

M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR
(Autonomous)
REGULATIONS - 2012
CURRICULUM I to IV SEMESTERS
M.E. COMPUTER SCIENCE AND ENGINEERING
(For the students admitted from academic year 2012-2013 onwards)

SEMESTER – I

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CIA	ESE	Total
	THEORY							
PMA12101	Operations Research	3	1	0	4	50	50	100
PCS12101	Advanced Computer Architecture	3	0	0	3	50	50	100
PCS12102	Data Structures and Algorithms	3	0	0	3	50	50	100
PCS12103	Object Oriented Software Engineering	3	0	0	3	50	50	100
PCS12104	Network Engineering and Management	3	0	0	3	50	50	100
	PRACTICAL							
PCS12105P	Data Structures and Algorithms Lab	0	0	3	2	50	50	100
PCS12106P	Networking Lab	0	0	3	2	50	50	100
Total					20	700		

SEMESTER II

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CIA	ESE	Total
	THEORY							
PCS12201	Advanced DBMS	3	0	0	3	50	50	100
PCS12202	Advanced Operating Systems	3	0	0	3	50	50	100
PCS12203	Mobile and Pervasive Computing	3	0	0	3	50	50	100
PCS12204	Information Security	3	0	0	3	50	50	100
PCS12205	Web Technology	3	0	0	3	50	50	100
E1	Elective – I	3	0	0	3	50	50	100
	PRACTICAL							
PCS12207P	Operating System Lab	0	0	3	2	50	50	100
PCS12208P	Web Technology Lab	0	0	3	2	50	50	100
Total					22	800		

SEMESTER – III

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CIA	ESE	Total
	THEORY							
E2	Elective – II	3	0	0	3	50	50	100
E3	Elective – III	3	0	0	3	50	50	100
E4	Elective – IV	3	0	0	3	50	50	100
	PRACTICAL							
PCS12301P	Project Work Phase I	0	0	12	6	100	100	200
Total					15	500		

SEMESTER – IV

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CIA	ESE	Total
	PRACTICAL							
PCS12401P	Project Work Phase II	0	0	24	12	200	200	400
Total					12	400		

Total Credits = 69

LIST OF ELECTIVES FOR II SEMESTER

PCS12251	Digital Imaging	3	0	0	3
PCS12252	Performance Evaluation of Computer Systems and Networks	3	0	0	3
PCS12253	Software Quality Assurance	3	0	0	3
PCS12254	Theory of Computation	3	0	0	3
PCS12255	Visualization Techniques	3	0	0	3

LIST OF ELECTIVES FOR III SEMESTER

Course	Course Title	L	T	P	C
PCS12351	Ad hoc Networks	3	0	0	3
PCS12352	Agent Based Intelligent Systems	3	0	0	3
PCS12353	Bio Informatics	3	0	0	3
PCS12354	Cloud Computing	3	0	0	3
PCS12355	Component Based Technology	3	0	0	3
PCS12356	Data Warehousing and Data Mining	3	0	0	3
PCS12357	Distributed Computing	3	0	0	3
PCS12358	Embedded Systems	3	0	0	3
PCS12359	Grid Computing	3	0	0	3
PCS123510	High Speed Networks	3	0	0	3
PCS123511	Infometrics	3	0	0	3
PCS123512	Integrated Software Project Management	3	0	0	3
PCS123513	Knowledge Engineering	3	0	0	3
PCS123514	Natural Language Processing	3	0	0	3
PCS123515	Network Security	3	0	0	3
PCS123516	Principles of Multimedia	3	0	0	3
PCS123517	Service Oriented Architecture	3	0	0	3
PCS123518	Soft Computing	3	0	0	3
PCS123519	User Interface Design	3	0	0	3
PCS123520	XML and Web Services	3	0	0	3

UNIT I	QUEUEING MODELS	9
Poisson Process - Markovian Queues - Single and Multi-server Models - Little's formula - Machine Interference Model - Steady State analysis - Self Service Queue.		
UNIT II	ADVANCED QUEUEING MODELS	9
Non- Markovian Queues - Pollaczek Khintchine Formula - Queues in Series - Open Queueing Networks -Closed Queueing networks.		
UNIT III	SIMULATION	9
Discrete Even Simulation - Monte - Carlo Simulation - Stochastic Simulation - Applications to Queueing systems.		
UNIT IV	LINEAR PROGRAMMING	9
Formulation - Graphical solution - Simplex method - Two phase method - Transportation and Assignment Problems.		
UNIT V	NON-LINEAR PROGRAMMING	9
Lagrange multipliers - Equality constraints - Inequality constraints - Kuhn - Tucker conditions - Quadratic Programming.		

Total Hours : 45

Text books:

1. Winston.W.L. "Operations Research", Fourth Edition, Thomson - Brooks/Cole, 2003.
2. Taha, H.A. "Operations Research: An Introduction", Ninth Edition, Pearson Education Edition, Asia, New Delhi, 2002.

Reference Books:

1. Robertazzi. T.G. "Computer Networks and Systems - Queuing Theory and Performance Evaluation", Third Edition, Springer, 2002 Reprint.
- 2.Ross. S.M., "Probability Models for Computer Science", Academic Press, 2002.

UNIT I	COMPLEXITY ANALYSIS & ELEMENTARY DATA STRUCTURES	9
Asymptotic notations - Properties of big oh notation - asymptotic notation with several parameters - conditional asymptotic notation - amortized analysis - NP-completeness - NPhard - recurrence equations - solving recurrence equations - arrays - linked lists - trees.		
UNIT II	HEAP STRUCTURES	9
Min-max heaps - Deaps - Leftist heaps -Binomial heaps - Fibonacci heaps - Skew heaps - Lazy-binomial heaps.		
UNIT III	SEARCH STRUCTURES	9
Binary search trees - AVL trees - 2-3 trees - 2-3-4 trees - Red-black trees - B-trees - splay trees - Tries.		
UNIT IV	GREEDY & DIVIDE AND CONQUER	9
Quicksort - Strassen's matrix multiplication- Convex hull - Tree-vertex splitting- Job sequencing with deadlines - Optimal storage on tapes.		
UNIT V	DYNAMIC PROGRAMMING AND BACKTRACKING	9
Multistage graphs - 0/1 knapsack using dynamic programming - Flow shop scheduling – 8Queens problem - graph coloring - knapsack using backtracking.		

Total Hours : 45

Reference Books:

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Galgotia, 1999.
2. E. Horowitz, S.Sahni and S. Rajasekaran, Computer Algorithms / C++, Galgotia, 1999.
3. Adam Drozdex, Data Structures and algorithms in C++, Second Edition, Thomson learning - vikas publishing house, 2001.
4. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Printice -Hall, 1988.
5. Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, "Introduction to Algorithms", Second Edition, PHI 2003.

PCS12103 OBJECT ORIENTED SOFTWARE ENGINEERING L T P C 3 0 0 3

UNIT I I INTRODUCTION	9
System Concepts - Software Engineering Concepts - Development Activities - Managing Software Development - Unified Modeling Language - Project Organization - Communication	
UNIT II ANALYSIS	9
Requirements Elicitation - Concepts - Activities - Management - Analysis Object Model - Analysis Dynamic Models	
UNIT III SYSTEM DESIGN	9
Decomposing the system - Overview of System Design - System Design Concepts - System Design Activities - Addressing Design Goals - Managing System Design	
UNIT IV OBJECT DESIGN AND IMPLEMENTATION ISSUES	9
Reusing Pattern Solutions - Specifying Interfaces - Mapping Models to Code - Testing	
UNIT V MANAGING CHANGE	9
Rationale Management - Configuration Management - Project Management – Software Life Cycle	

Total Hours : 45

Reference Books:

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd ed, Pearson Education, 2004.
2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
3. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

UNIT I HIGH SPEED NETWORKS 9

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's.

UNIT II CONGESTION AND TRAFFIC MANAGEMENT 9

Queuing Analysis- Queuing Models- Single Server Queues- Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks- Frame Relay Congestion Control.

UNIT III TCP AND ATM CONGESTION CONTROL 10

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services.

UNIT V PROTOCOLS FOR QoS SUPPORT 8

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

Total Hours : 45

Text book:

William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

Reference Books:

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Aparcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.

PCS12105P DATA STRUCTURES AND ALGORITHMS LAB L T P C 0 0 3 2

1. Min Heap
2. Deaps
3. Leftist Heap
4. AVL Tree
5. B-Tree
6. Tries
7. Quick Sort
8. Convex hull
9. 0/1 Knapsack using Dynamic Programming
10. Graph coloring using backtracking

PCS12106P NETWORKING LAB L T P C 0 0 3 2

1. Socket Programming
 - a. TCP Sockets
 - b. UDP Sockets
 - c. Applications using Sockets
2. Simulation of Sliding Window Protocol
3. Simulation of Routing Protocols
4. Development of applications such as DNS/ HTTP/ E - mail/ Multi - user Chat
5. Simulation of Network Management Protocols
6. Study of Network Simulator Packages - such as opnet, ns2, etc.

UNIT I DISTRIBUTED DATABASES**5**

Distributed Databases Vs Conventional Databases - Architecture - Fragmentation - Query Processing - Transaction Processing - Concurrency Control - Recovery.

UNIT II OBJECT ORIENTED DATABASES**10**

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence - Query Languages - Transaction - Concurrency - Multi Version Locks - Recovery.

UNIT III EMERGING SYSTEMS**10**

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

UNIT IV DATABASE DESIGN ISSUES**10**

ER Model - Normalization - Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues - Design of Temporal Databases - Spatial Databases.

UNIT V CURRENT ISSUES**10**

Rules - Knowledge Bases - Active And Deductive Databases - Parallel Databases - Multimedia Databases - Image Databases - Text Database

Total Hours : 45**Reference Books:**

1. Elisa Bertino, Barbara Catania, Gian Piero Zarri, "Intelligent Database Systems", Addison-Wesley, 2001.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, R.T.Snodgrass, V.S.Subrahmanian, "Advanced Database Systems", Morgan Kaufman, 1997.
3. N.Tamer Ozsu, Patrick Valduriez, "Principles Of Distributed Database Systems", Prentice Hal International Inc., 1999.
4. C.S.R Prabhu, "Object-Oriented Database Systems", Prentice Hall Of India, 1998.
5. Abdullah Uz Tansel Et Al, "Temporal Databases: Theory, Design And Principles", Benjamin Cummings Publishers, 1993.
6. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Mcgraw Hill, Third Edition 2004.
7. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fourth Edition, Mcgraw Hill, 2002.
8. R. Elmasri, S.B. Navathe, "Fundamentals Of Database Systems", Pearson Education, 2004.

UNIT I INTRODUCTION 9

Overview - Functions of an Operating System - Design Approaches - Types of Advanced Operating System - Synchronization Mechanisms - Concept of a Process, Concurrent Processes - The Critical Section Problem, Other Synchronization Problems - Language Mechanisms for Synchronization - Axiomatic Verification of Parallel Programs - Process Deadlocks - Preliminaries - Models of Deadlocks, Resources, System State - Necessary and Sufficient conditions for a Deadlock - Systems with Single-Unit Requests, Consumable Resources, Reusable Resources.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Introduction - Issues - Communication Primitives - Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion - Non-Token Based Algorithms - Lamport's Algorithm - Token-Based Algorithms - Suzuki-Kasami's Broadcast Algorithm - Distributed Deadlock Detection - Issues - Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols - Classification - Solutions - Applications.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File systems - Architecture - Mechanisms - Design Issues - Distributed Shared Memory - Architecture - Algorithm - Protocols - Design Issues. Distributed Scheduling - Issues - Components - Algorithms.

UNIT IV FAILURE RECOVERY AND FAULT TOLERANCE 9

Basic Concepts-Classification of Failures - Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Checkpointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Nonblocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols;

UNIT V MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS 9

Structures - Design Issues - Threads - Process Synchronization - Processor Scheduling - Memory Management - Reliability / Fault Tolerance; Database Operating Systems - Introduction - Concurrency Control - Distributed Database Systems - Concurrency Control Algorithms.

Total Hours : 45**Text book:**

Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 2000

Reference Books:

1. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Sixth Edition, Addison Wesley Publishing Co., 2003.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.

UNIT I MOBILE NETWORKS	9
Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS.	
UNIT II WIRELESS NETWORKS	9
Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services –Network – HiperLAN – Blue Tooth- Wi-Fi – WiMAX	
UNIT III ROUTING	9
Mobile IP – DHCP – AdHoc– Proactive and Reactive Routing Protocols – Multicast Routing.	
UNIT IV TRANSPORT AND APPLICATION LAYERS	9
Mobile TCP– WAP – Architecture – WWW Programming Model– WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WMLScripts.	
UNIT V PERVASIVE COMPUTING	9
Pervasive computing infrastructure-applications- Device Technology - Hardware, Human-machine Interfaces, Biometrics, and Operating systems– Device Connectivity – Protocols, Security, and Device Management- Pervasive Web Application architecture-Access from PCs and PDAs - Access via WA	

Total Hours : 45

Text books:

- 1.Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003
- 2.Jochen Burkhardt, Pervasive Computing: Technology and Architecture of Mobile Internet Applications, Addison-Wesley Professional; 3rd edition, 2007

Reference Books:

1. Frank Adelstein, Sandeep KS Gupta, Golden Richard, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill 2005
2. Debashis Saha, Networking Infrastructure for Pervasive Computing: Enabling Technologies, Kluwer Academic Publisher, Springer; First edition, 2002
3. Introduction to Wireless and Mobile Systems by Agrawal and Zeng, Brooks/ Cole (Thomson Learning), First edition, 2002
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principles of Mobile Computing, Springer, New York, 2003

UNIT I**9**

An Overview of Computer Security, Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT II**9**

Cryptography- Key management - Session and Interchange keys, Key exchange and generation, Cryptographic Key Infrastructure, Storing and Revoking Keys, Digital Signatures, Cipher Techniques

UNIT III**9**

Systems: Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem.

UNIT IV**9**

Malicious Logic, Vulnerability Analysis, Auditing and Intrusion Detection

UNIT V**9**

Network Security, System Security, User Security and Program Security

Total Hours: 45**Text Book:**

Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education

Reference Books:

1. Mark Merkow, James Breithaupt “ Information Security : Principles and Practices”
First Edition, Pearson Education
2. Whitman,“Principles of Information Security”, Second Edition, Pearson Education
3. William Stallings, “Cryptography and Network Security: Principles and Practices”,
Third Edition, Pearson Education
- 4.“Security in Computing ”, Charles P.Pfleeger and Shari Lawrence Pfleeger, Third Edition

UNIT I	9
Web essentials - clients - servers - communication - markup languages - XHTML - simple XHTML pages style sheets - CSS	
UNIT II	9
Client side programming - Java script language - java script objects - host objects : Browsers and the DOM	
UNIT III	9
Server side programming - java servlets - basics - simple program - separating programming and presentation - ASP/JSP - JSP basics ASP/JSP objects - simple ASP/JSP pages.	
UNIT IV	9
Representing Web data - data base connectivity - JDBC - Dynamic Web pages - XML - DTD - XML schema - DOM - SAX - Xquery.	
UNIT V	9
Building Web applications - cookies - sessions - open source environment - PHP - MYSQL - case studies.	

Total Hours: 45

Text Books:

1. Jeffrey C Jackson, “ Web Technology - A computer Science perspective”, Persoson Education, 2007
2. Chris Bates, “Web Programming - Building Internet Applications, “Wiley India, 2006

Multiprocessor Operating Systems

PROGRAM 1 - Semaphores - Multiprocessor operating systems

Assume there are three processes: Pa, Pb, and Pc. Only Pa can output the letter A, Pb B, and Pc C.

Utilizing only semaphores (and no other variables) the processes are synchronized so that the output satisfies the following conditions:

- a) A B must be output before any C's can be output.
- b) B's and C's must alternate in the output string, that is, after the first B is output, another B cannot be output until a C is output. Similarly, once a C is output, another C cannot be output until a B is output.
- c) The total number of B's and C's which have been output at any given point in the output string cannot exceed the number of A's which have been output up to that point.

Examples

```
AACB      -- invalid, violates a)
ABACAC    -- invalid, violates b)
AABCABC   -- invalid, violates c)
AABCAAABC -- valid
AAAABCBC  -- valid
AB        -- valid
```

PROGRAM 2 - Multithreading - Multiprocessor operating systems

The Cigarette Smokers Problem

Consider a simulation with three smoker threads and one agent thread. Each smoker continuously makes a cigarette and smokes it. But to make a cigarette, a smoker needs three ingredients: tobacco, paper, and matches. One of the smoker threads has only paper, another has only tobacco, and the third has only matches. The agent thread has an infinite supply of all three materials. The three smoker threads are initially blocked. The agent places two randomly chosen (different) ingredients on the table and unblocks the one smoker who has the remaining ingredient. The agent then blocks. The unblocked smoker removes the two ingredients from the table, makes a cigarette, and smokes it for a random amount of time, unblocking the agent on completion of smoking the cigarette. The agent then puts out another random two of the three ingredients, and the cycle repeats.

Write a multi-class multithreaded Java program that uses a monitor to synchronize the agent thread and the three smoker threads. Do not mechanically translate semaphore code into monitor code! The agent thread executes in an agent object created from an agent class. Each smoker thread executes in a smoker object. All smoker objects are created from one smoker class whose constructor is used to specify the ingredient possessed by the smoker object. A driver class with a main method constructs the objects and starts the threads.

Use a single monitor object instantiated from a class Control for synchronization. Each of the four threads invokes a synchronized monitor method for its synchronization. No semaphores are

allowed. No synchronized blocks are allowed, only synchronized methods. No busy waiting is

allowed. No calls to nap inside a synchronized method are allowed (do not nap while holding the monitor object's lock, that is, while inside a synchronized method or while inside a method

called by a synchronized method).

PROGRAM 3 - Multiple sleeping barbers - Multiprocessor operating systems

Write a multi-class multithreaded Java program that simulates multiple sleeping barbers, all in one barbershop that has a finite number of chairs in the waiting room. Each customer is instantiated from a single Customer class, each barber is instantiated from a single Barber class.

Network operating systems

PROGRAM 4 - Network operating systems

Establish a Lab setup for the following network operating systems based programs based on the skills in networking on your own. E.g. for identifying networking hardware, identifying different kinds of network cabling and network interface cards can be done.

Exercises

1. Identifying Local Area Network Hardware
2. Exploring Local Area Network Configuration Options
3. Verifying TCP/IP Settings
4. Sharing Resources
5. Testing LAN Connections

Real time operating systems

PROGRAM 5 - Real time operating systems

A real-time program implementing an alarm clock shall be developed.
[Alarm clock, using C and Simple_OS]

The program shall fulfill the following requirements:

Clock with alarm functionality shall be implemented, It shall be possible to set the time, It shall be possible to set the alarm time, the alarm shall be enabled when the alarm time is set, the alarm shall be activated when the alarm is enabled, and when the current time is equal to the alarm time, an activated alarm must be acknowledged. Acknowledgement of an alarm shall lead to the alarm being disabled, the alarm is enabled again when a new alarm time is set, an alarm which is not acknowledged shall be repeated every 10 seconds. The program shall communicate with a graphical user interface, where the current time shall be displayed, and where the alarm time shall be displayed when the alarm is enabled. It shall be possible to terminate the program, using a command which is sent from the graphical user interface.

Database operating systems

PROGRAM 6 - Transactions and Concurrency -Database operating systems

Exercises

Assume any application(e.g.banking) on your own and do the following exercises.

1. Investigate and implement the ObjectStore's concurrency options.
2. Implement the concurrency conflict that occurs between multiple client applications.
3. Observe and implement the implication of nested transactions.

Distributed operating systems

PROGRAM 7 - Distributed operating systems

1. Design a RMI Lottery application. Each time you run the client program --
“java LotteryClient n”, the server program “LotteryServer” will generate n set of
Lottery numbers. Here n is a positive integer, representing the money you will spend on
Lottery in sterling pounds. Write this program in a proper engineering manner, i.e. there
Should be specifications, design (flow chart, FD, or pseudo code), coding,
test/debug,and documentation.
2. Consider a distributed system that consists of two processes which communicate
With each other. Let P be a state predicate on the local state of one process and Q be a
state predicate on the local state of the other process. Assume that neither P nor Q are stable (i.e.
closed). Design a superimposed computation which detects that there exists an interleaving of
underlying events in this system where at some state $P \wedge Q$ holds. (A superposed
computation is one the does not affect the underlying system; it may \read" but not \write"
the state of the underlyin system. Events in a superposed computation may occur in at the
same instant as the underlying events and/or at di_arent instants.) State any assumptions you
make.[Hint: Use vector clocks.]

1. Creation of HTML pages with frames, links, tables and other tags
2. Usage of internal and external CSS along with HTML pages
3. Client side Programming
 - # Java script for displaying date and comparing two dates
 - # Form Validation including text field, radio buttons, check boxes, list box and other controls
4. Usage of ASP/JSP objects response, Request, Application, Session, Server, ADOetc
 - # Writing online applications such as shopping, railway/air/bus ticket Reservation system with set of ASP/JSP pages
 - # Using sessions and cookies as part of the web application
5. Writing Servlet Program using HTTP Servlet
6. Any online application with database access
7. Creation of XML document for a specific domain
8. Writing DTD or XML schema for the domain specific XML document
9. Parsing an XML document using DOM and SAX Parsers
10. Sample web application development in the open source environment

UNIT I	FUNDAMENTALS OF IMAGE PROCESSING	9
Introduction - Steps in Image Processing Systems - Image Acquisition - Sampling and Quantization - Pixel Relationships - Colour Fundamentals and Models, File Formats, Image operations - Arithmetic, Geometric and Morphological.		
UNIT II	IMAGE ENHANCEMENT	9
Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering - Smoothing and Sharpening.Frequency Domain : Filtering in Frequency Domain - DFT, FFT, DCT - Smoothing and Sharpening filters - Homomorphic Filtering.		
UNIT III	IMAGE SEGMENTATION AND FEATURE ANALYSIS	9
Detection of Discontinuities - Edge Operators - Edge Linking and Boundary Detection - Thresholding - Region Based Segmentation - Morphological WaterSheds - Motion Segmentation, Feature Analysis and Extraction.		
UNIT IV	MULTI RESOLUTION ANALYSIS AND COMPRESSIONS	9
Multi Resolution Analysis : Image Pyramids - Multi resolution expansion - Wavelet Transforms. Image Compression : Fundamentals - Models - Elements of Information Theory - Error Free Compression - Lossy Compression - Compression Standards.		
UNIT V	APPLICATIONS OF IMAGE PROCESSING	9
Image Classification - Image Recognition - Image Understanding - Video Motion Analysis - Image Fusion - Steganography – Digital Compositing - Mosaics - Colour Image Processing..		

Total Hours: 45

Reference Books:

- 1.Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Educaiton, 2003.

**PCS12252 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS
AND NETWORKS L T P C 3 0 0 3**

UNIT I **9**
Performance Characteristics - Requirement Analysis: Concepts -User, Device, Network Requirements - Process -Developing RMA ,Delay, Capacity Requirements - Flow Analysis - Identifying and Developing Flows -Flow Models -Flow Prioritization -Specification.

UNIT II **9**
Random variables - Stochastic process -Link Delay components - Queuing Models - Little's Theorem - Birth & Death process - Queuing Disciplines.

UNIT III **9**
Markovian FIFO Queuing Systems - M/M/1 - M/M/a - M/M/ ∞ - M/G/1 - M/M/m/m and other Markov-Non-Markovian and self-similar models - Network of Queues -Burke's Theorem - Jackson's Theorem.

UNIT IV **9**
Multi-User Uplinks/Downlinks - Capacity Regions - Opportunistic Scheduling for Stability and Max Throughput - Multi-Hop Routing - Mobile Networks - Throughput Optimality and Backpressure

UNIT V **9**
Performance of Optimal Lyapunov Networking - Energy Optimality- Energy-Delay Tradeoffs - Virtual Cost Queues - Average Power Constraints - Flow Control with Infinite Demand - Auxiliary Variables - Flow Control with Finite Demand - General Utility Optimization.

Total Hours: 45

Text Books :

1. James D.McCabe,Network Analysis,Architecture and Design,2nd Edition,Elsevier,2003
2. Bertsekas & Gallager , Data Networks , second edition ,Pearson Education,2003
3. Introduction to Probability Models by Sheldon Ross (8th edition) Academic Press, New York ,2003

Reference Books:

- 1.D. Bertsekas, A. Nedic and A. Ozdaglar, Convex Analysis and Optimization, Athena Scientific, Cambridge , Massachusetts , 2003
2. Nader F.Mir Computer and Communication Networks,Pearson Education.2007
3. Paul J.Fortier, Howard E.Michel, Computer Systems Performance Evaluation and Prediction, Elsevier,2003

UNIT I	9
Introduction to software quality - challenges - objectives - quality factors - components of SQA - contract review - development and quality plans - SQA components in project life cycle - SQA defect removal policies - Reviews	
UNIT II	9
Basics of software testing- test generation from requirements- finite state models- combinatorial designs - test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement	
UNIT III	9
Testing strategies - white box and black box approach - integration testing - system and acceptance testing - performance testing - regression testing - internationalization testing - ad-hoc testing - website testing - usability testing - accessibility testing Test plan- management - execution and reporting- software test automation- automated testing tools	
UNIT IV	9
Hierarchical models of software quality - software quality metrics -function points -Software product quality- software maintenance quality- effect of case tools- software quality infrastructure- procedures - certifications - configuration management- documentation control.	
UNIT V	9
Project progress control - costs - quality management standards - project process standards - management and its role in SQA - SQA unit	

Total Hours: 45

Reference Books:

1. Daniel Galin, Software quality assurance - from theory to implementation , Pearson education, 2009.
2. Aditya Mathur, Foundations of software testing, Pearson Education, 2008
practices , Pearson education, 2006
3. Ron Patton, Software testing , second edition, Pearson education, 2007
4. AlanC Gillies,“Software Quality Theory and Management”, Cengage Learning Second edition, 2003

UNIT I AUTOMATA**9**

Introduction to formal proof - Additional forms of Proof - Inductive Proofs -Finite Automata
Deterministic Finite Automata - No deterministic Finite Automata - Finite Automata with Epsilon
Transitions.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES**9**

Regular Expression - FA and Regular Expressions - Proving Languages not to be regular -
Closure Properties of Regular Languages - Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES**9**

FG - Parse Trees - Ambiguity in Grammars and Languages - Definition of the Pushdown
Automata - Languages of a Pushdown Automata - Equivalence of Pushdown Automata and
CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES**9**

Normal Forms for CFG - Pumping Lemma for CFL - Closure Properties of CFL - Turing
Machines - Programming Techniques for TM.

UNIT V INDECIDABILITY**9**

A Language That Is Not Recursive Enumerable - An Undecidable Problem that Is RE-
Undecidable Problems about TM - Post's Correspondence Problem, The Class P And NP.

Total Hours: 45**Text Book:**

J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages
and Computations", Second Edition, Pearson Education, 2003.

Reference Books:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second
Edition, PHI, 2003.
2. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition,
TMH, 2003.
3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole,
1997.

UNIT I VISUALIZATION**9**

Introduction - Issues - Data Representation - Data Presentation - Interaction

UNIT II FOUNDATIONS FOR DATA VISUALIZATION**9**

Visualization stages - Experimental Semiotics based on Perception Gibson's Affordance theory - A Model of Perceptual Processing - Types of Data.

UNIT III COMPUTER VISUALIZATION**9**

Non-Computer Visualization - Computer Visualization: Exploring Complex Information Spaces - Fisheye Views - Applications - Comprehensible Fisheye views - Fisheye views for 3D data - Non Linear Magnification - Comparing Visualization of Information Spaces - Abstraction in computer Graphics - Abstraction in user interfaces.

UNIT IV MULTIDIMENSIONAL VISUALIZATION**9**

One Dimension - Two Dimensions - Three Dimensions - Multiple Dimensions - Trees - Web Works - Data Mapping: Document Visualization - Workspaces.

UNIT V CASE STUDIES**9**

Small interactive calendars - Selecting one from many - Web browsing through a key hole - Communication analysis - Archival analysis

Total Hours: 45**Text Books:**

1. Colin Ware, "Information Visualization Perception for Design" Morgan Kaufmann Publishers, 2004, 2nd edition.
2. Robert Spence "Information visualization - Design for interaction", Pearson Education, 2nd Edition, 2007

Reference Books:

Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers.

UNIT I AD-HOC MAC 9

Introduction - Issues in Ad-Hoc Wireless Networks. MAC Protocols - Issues, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

UNIT II AD-HOC NETWORK ROUTING & TCP 9

Issues - Classifications of routing protocols - Hierarchical and Power aware. Multicast routing - Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc - Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

UNIT III WSN –MAC 9

Introduction - Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols - self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IV WSN ROUTING, LOCALIZATION & QOS 9

Issues in WSN routing - OLSR, AODV. Localization - Indoor and Sensor Network Localization. QoS in WSN.

UNIT V MESH NETWORKS 9

Necessity for Mesh Networks - MAC enhancements- IEEE802.11s Architecture- Opportunistic routing - Self configuration and Auto configuration - Capacity Models - Fairness - Heterogeneous Mesh Networks - Vehicular Mesh Networks.

Total Hours: 45

Reference Books:

1. C.Siva Ram Murthy and B.Smanoj, “ Ad Hoc Wireless Networks - Architectures and Protocols”, Pearson Education, 2004.
- 2.Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufman Publishers, 2004.
3. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
4. Thomas Krag and Sebastin Buettrich, “Wireless Mesh Networking”, O’Reilly Publishers, 2007.

UNIT I INTRODUCTION	9
Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching - Heuristics - Constraint Satisfaction Problems - Game playing.	
UNIT II KNOWLEDGE REPRESENTATION AND REASONING	9
Logical Agents-First order logic-First Order Inference-Unification-Chaining-Resolution Strategies-Knowledge Representation-Objects-Actions-Events	
UNIT III PLANNING AGENTS	9
Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic Domains-Conditional Planning-Continuous Planning-MultiAgent Planning.	
UNIT IV AGENTS AND UNCERTAINTY	9
Acting under uncertainty - Probability Notation-Bayes Rule and use - Bayesian Networks-Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory- Decision Network-Complex Decisions.	
UNIT V HIGHER LEVEL AGENTS	9
Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning- Communication-Formal Grammar-Augmented Grammars- Future of AI.	

Total Hours: 45

Text Book:

Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”,
2nd Edition, Prentice Hall, 2002

Reference Books:

1. Michael Wooldridge, “An Introduction to Multi Agent System”, John Wiley, 2002.
2. Patrick Henry Winston, “Artificial Intelligence”, III Edition, AW, 1999.
3. Nils.J.Nilsson, “Principles of Artificial Intelligence”, Narosa Publishing House, 1992.

UNIT I INTRODUCTORY CONCEPTS**9**

The Central Dogma - The Killer Application - Parallel Universes - Watson's Definition - Top Down Versus Bottom up - Information Flow - Convergence - Databases - Data Management - Data Life Cycle - Database Technology-Interfaces - Implementation - Networks-Geographical Scope-Communication Models - Transmissions Technology-Protocols - Bandwidth - Topology - Hardware - Contents - Security-Ownership-Implementation - Management.

UNIT II SEARCH ENGINES AND DATA VISUALIZATION**9**

The search process - Search Engine Technology - Searching and Information Theory - Computational methods - Search Engines and Knowledge Management - Data Visualization - sequence visualization - structure visualization - user Interface - Animation Versus simulation - General Purpose Technologies.

UNIT III STATISTICS AND DATA MINING**9**

Statistical concepts - Microarrays - Imperfect Data - Randomness - Variability - Approximation - Interface Noise - Assumptions - Sampling and Distributions - Hypothesis Testing - Quantifying Randomness - Data Analysis - Tool selection statistics of Alignment - Clustering and Classification - Data Mining - Methods - Selection and Sampling - Preprocessing and Cleaning - Transformation and Reduction - Data Mining Methods - Evaluation - Visualization - Designing new queries - Pattern Recognition and Discovery - Machine Learning - Text Mining - Tools.

UNIT IV PATTERN MATCHING**9**

Pairwise sequence alignment - Local versus global alignment - Multiple sequence alignment - Computational methods - Dot Matrix analysis - Substitution matrices - Dynamic Programming - Word methods - Bayesian methods - Multiple sequence alignment - Dynamic Programming - Progressive strategies - Iterative strategies - Tools - Nucleotide Pattern Matching - Polypeptide pattern matching - Utilities - Sequence Databases.

UNIT V MODELING AND SIMULATION**9**

Drug Discovery - components - process - Perspectives - Numeric considerations - Algorithms - Hardware - Issues - Protein structure - AbInitio Methods - Heuristic methods - Systems Biology - Tools - Collaboration and Communications - standards - Issues - Security - Intellectual property.

Total Hours: 45**Reference Books:**

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
2. T.K. Attwood and D.J. Perry Smith, "Introduction to Bio Informatics, Longman Essen, 1999.

UNIT I UNDERSTANDING CLOUD COMPUTING 6

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT II DEVELOPING CLOUD SERVICES 10

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT III CLOUD COMPUTING FOR EVERYONE 10

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists - Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV USING CLOUD SERVICES 10

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management - Collaborating on Event Management – Collaborating on Contact Management - Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files

UNIT V OTHER WAYS TO COLLABORATE ONLINE 9

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

Total Hours : 45

Reference Books:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

UNIT I INTRODUCTION

9

Software Components - Objects - Fundamental properties of Component Technology - Modules- Interfaces - Callbacks - Directory Services - Component Architecture - Components and Middleware.

UNIT II JAVA COMPONENT TECHNOLOGIES

9

Threads - Java Beans - Events and Connections - Properties - Introspection - Jar files -reflection - Object Serialization - Enterprise Java Beans - Distributed Object Models - RMI and RMI-IIOP.

UNIT III CORBA TECHNOLOGIES

9

Java and CORBA - Interface Definition language - Object Request Broker - System Object Model - Portable Object Adapter - CORBA services - CORBA component model - Containers - Application Server - Model Driven Architecture.

UNIT IV COM AND .NET TECHNOLOGIES

9

COM - Distributed COM - Object Reuse - Interfaces and Versioning - Dispatch Interfaces-Connectable Objects - OLE Containers and Servers - Active X controls - .NET component-Assemblies - Appdomains - Contexts - Reflection - Remoting.

UNIT V COMPONENT FRAMEWORKS AND DEVELOPMENT

9

Connectors - Contexts - EJB containers - CLR contexts and channels - Black Box Component Framework - Directory Objects - Cross-Development Environment Component-Oriented Programming - Component Design and Implementation Tools - Testing Tools - Assembly Tools.

Total Hours: 45**Text Book:**

“Component Software: Beyond Object-Oriented Programming”, Pearson Education publishers, 2003.

Reference Book:

Ed Roman, “Enterprise Java Beans”, Third Edition , Wiley , 2004.

UNIT I**9**

Data Warehousing and Business Analysis: - Data warehousing Components -Building a Data warehouse - Mapping the Data Warehouse to a Multiprocessor Architecture - DBMS Schemas for Decision Support - Data Extraction, Cleanup, and Transformation Tools -Metadata - reporting - Query tools and Applications - Online Analytical Processing (OLAP) - OLAP and Multidimensional Data Analysis.

UNIT II**9**

Data Mining: - Data Mining Functionalities - Data Preprocessing - Data Cleaning - Data Integration and Transformation - Data Reduction - Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods - Mining Various Kinds of Association Rules - Association Mining to Correlation Analysis – Constraint Based Association Mining.

UNIT III**9**

Classification and Prediction: - Issues Regarding Classification and Prediction - Classification by Decision Tree Introduction - Bayesian Classification - Rule Based Classification - Classification by Back propagation - Support Vector Machines - Associative Classification - Lazy Learners - Other Classification Methods - Prediction – Accuracy and Error Measures - Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods - Model Section.

UNIT IV**9**

Cluster Analysis: - Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods - Density-Based Methods - Grid-Based Methods - Model-Based Clustering Methods - Clustering High-Dimensional Data - ConstraintBased Cluster Analysis - Outlier Analysis.

UNIT V**9**

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects - Spatial Data Mining - Multimedia Data Mining Text Mining - Mining the World Wide Web.

Total Hours: 45**Reference Books:**

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw - Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

UNIT I	COMMUNICATION IN DISTRIBUTED ENVIRONMENT	8
Introduction - Client-Server Paradigm - Threads in Distributed Systems - Remote Procedure Call - Remote Object Invocation - Message-Oriented Communication - Unicasting - Group Communication - Reliable and Unreliable Multicasting.		
UNIT II	DISTRIBUTED OPERATING SYSTEMS	12
Issues in Distributed Operating System - Lamport's Logical Clock - Vector Clock - Causal Ordering - Global States - Election Algorithms - Distributed Mutual Exclusion - Distributed Transactions - Distributed Deadlock - Agreement Protocol.		
UNIT III	DISTRIBUTED SHARED MEMORY	10
Introduction- Data-Centric Consistency Models- Client-Centric Consistency Models - Distribution Protocols - Consistency Protocols - Ivy - Munin - Atomic Transaction.		
UNIT IV	FAULT TOLERANCE AND DISTRIBUTED FILE SYSTEMS	7
Introduction to Fault Tolerance- Distributed Commit Protocol - Distributed File System Architecture - Issues in Distributed File Systems - Sun NFS.		
UNIT V	CASE STUDIES	8
Distributed Object-Based System - CORBA - COM - Distributed Coordination-Based System - JINI.		
		Total Hours: 45

Text Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education Asia, 2002.
2. Mukesh Singhal, "Advanced Concepts In Operating Systems", McGraw Hill Series in Computer Science, 1994.

Reference Books:

1. A.S.Tanenbaum, M.Van Steen, "Distributed Systems", Pearson Education, 2004.
2. M.L.Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.

UNIT I	EMBEDDED COMPUTING	9
Challenges of Embedded Systems - Embedded system design process. Embedded processors - ARM processor - Architecture, ARM and Thumb Instruction sets		
UNIT II	EMBEDDED C PROGRAMMING	9
C-looping structures - Register allocation - Function calls - Pointer aliasing - structure arrangement - bit fields - unaligned data and endianness - inline functions and inline assembly - portability issues.		
UNIT III	OPTIMIZING ASSEMBLY CODE	9
Profiling and cycle counting - instruction scheduling - Register allocation - conditional execution - looping constructs - bit manipulation - efficient switches - optimized primitives.		
UNIT IV	PROCESSES AND OPERATING SYSTEMS	9
Multiple tasks and processes - Context switching - Scheduling policies - Interprocess communication mechanisms - Exception and interrupt handling - Performance issues.		
UNIT V	EMBEDDED SYSTEM DEVELOPMENT	9
Meeting real time constraints - Multi-state systems and function sequences. Embedded software development tools - Emulators and debuggers. Design methodologies - Case studies - Complete design of example embedded systems.		

Total Hours: 45

Reference Books:

1. Andrew N Sloss, D. Symes, C. Wright, "ARM System Developers Guide", Morgan Kaufmann / Elsevier, 2006.
2. Michael J. Pont, "Embedded C", Pearson Education, 2007.
3. Wayne Wolf, "Computers as Components : Principles of Embedded Computer System Design", Morgan Kaufmann / Elsevier, 2nd. edition, 2008.
4. Steve Heath, "Embedded System Design", Elsevier, 2nd. edition, 2003.

UNIT I	INTRODUCTION TO GRID COMPUTING	7
Introduction – The Grid – Past, Present and Future – Applications of grid computing organizations and their roles.		
UNIT II	GRID COMPUTING ARCHITURE	8
Grid Computing anatomy – Next generation of Grid computing initiatives–Merging the Grid services architecture with Web services architecture.		
UNIT III	GRID COMPUTING TECHNOLOGIES	11
OGSA – Sample use cases that drive the OGSA platform components – OGSI and WSRF – OGSA Basic Services – Security standards for grid computing.		
UNIT IV	GRID COMPUTING TOOL KIT	10
Globus Toolkit –Versions – Architecture –GT Programming model –A sample grid service implementation.		
UNIT V	HIGH LEVEL GRID SERVICES	9
High level grid services – OGSI .NET middleware Solution Mobile OGSI.NET for Grid computing on Mobile devices.		

Total Hours : 45

Text book:

Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson/PHI PTR-2003.

Reference Books:

- 1.Fran Berman, Geoffrey Fox, Anthony J.G. Hey,“Grid Computing: Making the Global Infrastructure a reality “, John Wiley and sons,2003.
- 2.Ahmar Abbas, “Grid Computing: A Practical Guide to Technology and Applications”, Charles River media, 2003.

UNIT I	HIGH SPEED NETWORKS	9
Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's: applications, requirements- Architecture of 802.11		
UNIT II	CONGESTION AND TRAFFIC MANAGEMENT	8
Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.		
UNIT III	TCP AND ATM CONGESTION CONTROL	12
TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.		
UNIT IV	INTEGRATED AND DIFFERENTIATED SERVICES	8
Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services		
UNIT V	PROTOCOLS FOR QOS SUPPORT	8
RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.		

Total Hours: 45

Reference Books:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002. [Chapter - 4-6, 8, 10, 12, 13, 17,18]
2. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
3. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003

UNIT I IT ORGANIZATION 9

Metrics that matter - Interpreting the metrics – Collecting the data – Managing the data – Obstacles to acquiring IT metrics information – Old data versus new graphical analysis – Core of software planning – Measuring the core metrics (Product, Quality, Process, Productivity, Time, Effort) – Estimating and controlling with the core metrics – Work output measurements.

UNIT II MEASUREMENT PROGRAM APPROACHES 9

EDS Brazil metrics program – Measurement program implementation approaches – Benchmarking – Data definition framework for defining software measurements.

UNIT III SOFTWARE METRICS 9

Functional points as part of measurement program – Estimation of software reliability – Establishing central support for software sizing activities – Using metrics to manage projects – Tracking software progress – Effectively utilizing software metrics.

UNIT IV SOFTWARE ESTIMATION 9

Problems with measurements – Avoiding obstacles and common pitfalls – Unreported and unpaid overtime – Using software metrics for effective estimating – Estimating software development projects – Enhanced estimation on time within budget – Metrics in outsourcing-Lifigaton – The product of non practicing function point metrics – Applying statistical process central to software – Metrics in E-Commerce.

UNIT V KNOWLEDGE MANAGEMENT 9

Quality information and knowledge – Why quality information and knowledge – Define information quality – Create organizational knowledge – Manage knowledge as assets – Create customized solution – Network knowledge infrastructure.

Total Hours: 45

Reference Books:

- 1.Stephen H. Kan, “ Metrics and Models In Software Quality Engineering”, First Edition, Pearson Education, 2003.
- 2.N. Fenton, S. L. Pfleeger, “Software Metrics: A Rigorous and Practical Approach”, Thomson Learning, 1997.
- 3.IT Measurement – A Practical Advice from the Experts”, International Function Point Users Group, Pearson Education, Asia.

UNIT I PROJECT MANAGEMENT CONCEPTS 9

Evolution of Software Economics – Software Management Process Framework (Phases, Artifacts, Workflows, Checkpoints) – Software Management Disciplines (Planning / Project Organization and Responsibilities / Automation / Project Control) – Modern Project Profiles

UNIT II SOFTWARE ESTIMATION & COSTING 9

Problems in Software Estimation – Algorithmic Cost Estimation Process, Function Points, SLIM (Software Life cycle Management), COCOMO II (CONstructive COSt MOdel) – Estimating Web Application Development – Concepts of Finance, Activity Based Costing and Economic Value Added (EVA) – Balanced Score Card.

UNIT III RISK MANAGEMENT 9

Risk Definition – Risk Categories – Risk Assessment (Identification / Analysis / Prioritization) – Risk Control (Planning / Resolution / Monitoring) – Failure Mode and Effects Analysis (FMEA)

UNIT IV METRICS 9

Need for Software Metrics – Classification of Software Metrics: Product Metrics (Size Metrics, Complexity Metrics, Halstead’s Product Metrics, Quality Metrics), and Process metrics (Empirical Models, Statistical Models, Theory-based Models, Composite Models, and Reliability Models).

UNIT V PEOPLE MANAGEMENT 9

Team Management – Client Relationship Management.

Total Hours: 45

Reference Books:

- 1.McConnell, S. “Software Project: Survival Guide”, Microsoft Press, 1998.
Royce, W. “Software Project management: A Unified Framework”, Addison-Wesley, 1998.
- 2.Cooper, R., “The Rise of Activity-Based Costing- PartOne: What is an Activity-Based Cost System?” Journal of Cost Management, Vol.2, No.2 (Summer 1988), pp.45 – 54.
- 3.Grant, J.L. “Foundations of Economic Value Added”, John Wiley & Sons, 1997.
- 4.Kaplan, R.S., Norton, D.P. “The Balanced Scorecard: Translating Strategy into Action”, Harvard Business School Press, 1996.
- 5.Boehm, B. W. "Software Risk Management: Principles and Practices" in IEEE Software, January 1991, pp32-41.
- 6.Fenton, N.E., and Pfleeger, S.L.. “Software Metrics: A Rigorous and Practical Approach, Revised” Brooks Cole, 1998.
- 7.Demarco, T. and Lister, T. “Peopleware: Productive Projects and Teams, 2nd Ed.”, Dorset House,1999.

UNIT I INTRODUCTION 9

Key concepts – Why knowledge Representation and Reasoning – Language of first order Logic – Syntax, Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontologies – Language Ontologies –Language Patterns – Tools for Knowledge Acquisition

UNIT II RESOLUTION AND REASONING 9

Proportional Case – Handling Variables and Qualifies – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning – Rules in Production – Description Logic – Vivid Knowledge – Beyond Vivid.

UNIT III REPRESENTATION 9

Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment -Taxonomies and Classification – Inheritance – Networks –Strategies for Defeasible Inheritance – Formal Account of Inheritance Networks.

UNIT IV DEFAULTS, UNCERTAINTY AND EXPRESSIVENESS 9

Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic Limitations of Logic – Fuzzy Logic – Nonmontonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Noncategorical Reasoning – Objective and Subjective Probability.

UNIT V ACTIONS AND PLANNING 9

Explanation and Diagnosis – Purpose – Syntax, Semantics of Context – First Order Reasoning – Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning – Strips – Planning as Reasoning – Hierarchical and Conditional Planning.

Total Hours: 45

Reference Books:

- 1.Ronald Brachman, Hector Levesque “Knowledge Representation and Reasoning “, The Morgan Kaufmann Series in Artificial Intelligence 2004
- 2.John F. Sowa, “ Knowledge Representation: Logical, Philosophical, and Computational Foundations”, 2000
- 3.Arthur B. Markman, “Knowledge Representation”, Lawrence Erlbaum Associates,1998

UNIT I INTRODUCTION	6
Introduction: Knowledge in speech and language processing - Ambiguity - Models and Algorithms - Language, Thought and Understanding. Regular Expressions and automata: sions - Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology - Finite-State Morphological parsing - Combining FST Lexicon and rules - Lexicon-Free FSTs: The porter stammer - Human morphological processing	
UNIT II SYNTAX	10
Word classes and part-of-speech tagging: English word classes - Tagsets for English – Part-of-speech tagging - Rule-based part-of-speech tagging - Stochastic part-of-speech tagging - Transformation-based tagging - Other issues. Context-Free Grammars for English: Constituency - Context-Free rules and trees - Sentence-level constructions - The noun phrase - Coordination - Agreement - The verb phrase and sub categorization – Auxiliaries - Spoken language syntax - Grammars equivalence and normal form – Finite-State and Context-Free grammars - Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search - A Basic Top-Down parser – Problems with the basic Top-Down parser - The early algorithm - Finite-State parsing methods.	
UNIT III ADVANCED FEATURES AND SYNTAX	11
Features and Unification: Feature structures - Unification of feature structures - Features structures in the grammar - Implementing unification - Parsing with unification constraints - Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic context-free grammar - problems with PCFGs - Probabilistic lexicalized CFGs - Dependency Grammars - Human parsing.	
UNIT IV SEMANTIC	10
Representing Meaning: Computational desiderata for representations - Meaning structure of language - First order predicate calculus - Some linguistically relevant concepts - Related representational approaches - Alternative approaches to meaning. Semantic Analysis: Syntax-Driven semantic analysis - Attachments for a fragment of English - Integrating semantic analysis into the early parser - Idioms and compositionality – Robust semantic analysis. Lexical semantics: relational among lexemes and their senses - WordNet: A database of lexical relations - The Internal structure of words – Creativity and the lexicon.	
UNIT V APPLICATIONS	8
Word Sense Disambiguation and Information Retrieval: Selectional restriction-based disambiguation - Robust word sense disambiguation - Information retrieval - other information retrieval tasks. Natural Language Generation: Introduction to language generation -Architecture for generation - Surface realization - Discourse planning- Otherissues. Machine Translation: Language similarities and differences - The transfer metaphor- The interlingua idea: Using meaning – Direct translation – Using statistical techniques – Usability and system development.	
Total Hours: 45	

Reference Books:

1. Daniel Jurafsky & James H. Martin, “Speech and Language Processing”, Pearson Education (Singapore) Pte. Ltd., 2002.
2. James Allen, “Natural Language Understanding”, Pearson Education, 2003.

UNIT I	INTRODUCTION	9
Attacks - Services - Mechanisms - Conventional Encryption - Classical And Modern Techniques - Encryption Algorithms - Confidentiality.		
UNIT II	PUBLIC KEY ENCRYPTION	9
RSA - Elliptic Curve Cryptography - Number Theory Concepts		
UNIT III	MESSAGE AUTHENTICATION	9
Hash Functions - Digest Functions - Digital Signatures - Authentication Protocols.		
UNIT IV	NETWORK SECURITY PRACTICE	9
Authentication, Applications - Electronic Mail Security - IP Security - Web Security.		
UNIT V	SYSTEM SECURITY	9
Intruders - Viruses - Worms - Firewalls Design Principles - Trusted Systems.		

Total Hours:45

Text Book:

Stallings, Cryptography & Network Security - Principles & Practice, Prentice Hall, 3rd Edition 2002.

Reference Books:

1. Bruce, Schneier, "Applied Cryptography", 2nd Edition, Toha Wiley & Sons, 1996.
2. Man Young Rhee, "Internet Security", Wiley, 2003.
3. Pfleeger & Pfleeger, "Security in Computing", Pearson Education, 3rd Edition, 2003.

UNIT I INTRODUCTION 7

Introduction to Multimedia – Characteristics – Utilities – Creation -Uses – Promotion – Digital Representation – Media and Data streams – Multimedia Architecture – Multimedia Documents

UNIT II ELEMENTS OF MULTIMEDIA 11

Text : types – font - Unicode standard - text compression - file formats. – Image: types – image processing – standards - specification - device independent color models - gamma correction - file formats – Video :video signal transmission - signal formats - broadcasting standards - digital video standards - PC video - video file formats – Audio : acoustics – characteristics of sound - elements of audio system – microphone – amplifier – loudspeaker – audio mixer - digital audio - MIDI – Graphics – components of graphics system, co-ordinate system – plotter - Intro to 2D & 3D Graphics -surface characteristics and texture - lights – Animation :key frames & Tweening, techniques, principles of animation, 3D animation, file formats.

UNIT III MULTIMEDIA SYSTEMS 9

Systems – CRT - video adapter card - video adapter cable – LCD – PDP - optical storage media - CD technology - DVD Technology - Compression Types and Techniques – CODEC - GIF coding standards - lossy and lossless – JPEG - MPEG-1 - MPEG-2 – MP3 - Fractals – MMDBS

UNIT IV MULTIMEDIA TOOLS 9

Authoring tools – features and types - card and page based tools - icon and object based tools – time based tools - cross platform authoring tools - Editing tools - text editing and word processing tools - OCR software - painting and drawing tools - 3D modeling and animation tools – image editing tools -sound editing tools - digital movie tools – plug -ins and delivery vehicles for www

UNIT V MULTIMEDIA APPLICATION DEVELOPMENT 9

Software life cycle – ADDIE Model – conceptualization – content collection and processing – story – flow line – script - storyboard - implementation - multiplatform issues – authoring – metaphors – testing – report writing - documentation - case study: -Web Application – Console Application – Distributed Application – Mobile Application - games consoles – iTV kiosks – education

Total Hours: 45

Text Books:

1. Parekh R “Principles Of Multimedia” Tata McGraw-Hill, 2006.
2. Ralf Steinmetz, Klara Nahrstedt, “Multimedia: Computing, Communications and Applications” Prentice Hall, 1995.

Reference Books:

1. Tay Vaughan, “Multimedia: Making It Work” McGraw-Hill Professional, 2006
2. Deitel & Deitel “Internet & World Wide Web How to Program”, Fourth Edition – Prentice Hall, 2008.

UNIT I**9**

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models

UNIT II**9**

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

UNIT III**9**

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

UNIT IV**9**

Meta data management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in web service framework - advanced messaging

UNIT V**9**

Transaction processing – paradigm – protocols and coordination – transaction specifications – SOA in mobile – research issues

Total Hours: 45**Reference Books:**

1. Shankar Kambhampaly, “Service –Oriented Architecture for Enterprise Applications”, Wiley India Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, “Understanding SOA with Web Services”, Pearson Education.
3. Mark O’ Neill, et al. , “Web Services Security”, Tata McGraw-Hill Edition, 2003.

UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9

Evolution of Computing- Soft Computing Constituents - From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) - Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT III NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks - Feed forward Networks - Supervised Learning Neural Networks - Radial Basis Function Networks - Reinforcement Learning - Unsupervised Learning Neural Networks - Adaptive Resonance architectures - Advances in Neural networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets - Operations on Fuzzy Sets - Fuzzy Relations - Membership Functions- Fuzzy Rules and Fuzzy Reasoning - Fuzzy Inference Systems - Fuzzy Expert Systems - Fuzzy Decision Making.

UNIT V NEURO-FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems - Coactive Neuro-Fuzzy Modeling - Classification and Regression Trees - Data Clustering Algorithms - Rulebase Structure Identification - Neuro-Fuzzy Control - Case studies.

Total Hours: 45

Text Books:

- 1.Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
- 2.George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
- 3.James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.

Reference Books:

- 1.Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
- 2.David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997.
- 3.S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
- 4.S.N.Sivanandam · S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2007.
- 5.Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992.

UNIT I	INTRODUCTION	8
Human-Computer Interface – Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic & Principles.		
UNIT II	HUMAN COMPUTER INTERACTION	7
User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed –Business Functions –Requirement Analysis – Direct – Indirect Methods – Basic Business Functions – Design Standards – General Design Principles – Conceptual Model Design – Conceptual Model Mock-Ups		
UNIT III	WINDOWS	12
Characteristics– Components– Presentation Styles– Types– Managements– Organizations– Operations– Web Systems– System Timings - Device– Based Controls Characteristics– Screen – Based Controls — Human Consideration In Screen Design – Structures Of Menus – Functions Of Menus– Contents Of Menu– Formatting – Phrasing The Menu – Selecting Menu Choice– Navigating Menus– Graphical Menus. Operate Control – Text Boxes– Selection Control– Combination Control– Custom Control– Presentation Control.		
UNIT IV	MULTIMEDIA	9
Text For Web Pages – Effective Feedback– Guidance & Assistance– Internationalization– Accessibility– Icons– Image– Multimedia – Coloring.		
UNIT V	EVALUATION	9
Conceptual Model Evaluation – Design Standards Evaluation – Detailed User Interface Design Evaluation		

Total Hours: 45

Text Books:

1. Wilbent. O. Galitz, “The Essential Guide To User Interface Design”, John Wiley& Sons, 2001.
2. Deborah Mayhew, The Usability Engineering Lifecycle, Morgan Kaufmann, 1999 Ben Shneiderman, “Design The User Interface”, Pearson Education, 1998.

Reference Books:

- Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd., 2002.
 Sharp, Rogers, Preece, ‘Interaction Design’, Wiley India Edition, 2007

UNIT I DATABASE TECHNOLOGY **7**

Distributed Databases Vs Conventional Databases - Architecture - Fragmentation - Query Processing - Transaction Processing - Concurrency Control - Recovery.

UNIT II OBJECT ORIENTED DATABASES **10**

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence - Query Languages - Transaction - Concurrency - Multi Version Locks - Recovery

UNIT III EMERGING SYSTEMS **10**

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

UNIT IV DATABASE DESIGN ISSUES **9**

ER Model - Normalization - Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues - Design of Temporal Databases - Spatial Databases.

UNIT V CURRENT ISSUES **9**

Semantic Web - Role of Meta data in web content - Resource Description Framework - RDF schema - Architecture of semantic web - content management workflow - XLANG - WSFL - BPEL4WS

Total Hours: 45

Text Books:

1. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2002.
2. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.

Reference Books:

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002.
2. Keith Ballinger, ".NET Web Services Architecture and Implementation", Pearson Education, 2003.
3. Henry Bequet and Meeraj Kunnumpurath, "Beginning Java Web Services", First Edition, Apress, 2004.
4. Russ Basiura and Mike Batongbacal, "Professional ASP .NET Web Services", Apress, 2003.