and Discriminants.

Non-Parametric Techniques
Introduction; Density Estimation; Parzen Windows; k_n – Nearest- Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.

Linear Discriminant Functions
Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.

Stochastic Methods
Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.

Unsupervised Learning and Clustering
Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Discrimination and Clustering; Criterion Functions for Clustering; Iterative Optimization; Hierrchical Clustring; The Problem of Validity; On-Line Clustering; Graph Theoritic Methods; Low-Dimensional Representation and Multi-Dimensional Scaling.

Introduction to Biometric Recognition
Biometric Methodologies: Finger Prints; Hand Geometry; Facial Recognition; Iris Scanning; Retina Scanning; Identification versus Verification; Performance Criteria.

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, and David G.Stork: "**Patter Classification"**, 2nd Edition, Wiley-Interscience, 2001.
2. K. Jain, R. Bolle, S. Pankanti: "**Biometrics: Personal Identification in Networked Society"**, Kluwer Academic, 1999.

REFERENCE BOOKS:

1. Earl Gose, Richard Johnsonbaugh, Steve Jost : "**Pattern Recognition and Image Analysis"**, Pearson Education, 2007.

DISTRIBUTED SYSTEMS

Subject Code	:	**08SCE333**	IA Marks	:	50
No of Lecture Hrs/Week	:	04	Exam hours	:	03
Total No of Lecture Hours	:	52	Exam Marks	:	100

Characterization of Distributed Systems and System Models
Introduction, Examples of distributed systems, Resource sharing and the Web, Challenges, Architectural models, Fundamental models.

Networking and Internetworking
Types of Networks, Networks principles, Internet protocols, Network case studies(Ethernet, wireless LAN and ATM).

Interprocess Communication
Introduction, The API for the Internet protocols, External data representation and marshalling, Client -Server communication, Group communication, Case study: Interprocess communication in UNIX

Distributed Objects and Remote Invocation
Communication between distributed objects, Remote procedure call, events and notifications, JAVA RMI case study.

Operating System Support and Security
The Operating system layer, protection, processes and threads, communication and invocation , operating system architecture, overview of security techniques, cryptographic algorithms, digital signatures, cryptography pragmatics, case studies: Needham-Schroeder, Kerberos, SSL and Millicent.

Distributed File Systems
File service architecture, Sun Network file system, Andrew file system, Recent advances

Transactions and Concurrency Control
Transactions, nested transactions, locks, optimistic concurrency control, timestamp ordering, comparison of methods for concurrency control

Distributed Transactions
Flat and nested distributed transactions, atomic commit protocols, concurrency control in distributed transactions, distributed deadlocks, transaction recovery.

Distributed Shared Memory
Design and Implementation issues, sequential consistency and Ivy, Release consistency and Munin, other consistency models

CASE Studies
CORBA , Mach

TEXT BOOKS:

1. George Coulouris, Jean Dollimore, Tim Kindberg: "**Distributed Systems, Concept and Design**", 3rd edition, Pearson Education, 2005.