AFFILIATED INSTITUTIONS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E.COMPUTER SCIENCE AND ENGINEERING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**MA9219**	Operations Research	3	1	0	4
2	CS9211	Computer Architecture	3	0	0	3
3	CS9212	Data Structures and Algorithms	3	0	0	3
4	SE9213	Object Oriented Software Engineering	3	0	0	3
5	CS9213	Computer Networks and Management	3	0	0	3
PRACTICAL						
6	CS 9215	**Data Structures Lab**	0	0	3	2
7	CS9216	**Networking Lab**	0	0	3	2
		TOTAL	**15**	**1**	**6**	**20**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CS9221	Data Base Technology	3	0	0	3
2	CS9222	Advanced Operating Systems	3	0	0	3
3	CS9223	Advanced System Software	3	0	0	3
4	CS9224	**Information Security**	3	0	0	3
5	CS9225	Web Technology	3	0	0	3
6	E1	Elective I	3	0	0	3
PRACTICAL						
7	CS9227	Operating System Lab	0	0	3	2
8	CS9228	**Web Technology Lab**	**0**	**0**	**3**	**2**
		TOTAL	**18**	**0**	**6**	**22**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E2	Elective II	3	0	0	3
2	E3	Elective III	3	0	0	3
3	E4	Elective IV	3	0	0	3
PRACTICAL						
4	CS9234	Project Work (Phase I)	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	CS9241	Project Work (Phase II)	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL NO OF CREDITS TO BE EARNED FOR THE AWARD OF DEGREE 20+23+15+12= 70

AFFILIATED INSTITUTIONS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E.COMPUTER SCIENCE AND ENGINEERING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**MA9219**	Operations Research	3	1	0	4
2	CS9212	Data Structures and Algorithms	3	0	0	3
3	**CS9213**	Computer Networks and Management	3	0	0	3
PRACTICAL						
4	CS 9215	**Data Structures Lab**	0	0	3	2
		TOTAL	**9**	**1**	**3**	**12**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CS9221	Data Base Technology	3	0	0	3
2	CS9222	Advanced Operating Systems	3	0	0	3
3	CS9223	Advanced System Software	3	0	0	3
PRACTICAL						
4	**CS9227**	Operating System Lab	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CS9211	Computer Architecture	3	0	0	3
2	**SE9213**	Object Oriented Software Engineering	3	0	0	3
PRACTICAL						
3	CS9216	**Networking Lab**	0	0	3	2
		TOTAL	**6**	**0**	**3**	**8**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CS9224	Information Security	3	0	0	3
2	CS9225	Web Technology	3	0	0	3
3	E1	Elective I	3	0	0	3
PRACTICAL						
4	CS9228	Web Technology Lab	**0**	**0**	**3**	**2**
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E2	Elective II	3	0	0	3
2	E3	Elective III	3	0	0	3
3	E4	Elective IV	3	0	0	3
PRACTICAL						
4	CS9234	Project Work (phase I)	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	CS9241	Project Work (Phase II)	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

Total credit 12+11+8+11+15+12 = 69

LIST OF ELECTIVES FOR M.E.COMPUTER SCIENCE AND ENGINEERING*

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	CS9251	Mobile Computing	3	0	0	3
2	CS9252	Grid Computing	3	0	0	3
3	CS9253	Theory of Computation	3	0	0	3
4	CS9254	Soft Computing	3	0	0	3
5	CP9264	**Distributed Computing**	3	0	0	3
6	CS9256	Multimedia Systems	3	0	0	3
7	CS9257	XML and Web Services	3	0	0	3
8	CS9258	Bio Informatics	3	0	0	3
9	CS9259	Network Security	3	0	0	3
10	CS9260	Embedded Systems	3	0	0	3
11	CS9261	Digital Imaging	3	0	0	3
12	CS9262	Software Quality Assurance	3	0	0	3
13	CS9263	Adhoc Networks	3	0	0	3
14	CS9264	**Data Warehousing and Data Mining**	3	0	0	3
15	CS9265	Performance Evaluation of Computer Systems and Networks	3	0	0	3
16	CS9266	Agent Based Intelligent Systems	3	0	0	3
17	CS9267	Visualization Techniques	3	0	0	3
18	CS9268	Advanced Databases	3	0	0	3
19	CS9269	Software Project Management	3	0	0	3
20	CS9270	Component Based Technology	3	0	0	3

MA9219 OPERATIONS RESEARCH

L T P C
3 1 0 4

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.

L + T: 45+15 =60

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.

REFERENCES:

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.

CS9211 COMPUTER ARCHITECTURE

L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND PIPELINING 9

Fundamentals of Computer Design – Measuring and reporting performance – Quantitative principles of computer design. Instruction set principles – Classifying ISA – Design issues. Pipelining – Basic concepts – Hazards – Implementation – Multicycle operations.

UNIT II INSTRUCTION LEVEL PARALLELISM WITH DYNAMIC APPROACHES 9

Concepts – Dynamic Scheduling – Dynamic hardware prediction – Multiple issue – Hardware based speculation – Limitations of ILP – Case studies.

UNIT III INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES 9

Compiler techniques for exposing ILP – Static branch prediction – VLIW – Advanced compiler support – Hardware support for exposing more parallelism – Hardware versus software speculation mechanisms – Case studies.

UNIT IV MULTIPROCESSORS AND MULTICORE ARCHITECTURES 9

Symmetric and distributed shared memory architectures – Performance issues – Synchronisation issues – Models of memory consistency – Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies.

UNIT V MEMORY AND I/O 9

Cache performance – Reducing cache miss penalty and miss rate – Reducing hit time – Main memory and performance – Memory technology. Types of storage devices – Buses – RAID – Reliability, availability and dependability – I/O performance measures – Designing an I/O system.

REFERENCES:

1. John L. Hennessey and David A. Patterson, " Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 4th. edition, 2007.
2. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A hardware/ software approach" , Morgan Kaufmann / Elsevier, 1997.
3. William Stallings, " Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2006.
4. Behrooz Parhami, "Computer Architecture", Oxford University Press, 2006.

CS9212 DATA STRUCTURES AND ALGORITHMS

L T P C
3 0 0 3

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 – NP-hard – 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 – 8-queens problem – graph coloring – knapsack using backtracking

TOTAL = 45

REFERENCES:

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.

SE9213 OBJECT ORIENTED SOFTWARE ENGINEERING

L T P C
3 0 0 3

UNIT I INTRODUCTION

System Concepts – Software Engineering Concepts – Development Activities – Managing Software Development – Unified Modeling Language – Project Organization – Communication

UNIT II ANALYSIS

Requirements Elicitation – Concepts – Activities – Management – Analysis Object Model – Analysis Dynamic Models

UNIT III SYSTEM DESIGN

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

Reusing Pattern Solutions – Specifying Interfaces – Mapping Models to Code – Testing

UNIT V MANAGING CHANGE

Rationale Management – Configuration Management – Project Management – Software Life Cycle

REFERENCES:

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.

CS9213 COMPUTER NETWORKS AND MANAGEMENT

L T P C
3 0 0 3

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 = 45

TEXT BOOKS:

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

REFERENCES:

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

CS9215 DATA STRUCTURES 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

CS9216 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.

CS9221 DATABASE TECHNOLOGY

L T P C
3 0 0 3

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 = 45

REFERENCES:

1. Elisa Bertino, Barbara Catania, Gian Piero Zarri, “Intelligent Database Systems”, Addison-Wesley, 2001.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloustsos, 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 Ediion, Mcgraw Hill, 2002.
8. R. Elmasri, S.B. Navathe, “Fundamentals Of Database Systems”, Pearson Education, 2004.

CS9222 ADVANCED OPERATING SYSTEMS

L T P C
3 0 0 3

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 Non-blocking 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 = 45

TEXT BOOKS:

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

REFERENCES: .

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.

CS9223 ADVANCED SYSTEM SOFTWARE

L T P C
3 0 0 3

UNIT I

Basic Compiler Functions – Grammars – Lexical Analysis – Syntactic Analysis – Code Generation – Heap Management – Parameter Passing Methods – Semantics of Calls and Returns – Implementing Subprograms – Stack Dynamic Local Variables – Dynamic binding of method calls to methods – Overview of Memory Management, Virtual Memory, Process Creation – Overview of I/O Systems, Device Drivers, System Boot

UNIT II **10**

Introduction and Overview – Symbol table structure – Local and Global Symbol table management Intermediate representation – Issues – High level, medium level, low level intermediate languages – MIR, HIR, LIR – ICAN for Intermediate code – Optimization – Early optimization – loop optimization

UNIT III **9**

Procedure optimization – in-line expansion – leaf routine optimization and shrink wrapping – register allocation and assignment – graph coloring – data flow analysis – constant propagation – alias analysis – register allocation – global references – Optimization for memory hierarchy - Code Scheduling – Instruction scheduling – Speculative scheduling – Software pipelining – trace scheduling – Run-time support – Register usage – local stack frame – run-time stack – Code sharing – position–independent code

UNIT IV **9**

Introduction to Virtual Machines (VM) – Pascal P-Code VM – Object-Oriented VMs – Java VM Architecture – Common Language Infrastructure – Dynamic Class Loading – Security – Garbage Collection – Optimization

UNIT V **8**

Emulation – Interpretation and Binary Translation – Instruction Set Issues – Process Virtual Machines – Profiling – Migration – Grids – Examples of real world implementations of system software

TEXT BOOKS:

1. Steven S. Muchnick, “Advanced Compiler Design Implementation”, Morgan Koffman – Elsevier Science, India, First Edition 2004
2. James E Smith and Ravi Nair, “Virtual Machines”, Elsevier, 2005. (Units 4, 5) (Sections 1.0-1.6, 2.0-2.5, 2.8, 3.0-3.6, 4.2, 5.0-5.3, 5.5-5.6, 6.0-6.3, 6.5-6.6, 10.2, 10.3)
3. Robert W. Sebesta, “Concepts of Programming Languages”, 7th ed., Pearson Education, 2006. (Unit 3) (Sections 6.9, 9.3, 9.5, 10.1-10.3, 12.10.2)

REFERENCES:

1. Alfred V Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers”, Pearson Education, 1986.
2. Terrance W Pratt, Marvin V Zelkowitz, T V Gopal, “Programming Languages”, 4th ed., Pearson Education, 2006.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization”, 5th ed., McGraw Hill, 2002.
4. Silberschatz, Galvin, Gagne, “Operating System Concepts”, 6th ed., Wiley, 2003.

CS9224 INFORMATION SECURITY

L T P C
3 0 0 3

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

TEXT BOOK:

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

REFERENCES:

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.

CS9225 WEB TECHNOLOGY

L T P C
3 0 0 3

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.

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 ^Q holds. (A superposed computation is one that does not a_ect the underlying system; it may \read" but not \write" the state of the underlying system. Events in a superposed computation may occur in at the same instant as the underlying events and/or at di_erent instants.) State any assumptions you make.

   [Hint: Use vector clocks.]

CS9228 WEB TECHNOLOGY LAB **L T P C**
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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, ADO etc
   - # 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

CS9251 MOBILE COMPUTING

L T P C
3 0 0 3

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT II TELECOMMUNICATION SYSTEMS 11

GSM – System Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Handover – Security – GPRS.

UNIT III WIRELESS NETWORKS 9

Wireless LAN – IEEE 802.11 Standards – Architecture – Services – HIPERLAN – Adhoc Network – Blue Tooth.

UNIT IV NETWORK LAYER 9

Mobile IP – Dynamic Host Configuration Protocol – Routing – DSDV – DSR – AODV – ZRP – ODMR.

UNIT V TRANSPORT AND APPLICATION LAYERS 7

TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing – Selective Retransmission – Transaction Oriented TCP – WAP – WAP Architecture – WDP – WTLS – WTP – WSP – WML –WML Script – WAE – WTA.

TOTAL = 45

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, First Edition, Pearson Education, 2003.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.
4. Burkhardt, “Pervasive Computing”, First Edition, Pearson Education, 2003.

CS9252 GRID COMPUTING

L T P C
3 0 0 3

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 = 45

TEXT BOOKS:

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

REFERENCES:

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.

CS9253 THEORY OF COMPUTATION

L T P C
3 0 0 3

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

CFG – 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 = 45

TEXT BOOKS:

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

REFERENCES:

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.

CS9254 SOFT COMPUTING

L T P C
3 0 0 3

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 = 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.

REFERENCES:

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.

CP9264 DISTRIBUTED COMPUTING

L T P C
3 0 0 3

UNIT I COMMUNICATION IN DISTRIBUTED ENVIRONMENT 8

Introduction – Various Paradigms in Distributed Applications – Remote Procedure Call – Remote Object Invocation – Message-Oriented Communication – Unicasting, Multicasting and Broadcasting – Group Communication.

UNIT II DISTRIBUTED OPERATING SYSTEMS 12

Issues in Distributed Operating System – Threads in Distributed Systems – Clock Synchronization – Causal Ordering – Global States – Election Algorithms –Distributed Mutual Exclusion – Distributed Transactions – Distributed Deadlock – Agreement Protocols .

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 10

Distributed Shared Memory – Data-Centric Consistency Models – Client-Centric Consistency Models – Ivy – Munin – Distributed Scheduling – Distributed File Systems – Sun NFS.

UNIT IV FAULT TOLERANCE AND CONSENSUS 7

Introduction to Fault Tolerance – Distributed Commit Protocols – Byzantine Fault Tolerance – Impossibilities in Fault Tolerance.

UNIT V CASE STUDIES 8

Distributed Object-Based System – CORBA – COM+ – Distributed Coordination-Based System – JINI.

Total= 45

REFERENCES:

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Third Edition, Pearson Education Asia, 2002.
2. Hagit Attiya and Jennifer Welch, “Distributed Computing: Fundamentals, Simulations and Advanced Topics”, Wiley, 2004.
3. Mukesh Singhal, “Advanced Concepts In Operating Systems”, McGrawHill Series in Computer Science, 1994.
4. A.S.Tanenbaum, M.Van Steen, “Distributed Systems”, Pearson Education, 2004.
5. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

CS9256 MULTIMEDIA SYSTEMS

L T P C
3 0 0 3

UNIT I INTRODUCTION AND QOS 9

Introduction-QOS Requirements and Constraints-Concepts-Resources- Establishment Phase-Run-Time Phase-Management Architectures.

UNIT II OPERATING SYSTEMS 9

Real-Time Processing-Scheduling-Interprocess Communication-Memory and Management-Server Architecture-Disk Management.

UNIT III FILE SYSTEMS AND NETWORKS 9

Traditional and Multimedia File Systems-Caching Policy-Batching-Piggy backing-Ethernet-Gigabit Ethernet-Token Ring-100VG Any LAN-Fiber Distributed Data Interface (FDDI)- ATM Networks-MAN-WAN.

UNIT IV COMMUNICATION 9

Transport Subsystem-Protocol Support for QOS-Transport of Multimedia-Computer Supported Cooperative Work-Architecture-Session Management-MBone Applications.

UNIT V SYNCHRONIZATION 9

Synchronization in Multimedia Systems-Presentation-Synchronization Types-Multimedia Synchronization Methods-Case Studies-MHEG-MODE-ACME.

Total No of periods: 45

TEXT BOOKS:

1. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Systems”, Springer, I Edition 2004.

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt , Media Coding and Content Processing, Prentice hall, 2002.
2. Vaughan T, Multimedia, Tata McGraw Hill, 1999.
3. Mark J.B., Sandra K.M., Multimedia Applications Development using DVI technology, McGraw Hill, 1992.
4. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovacovic, D. A. Milovacovic , Multimedia Communication Systems: Techniques, Standards, and Networks, Prentice Hall, 1st Edition, 2002
5. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson, 2004.

CS9257 XML AND WEB SERVICES

L T P C
3 0 0 3

UNIT I

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 = 45

REFERENCES:

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

CS9258 BIO INFORMATICS

L T P C
3 0 0 3

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 = 45

REFERENCES

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.

CS9259 NETWORK SECURITY

L T P C
3 0 0 3

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 No. of Periods: 45

TEXT BOOK:

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

REFERENCES:

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.

CS9260 EMBEDDED SYSTEMS

L T P C
3 0 0 3

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 = 45

REFERENCES

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.

CS9261 DIGITAL IMAGING

L T P C
3 0 0 3

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.

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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.

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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 = 45

REFERENCES:

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.

CS9262 SOFTWARE QUALITY ASSURANCE

L T P C
3 0 0 3

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 = 45

REFERENCES

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

CS9263 AD-HOC NETWORKS

L T P C
3 0 0 3

UNIT I AD-HOC MAC

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

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

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

UNIT IV WSN ROUTING, LOCALIZATION & QOS

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

UNIT V MESH NETWORKS

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

REFERENCES:

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.

CS9264 DATA WAREHOUSING AND DATA MINING

L T P C
3 0 0 3

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 – Constraint-Based 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 = 45

REFERENCES

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

CS9265 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.

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

REFERENCES

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

CS9266 AGENT BASED INTELLIGENT SYSTEMS

L T P C

3 0 0 3

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 UNCERTAINITY 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 No of periods: 45

TEXT BOOK:

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

REFERENCES:

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.

CS9267 VISUALIZATION TECHNIQUES

L T P C
3 0 0 3

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 Magnificaiton – 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 = 45

TEXT BOOKS:

1. Colin Ware, “Information Visualization Perception for Design” Margon Kaufmann Publishers, 2004, 2nd edition.
2. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007

REFERENCES:

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

CS9268 ADVANCED DATABASES

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UNIT I PARALLEL AND DISTRIBUTED DATABASES

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture-Case Studies**.**

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational feature sin SQL/Oracle – Case Studies.

UNIT III XML DATABASES

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT IV MOBILE DATABASES

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

UNIT V MULTIMEDIA DATABASES

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

TOTAL = 45

REFERENCES

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt Ltd., 2001.

6. Vijay Kumar, " Mobile Database Systems", John Wiley & Sons, 2006.

CS9269 SOFTWARE PROJECT MANAGEMENT

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UNIT I BASIC CONCEPTS 9

Product, Process and Project – Definition – Product Life Cycle – Project Life Cycle Models.

UNIT II FORMAT PROCESS MODELS AND THEIR USE 9

Definition and Format model for a process – The ISO 9001 and CMM Models and their relevance to Project Management – Other Emerging Models like People CMM.

UNIT III UMBRELLA ACTIVITIES IN PROJECTS 9

Metrics – Configuration Management – Software Quality Assurance – Risk Analysis.

UNIT IV IN STREAM ACTIVITIES IN PROJECTS 9

Project Initiation **–** Project Planning **–** Execution and Tracking **–** Project Wind up **–** Concept of Process/Project Database.

UNIT V ENGINEERING AND PEOPLE ISSUES IN PROJECT MANAGEMENT 9

Phases (Requirements, Design, Development, Testing , Maintenance, Deployment) – Engineering Activities and Management Issues in Each Phase – Special Considerations in Project Management for India and Geographical Distribution Issues.

TOTAL=45

REFERENCES:

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Humphrey,Watts,"Managing the Software Process ",Addison Wesley,1986.
3. Pressman,Roger,"Software Engineering",A Practitioner's approach.McGraw Hill,1997.
4. Bob Hughes and Mike Cotterell,"Software Project Management".
5. Wheelwright and Clark,"Revolutionising product development",The Free Press,1993.

CS9270 COMPONENT BASED TECHNOLOGY

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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 components - 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 = 45

TEXT BOOKS:

1. "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003.

REFERENCES:

1. Ed Roman, "Enterprise Java Beans", Third Edition , Wiley , 2004.