Department of Computer Science & Engineering
MATS University
Aarang, Raipur (C.G.)
Syllabus Scheme of M. Tech. in Computer Science & Engineering

Semester – I

S. No.	Code	Subject	Periods Per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	MTCSE120	Mobile Communication	4	-	-	70	30	4
2.	MTCSE121	Advanced Computer Architecture	4	-	-	70	30	4
3.	MTCSE122	Data Structures and Algorithms	4	-	-	70	30	4
4.	MTCSE123	Object Oriented Software Engineering	4	-	-	70	30	4
5.	MTCSE124	Computer Network and Management	4	-	-	70	30	4
6.	MTCSE125	Data Structures Lab	1	-	2	30	20	2
7.	MTCSE126	Networking Lab	1	-	2	30	20	2
8.	MTCSE127	Software Engineering Lab	1	-	2	30	20	2
Total			**23**	**0**	**6**	**440**	**210**	**26**

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical,   IM – Internal Marks (Include Class Test & Teacher's Assessments)

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MOBILE COMMUNICATION (MTCSE120)

Course Objective:
1. To familiar with the fundamentals of Mobile Communication Systems.
2. To learn how to choose mobile communication system according to the complexity, installation cost, speed of transmission, channel properties etc.
3. To identify the requirements of mobile communication as compared to static communication
4. As a prerequisite for the course in Wireless Systems.

UNIT – I WIRELESS COMMUNICATION FUNDAMENTALS
Introduction, Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread spectrum, MAC, Cellular Wireless Networks.

UNIT – II TELECOMMUNICATION SYSTEMS
GSM, System Architecture, Protocols, Connection Establishment, Frequency Allocation, Routing , Handover, Security, GPRS.

UNIT – III WIRELESS NETWORKS
Wireless LAN, IEEE 802.11 Standards, Architecture, Services, HIPERLAN, Adhoc Network, Blue Tooth, Future Wireless Network, Case study on 4G, Architecture of Wireless Network, Wireless ATM.

UNIT – IV NETWORK LAYER
Mobile IP, Dynamic Host Configuration Protocol, Routing Protocols.

UNIT – V TRANSPORT AND APPLICATION LAYERS
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.

Text Books:
1. Mobile Communications, Jochen Schiller, Second Edition, Pearson Education, 2003.
2. Wireless Communications and Networks, William Stallings, Pearson Education, 2002.

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

Course Outcome:
After completion of the course study, students will be able
1. To explain fundamentals of mobile communication systems.
2. To choose mobile communication system according to the complexity, installation cost, speed of transmission, channel properties etc.
3. To identify the requirements of mobile communication as compared to static communication.

ADVANCED COMPUTER ARCHITECTURE (MTCSE121)

Course Objective:
1. To endow with in detail coverage of current and budding trends in computer architectures, focusing on performance and the hardware/software interface.
2. To analyze basic issues in architecture design and their impact on application performance.

UNIT – I FUNDAMENTALS OF COMPUTER DESIGN AND PIPELINING
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
Concepts, Dynamic Scheduling, Dynamic hardware prediction, Multiple issue, Hardware based speculation, Limitations of ILP, Case studies.

UNIT – III INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES
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
Symmetric and distributed shared memory architectures, Performance issues, Synchronization issues, Models of memory consistency, Software and hardware multithreading, SMT and CMP architectures, Design issues, Case studies.

UNIT – V MEMORY AND I/O
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.

Text/Reference Books:
1. Computer Architecture, A Quantitative Aapproach, John L. Hennessey and David A. Patterson, Morgan Kaufmann / Elsevier, 4th Edition, 2007.
2. Parallel Computing Architecture: A Hardware/ Software Approach, David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
3. Computer Organization and Architecture–Designing for Performance, William Stallings, Pearson Education, Seventh Edition, 2006.
4. Computer Architecture, Behrooz Parhami, Oxford University Press, 2006.

Course Outcome:
After completion of the course study, students will be able
1. Confer the organization of computer-based systems and how a range of design choices are inclined by applications.
2. Differentiate diverse processor architectures and system-level design processes.
3. Recognize the components and operation of a memory hierarchy and the series of performance issues influencing its design.
4. Recognize the organization and operation of modern generation parallel computer systems, including multiprocessor and multi core systems.
5. Recognize the ethics of I/O in computer systems, counting feasible mechanisms for I/O and secondary storage organization.

DATA STRUCTURES AND ALGORITHMS (MTCSE122)

Course Objective:
1. To understand the data organization and basic concepts of data structure.
2. To study the classifications of data structures.
3. To study the memory representation of all types of data structures.
4. To implement the all kinds of data structures.

UNIT – I COMPLEXITY ANALYSIS & ELEMENTARY DATA STRUCTURES

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

Min-Max heaps, Deaps, Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps, Lazy-binomial heaps.

UNIT – III SEARCH STRUCTURES

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

Quicksort, Strassen's matrix multiplication, Convex hull, Tree-vertex splitting, Job sequencing with deadlines, Optimal storage on tapes.

UNIT – V DYNAMIC PROGRAMMING AND BACKTRACKING

Multistage graphs,0/1 knapsack using dynamic programming, Flow shop scheduling,8,queens problem, graph coloring, knapsack using backtracking

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

Course Outcome:

After completion of the course study, students will be able to
1. Have a comprehensive knowledge of the data structures and algorithms.
2. Understand the importance of data and identify the data requirements for an application.
3. Have in depth understanding and practical experience of algorithmic design and implementation.
4. Understand the issues involved in algorithm complexity and performance.

OBJECT ORIENTED SOFTWARE ENGINEERING (MTCSE123)

Course Objective:
1. To introduce notion of software.
2. To learn the different software processes & their uses.
3. To understand good coding practices, documentation, contracts, regression tests and daily builds.
4. To study ethical and professional issues and its concern to software engineers.
5. To understand how Software Engineering is concerned with theories, methods and tools for professional software development.

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

Text/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.

Course Outcome:
After completion of the course study, students will be able to
1. Select and implement different software development process models.
2. Extract and analyze software requirements specifications for different projects.
3. Define the basic concepts and importance of Software concepts like cost estimation, scheduling and reviewing the progress.
4. Apply different testing and debugging techniques and analyze their effectiveness.
5. Analyze software risks and risk management strategies.

COMPUTER NETWORKS AND MANAGEMENT (MTCSE124)

Course Objective:
1. Provide students with an improved foundation of knowledge in current and reflective practice necessary to hold up a career in indulging the different protocols, software, and network architectures.
2. Understanding theory of local area networks, their topologies, protocols and applications.
3. Computer networking at sophisticated professional level.

UNIT – I HIGH SPEED NETWORKS
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, Fiber Channel, Wireless LAN's.

UNIT – II CONGESTION AND TRAFFIC MANAGEMENT
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
TCP Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO back off, 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
Integrated Services Architecture, Approach, Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services.

UNIT – V PROTOCOLS FOR QoS SUPPORT
RSVP, Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms, Multiprotocol Label Switching, Operations, Label Stacking, Protocol details, RTP, Protocol Architecture, Data Transfer Protocol, RTCP.

Text Books:
1. High Speed Networks And Internet, William Stallings, Pearson Education, Second Edition, 2002.

Reference Books:
1. High Performance Communication Networks, Warland & Pravin Varaiya, Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. MPLS and VPN architecture, Irvan Pepelnjk, Jim Guichard and Jeff Apcar, Cisco Press, Volume 1 and 2, 2003.

Course Outcome:
After completion of the course study, students will be able to
1. To classify and relate vital theorems and formulae for the information-theoretic basis of communication and the performance of TCP/IP network protocols
2. Depict the basis and organization of conceptually layered Network protocol model.

DATA STRUCTURES LAB (MTCSE125)

1. Write C/C++ programs to implement the following using an array.

    a) Stack ADT

    b) Queue ADT

2. Write a C/C++ program to perform Min Heap.

3. Write a C/C++ program to perform Min Deaps.

4. Write a C/C++ program to perform the following operations:

    a) Insert an element into a binary search tree.

    b) Delete an element from a binary search tree.

    c) Search for a key element in a binary search tree.

5. Write a C/C++ program to perform the following operations on B,Trees:

    a) Insertion

    b) Deletion

6. Write a C/C++ program to perform the following operations on AVL,Trees:

    a) Insertion

    b) Deletion

7. Write a C/C++ program to perform Tries.

8. Write a C/C++ program for sorting a given list of elements in ascending order using Quick sort method.

9. Write a C/C++ program to implement convex hull

10. Write a C/C++ program to perform 0/1 Knapsack using Dynamic Programming.

11. Write a C/C++ program to perform Graph coloring using backtracking.

12. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a C++ program that implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.

NETWORKING LAB (MTCSE126)

1. WAP for implementation of Socket Programming Concepts.

2. WAP to implement TCP Sockets

3. WAP to implement UDP Sockets

4. WAP for implementation of Socket Applications.

5. WAP for Simulation of Sliding Window Protocol.

6. WAP for Simulation of Routing Protocols.

7. WAP for development of applications such as DNS/ HTTP/ E-mail/ Multi-user Chat.

8. WAP for simulation of Network Management Protocols.

9. Study of Network Simulator Packages-such as OPNET, NS-2 etc.

SOFTWARE ENGINEERING LAB (MTCSE127)

CASE TOOLS

The student is expected to take up about five mini, projects and model them and produce Use Cases, Analysis documents-both Static and Dynamic aspects, Sequence Diagrams and State-Charts, Database Design using Rational Products.

1. Online Bookshop

2. Simulation of a small manufacturing Company

3. A Content Management System

4. Air traffic Simulation

5. Automated Community Portal

6. File Management System

7. Medical Imaging System

Semester – II

S. No.	Code	Subject	Periods Per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	MTCSE 220	Advanced Database System	4	-	-	70	30	4
2.	MTCSE 221	Advanced Operating System	4	-	-	70	30	4
3.	MTCSE 222	Network Security	4	-	-	70	30	4
4.	MTCSE 223	Cloud Computing	4	-	-	70	30	4
5.	MTCSE 234X	Professional Elective – I	4	-	-	70	30	4
6.	MTCSE 225	Operating System Lab	1	-	2	30	20	2
7.	MTCSE 226	Network Security Lab	1	-	2	30	20	2
8.	MTCSE 227	Advanced DBMS Lab	1	-	2	30	20	2
	Total		**23**	**0**	**6**	**440**	**210**	**26**

Professional Elective – I

S. No	Subject Code	Name Of Subject
1.	MTCSE2340	Distributed Computing
2.	MTCSE2341	Soft Computing
3.	MTCSE2342	Multimedia System
4.	MTCSE2343	Natural Language Processing
5.	MTCSE2344	System Simulation

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,

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ADVANCED DATABASE SYSTEM (MTCSE220)

Course Objective:
1. To discuss the requirements for advanced database features in database applications.
2. To study the concept of Distributed Database and Object Oriented Database.
3. To understand the enhanced data models for advanced applications of DBMS.
4. To examine the concepts of various emerging database technologies.

UNIT – I INTRODUCTION
DBMS Concept introduction, Data Models, E-R diagram, Keys, Relational Database Schemas, Integrity Constraints, Relational Algebra and Calculus, Normalization, Normal Form.

UNIT – II QUERY PROCESSING AD TRANSACTION
Indexing, Query Processing and Optimization, Concurrency Control, Distributed Database, Fragmentation, Transparency, Distributed Query Processing and Optimization, Distributed Transaction Model and Concurrency Control, Distributed Deadlock and Commit Protocol.

UNIT – III OBJECT ORIENTED DATABASE
Object Oriented and Object Relational Databases: Specialization, Generalization, Aggregation, Association, Object, Object Identity, Architecture of Object Oriented and Object Relational Databases.

UNIT – IV WEB DATABASES
Web Databases: Accessing Databases through Web, Web Server, XML Database.

UNIT – V MULTIMEDIA DADABASE
Introduction to Image and Multimedia Database and Data Structure, Data StructureS: R Tree, K-D tree, Quad Tree, Content Based Retrieval: Color Histogram.

Text/Reference Books:
1. Fundamentals of Database System, R. Elmasri, S. Navathe, Benjamin Cumming,
2. Database concept, H.F. Korth and A. Silberschatz, (II ed) McGraw Hill, 1991
3. An Introduction to Database System, C.J. Date, Volume I (V ed), Addision Wesley
4. Object Oriented Database, Narang, Prentice – Hall of India, New Delhi.
5. Modern Database System, W. Kim, 1995, Acin Press, Addision – Wesley.

Course Outcome:
After completion of the course study, students will be able to
1. Explain the needs and concepts of object-oriented database, spatial database, web database, data warehousing and data mining.
2. Analyze, design and evaluate the construct of various advanced databases topics such as Object Oriented, Object Relational, Semi Structured, Unstructured and Distributed Databases.
3. Implement practical solutions to complex database problems using OO/OR database, spatial database, data warehousing and data mining approaches.

ADVANCED OPERATING SYSTEM (MTCSE221)

Course Objective:
1. To give basics of Distributed Operating System.
2. To study the communication in distributed system.
3. To learn about inter-process communication in distributed environment.
4. To have concepts of distributed shared memory and distributed file systems.

UNIT – I MULTIPROCESSOR SYSTEM
Multiprocessor Operating System: Multiprocessor System Architecture, Structure, Processor Scheduling and Allocation, Memory Management.

UNIT – II DISTRIBUTED OPERATING SYSTEM
Distributed Operating System: Characteristics, Design Issues, Communication Models, Clock Synchronization, Mutual Exclusion, Election Algorithms.

UNIT – III DISTRIBUTED OPERATING SYSTEM FUNCTIONS
Distributed Deadlocks Detection, Distributed Scheduling, Distributed File System, Distributed shared Memory.

UNIT – IVFILE/DISK PROCESSING
Multimedia Files, Video compression, Process Scheduling, File System, File placement, Caching, Disk Scheduling.

UNIT – V REAL TIME OPERATING SYSTEM
Real Time Operating System: Scheduling mechanisms, Interrupts, Memory management, I/O & networking, resource reservation.
Case studies: Open source software, LINUX, Open SOLARIS, Amoeba, Mach, chorus etc.

Text Books:

1. Advanced Concepts in Operating Systems, M Singhal and NG Sivaratri, Tata McGraw Hill Inc., 2001
2. Distributed Operating System, A.S. Tanenbaum, Pearson Education Asia, 2001.

Reference Book:
1. Operating System Concepts, Silberschatz And P. Galvin, Addison Wesley 2004.

Course Outcome:
After completion of the course study, students will be able to
1. Explain the concepts of Distributed System, Real Time Systems (Hardware, Software, and Operating System).
2. Summarize the major security issues associated with distributed systems along with the system security techniques.
3. Apply standard design principles in the construction of Advanced Operating Systems.

NETWORK SECURITY (MTCSE222)

Course Objective:
1. To understand the principles and practices of cryptography and network security.
2. To understand the practical applications that has been implemented and is in use to provide network security.

UNIT – I INTRODUCTION
Introduction to Classical and Modern Techniques: Attacks, Services and Mechanisms, Classical Encryption Techniques, DES, Block Cipher, Design Principles and Modes of Operation.

UNIT – II ENCRYPTION TECHNIQUES
Encryption Algorithms and Hash Functions: Triple DES, RC5, Key Management, Public Key Cryptography, RSA Algorithm, Digital Signatures and Authentication Protocols.

UNIT – III SYSTEM SECURITY
System Security: Backups, integrity Management, Protecting against Programmed Threats, Viruses and Worms, Physical Security, Personnel Security.

UNIT – IV NETWORK SECURITY
Network Security: Protection against Eavesdropping, Security for Modems, IP Security, Web Security, Electronic Mail Security, Authentication, Applications.

UNIT – V SECURITY TOOLS
Security Tools: Firewalls, Wrappers, Proxies, Discovering a Break-in, Denial of Service Attacks and Solutions, Cryptographic Security Tools: KERBEROS, PGP, SSH, SRP, OPIE.

Text Books:
1. Cryptography and Network Security Principles and Practice, William Stallings, Pearson Education.
2. Practical UNIX and Internet Security, Simson Garjainkal, and Gene Spafford, Oreilly Pule Pvt. Ltd. 2000.

Reference Books:
1. RSA Security 's official guide to cryptography, Steve Burnett and Stephene Paine, RSA Press, Tata McGraw Hill Edition, 2001.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education (India) Private Limited.

Course Outcome:
After completion of the course study, students will be able to
1. Explain the concepts of various Encryption techniques
2. Summarize the major security issues associated with systems along with the system security techniques.
3. Apply standard security tools.

CLOUD COMPUTING (MTCSE223)

Course Objective:
1. To give the idea of cloud computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.

UNIT – I INTRODUCTION
History of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Computing Matters, Advantages of Cloud Computing, Disadvantages of Cloud Computing, Companies in the Cloud Today, Cloud Services.

UNIT – II CLOUD APPLICATIONS
Web Based Application, Pros and Cons of Cloud Service Development, Types of Cloud Service Development, Software as a Service, Platform as Service, Web Services, On-Demand Computing, Discovering Cloud Services, Development Services and Tools, Amazon EC2- Google App Engine, IBM Clouds.

UNIT – III EXTENDED APPLICATIONS
Centralizing emails communications: Collaborations on schedules, Collaborating on To-do lists, Collaborating contacts lists, Cloud computing for the community, collaborating on group projects and events, Cloud computing for the corporation.

UNIT – IV SCHEDULING AND MANAGEMNET
Collaborating on Calendars: Schedules and Task Management, Exporting 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 WEB SERVICES
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.

Text/Reference Books
1. Cloud Computing: Web-Based Applications that change the way you work and Collaborate Online, Michael Miller, Que Publishing, 2008.
2. Cloud Computing Best Practices for Managing and Measuring Processes for On-Demand Computing, Haley Beard, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, 2008.

Course Outcome:
After completion of the course study, students will be to
1. Understand the key dimensions of the challenges of cloud computing.
2. Students will be able to perform cloud oriented analysis.
3. Assess economics, financial, and technological implications for selecting cloud computing for an organization.
4. Design the composition of a cloud services.
5. Design application services for technology abstraction.

OPERATING SYSTEM LAB (MTCSE225)

MULTIPROCESSOR OPERATING SYSTEMS

PROGRAM 1 – Semaphores - Multiprocessor operating systems

Assume there are three processes: P_a, P_b, and P_c. Only Pa can output the letter A, P_b B, and P_c 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 Object Store'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 Lottery Client n**", the server program "**Lottery Server**" 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 act 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 different instants.) State any assumptions you make. [Hint: Use vector clocks.]

NETWORK SECURITY LAB (MTCSE226)

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should

    a) AND

    b) XOR

    Each character in this string with 127 and display the results.

3. Write a Java program to perform encryption and decryption using the following algorithms

    a) Ceaser Cipher

    b) Substitution Cipher

    c) Hill Cipher

4. Write a C/Java program to implement the 8 bits simplified DES algorithm logic

5. Write a C/Java program to implement the Blowfish algorithm logic.

6. Write the RC4 logic in Java.

7. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.

8. Implement Rabin-Miller Primality Testing Algorithm.

9. Write a Java program to implement RSA algorithm.

10. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

11. Write a Java program to calculate the message digest of a text using the SHA-1 algorithm.

12. Calculate the message digest of a text using the MD5 algorithm in JAVA.

13. Create a digital certificate of your own by using the Java keytool.

14. Write Java program to hide of confidential information within Image using Steganography technique.

15. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:

    a) Two neighborhood IP addresses on your LAN.

    b) All ICMP requests.

    c) All TCP SYN Packets.

ADVANCED DBMS LAB (MTCSE227)

Topic: **Distributed Databases**

Software used: Oracle 9.2

1. Create a global conceptual schema Emp(Eno;Ename;Address;Email;Salary) and insert 10 records. Divide Emp into vertical fragments Emp1(Eno;Ename;Address) and Emp2(Eno;Email;Salary) on two different nodes. Fire the following queries:
   - (i) Find the salary of an employee where employee number is known.
   - (ii) Find the Email where the employee name is known.
   - (iii) Find the employee name and Email where employee number is known.
   - (iv) Find the employee name whose salary is > 2000.

2. Create a global conceptual schema Emp(Eno;Ename;Address;Email;Salary) and insert 10 records. Divide Emp into horizontal fragments using the condition that Emp1 contains the tuples with salary = 10,000 and Emp2 with 10,000< salary = 20,000 on two different nodes. Fire the following queries:
   - (i) Find the salary of all employees.
   - (ii) Find the Email of all employees where salary = 15,000
   - (iii) Find the employee name and Email where employee number is known.
   - (iv) Find the employee name and address where employee number is known.

3. Create a global conceptual schema Emp (Eno; Ename; Address;Email ;Salary) and insert 10 records. Store the replication of Emp into two different nodes and fire the following queries:
   - (i) Find the salary of all employees.
   - (ii) Find the Email of all employees where salary = 15,000
   - (iii) Find the employee name and Email where employee number is known.
   - (iv) Find the employee name and address where employee number is known.

Topic: **Object Oriented Databases**

Software used: Oracle 9.2

4. Using Object Oriented databases create the following types:
   - a) AddrType1 (Pincode: number, Street :char, City : char, state :char)
   - b) BranchType (address: AddrType1, phone1: integer, phone2: integer)
   - c) AuthorType (name:char,,addr AddrType1)
   - d) PublisherType (name: char, addr: AddrType1, branches: BranchTableType)
   - e) AuthorListType as array, which is a reference to AuthorType

Next create the following tables:
   - f) BranchTableType of BranchType
   - g) authors of AuthorType
   - h) books(title: varchar, year : date, published_by ref PublisherType, authors AuthorListType)
   - i) Publishers of PublisherType

Insert 10 records into the above tables and fire the following queries:
   - a) List all of the authors that have the same pin code as their publisher:
   - b) List all books that have 2 or more authors:
   - c) List the name of the publisher that has the most branches

d) Name of authors who have not published a book
e) List all authors who have published more than one book:
f) Name of authors who have published books with at least two different publishers
g) List all books (title) where the same author appears more than once on the list of authors (assuming that an integrity constraint requiring that the name of an author is unique in a list of authors has not been specified).

Topic: **Multimedia Database**
Software used: Oracle 9.2, J2SDK 1.4.2, Java Media Framework 2.

5. [A] Create a table Emp with the attributes Eno as employee number, Ename as employee name, Eaddress as employee address and photo as an employee picture. Also create a table Company with attributes Eno, designation and age. Fire the following queries
   a) Find name and designation of all the employees
   b) Find name and age of all the employees
   c) Find name and photo of a particular employee

[B] Create a table Singer with the attributes sno as singer number, Sname as singer name, Saddress as singer address and audio as an audio clip. Also create a table Company with attributes Sno,age. Fire the following queries
   a) Find name and age of all the singer
   b) Find name and audio clip of a particular singer

[C] Create a table Singer with the attributes sno as singer number, Sname as singer name, Saddress as singer address and video as an audio clip. Also create a table Company with attributes Sno, age. Fire the following queries
   a) Find name and age of all the singer
   b) Find name and video clip of a particular singer

Topic: **Temporal Databases**
Software used: Oracle 9.2

6. [A] Create a table tblEmp_Appnt, which stores the account number, name, and valid time say, recruitment date and retirement date. Insert 10 records and fire the following queries
   a) Find all the employees who join the company on 2/3/2011
   b) Find all the employees who will retired on 2/3/2011

[B] Create a table tbl_shares, which stores the, name of company, number of shares, and price per share at transaction time. Insert 10 records and fire the following queries
   a) Find all the names of a company whose share price is more than Rs. 100 at 11:45 A.M.
   b) Find the name of company which has highest share price at 5.00 P.M.

[C] Create a table tblEmp_Appnt, which stores the account number, name, and valid time say, recruitment date and retirement date. Create a trigger for valid time to check that no two records of same employee have common employment period and does not allow the user to update the records. Trigger should also fill up the empty retirement date.

Topic: **Active Databases**

Software used: Oracle 9.2

7. Create a table emp (eno, ename, hrs, pno, super_no) and project (pname, pno, thrs, head_no) where this is the total hours and is the derived attribute. Its value is the sum of hrs of all employees working on that project. eno and pno are primary keys, head_no is foreign key to emp relation. Insert 10 tuples and write triggers to do the following:

   a) Creating a trigger to insert a new employee tuple and display the new total hours from project table.
   b) Creating a trigger to change the hrs of existing employee and display the new total hours from project table.
   c) Creating a trigger to change the project of an employee and display the new total hours from project table.
   d) Creating a trigger to deleting the project of an employee.

Topic: **XML databases**

Software used: Oracle 9.2

8. Create a table employee having dept_id as number datatype and employee_spec as XML datatype (XMLType).The employee_spec is a schema with attributes emp id, name, email, acc_no, managerEmail, dateOf Joning. Insert 10 tuples into employee table. Fire the following queries on XML database.

   a) Retrieve the names of employee.
   b) Retrieve the acc_no of employees.
   c) Retrieve the names,acc_no, email of employees.
   d) Update the 3rd record from the table and display the name of an employee.
   e) Delete 4 th record from the table.

Topic: **Spatial databases**

Software used: Oracle 9.2

9. Create a spatial database table that stores the number, name and location, which consists of four different areas say abc, pqr, mno and xyz. Fire the following queries

   a) Find the topological intersection of two geometries.
   b) Find whether two geometric figures are equivalent to each other.
   c) Find the areas of all different locations.
   d) Find the area of only one location.
      Find the distance between two geometries

DISTRIBUTED COMPUTING (MTCSE2340)

Course Objective:

To learn the concepts of Distributed Computing.
1. To study resource management in distributed system.
2. To study about communication in distributed environment.
3. To study IPC and RPC mechanisms in distributed systems.

UNIT – I COMMUNICATION IN DISTRIBUTED ENVIRONMENT

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

UNIT – II DISTRIBUTED OPERATING SYSTEMS

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

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

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

UNIT – V CASE STUDIES

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

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

Course Outcome:

After completion of the course study, students will be to
1. Explain the concept of Distributed Computing.
2. Design and build application programs on distributed systems.
3. Improve the performance and reliability of distributed programs.

SOFT COMPUTING (MTCSE2341)

Course Objective:
1. To introduce basics of soft computing (neural networks, fuzzy system).
2. To give idea of genetic algorithm and its applications.

UNIT – I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS
Evolution of Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics.

UNIT – II GENETIC ALGORITHMS
Introduction to Genetic Algorithms (GA, Applications of GA in Machine Learning, Machine Learning Approach to Knowledge Acquisition. Chromosome representation, encoding, decoding, Genetic operators: Selection, Crossover, Mutation, Elitism, Schema Theorem, EGA, Convergence theorem, real-coded GA, Ordered GA, Steady-state GA, Multi-objective evolutionary algorithms, applications in search and optimization. Recent advances in Evolutionary Computing (Particle Swarm Optimization, Ant Colony Optimization).

UNIT – III NEURAL NETWORKS
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
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
Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification, Neuro-Fuzzy Control, Case studies.

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

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

Course Outcome:
After completion of the course study, students will be to
1. Explain the concept of Soft Computing, Neural Networks, Genetic Algorithms.
2. Design and build application s of Neuro Fuzzy Models.
3. Improve the performance and reliability of Fuzzy Logic.

MULTIMEDIA SYSTEMS (MECSE2342)

Course Objective:
1. To study the fundamental concept of multimedia.
2. To study issues and problems in the representation, manipulation, and delivery of multimedia content.
3. To understand the concepts of Operating System, File System, Networks in Multimedia Components.
4. To study the communication and synchronization concepts for Multimedia.

UNIT – I INTRODUCTION AND QOS
Introduction, QoS Requirements and Constraints, Concepts, Resources, Establishment Phase, Run Time Phase, Management Architectures.

UNIT – II OPERATING SYSTEMS
Real Time Processing, Scheduling, Inter-process Communication, Memory and Management, Server Architecture, Disk Management.

UNIT – III FILE SYSTEMS AND NETWORKS
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
Transport Subsystem, Protocol Support for QoS, Transport of Multimedia, Computer Supported Cooperative Work, Architecture, Session Management, M Bone Applications.

UNIT – V SYNCHRONIZATION
Synchronization in Multimedia Systems, Presentation, Synchronization Types, Multimedia Synchronization Methods, Case Studies, MHEG, MODE, ACME.

Text Book:
1. Multimedia Systems, Ralf Steinmetz and Klara Nahrstedt, Springer, I Edition 2004.

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

Course Outcome:
After completion of the course study, students will be able to
1. Explain concepts of multimedia.
2. Explain issues and problems in the representation, manipulation, and delivery of multimedia content.
3. Implement concepts of Operating System, File System, and Networks in Multimedia Components.
4. Implement communication and synchronization concepts for Multimedia.

NATURAL LANGUAGE PROCESSING (MTCSE2343)

Course Objective:

1. To introduce the concept of Natural Language Processing.
2. To study various phases of Natural Language Processing.
3. To learn the linguistic implementation.
4. To learn the concept of speech recognition.

UNIT – I INTRODUCTION

Introduction: NLP, Challenges of NLP, NLP Applications, Processing of Indian Languages.

Words and Word Forms: Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields, Scope Ambiguity and Attachment Ambiguity resolution.

UNIT – II PARSING IN NLP

Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

UNIT – III MACHINE TRANSLATION

Machine Translation: Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule-Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation, UNL Based Machine Translation, Translation involving Indian Languages.

UNIT – IV LINGUISTICS

Meaning: Lexical Knowledge Networks, WorldNet Theory; Indian Language Word Nets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality, Metaphors.

UNIT – IV SPEECH RECOGNITION

Speech Recognition: Signal processing and analysis method, Articulation and acoustics, Phonology and phonetic transcription, Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

Text/Reference Books:

1. Natural Language Understanding, Allen J., Benjamin/Cunnings, (1987).

2. Natural Language Processing and Information Retrieval, Siddiqui and Tiwary U.S., Oxford University Press (2008).

3. Natural Language Processing: The PLNLP Approach, Jensen K., Heidorn G.E., Richardson S.D., Springer (2013).

4. Phonetics, Roach P., Oxford University Press (2012).

5. Speech and Language Processing, Jurafsky, Dab and Martin, James, Second Edition, Prentice Hall, 2008.

Course Outcome:

After completion of the course study, students will be to

1. Explain the concept of Natural Language Processing.
2. Implement various phases of Natural Language Processing.
3. Do linguistic implementation and develop the various speech recognition applications.

SYSTEM SIMULATION (MTCSE2344)

Course Objective:

1. Introduce computer simulation technologies and techniques, provides the foundations for the student to understand computer simulation needs, and to implement and test a variety of simulation and data analysis libraries and programs. This course focusses what is needed to build simulation software environments, and not just building simulations using preexisting packages.
2. Introduce concepts of modeling layers of society's critical infrastructure networks.
3. Build tools to view and control simulations and their results.

UNIT – I SIMULATION BASICS

Handling Stepped and Event-based Time in Simulations, Discrete versus Continuous Modelling , Numerical Techniques,
Sources and Propagation of Error.

UNIT – II DYNAMICAL, FINITE STATE, AND COMPLEX MODEL SIMULATIONS

Graph or Network Transitions Based Simulations, Actor Based Simulations, Mesh Based Simulations, Hybrid Simulations.

UNIT – III CONVERTING TO PARALLEL AND DISTRIBUTED SIMULATIONS

Partitioning the Data, Partitioning the Algorithms, Handling Inter-partition Dependencies.

UNIT – IV PROBABILITY AND STATISICS FOR SIMULATIONS AND ANALYSIS

Introduction to Queues and Random Noise ,Random Variates Generation, Sensitivity Analysis.

UNIT – V   SIMULATIONS RESULTS ANALYSIS AND VIEWING TOOLS

Display Forms: Tables, Graphs, and Multidimensional Visualization, Terminals, X and MS Windows, and Web Interfaces,
Validation of Model Results

Text/Reference Books:

1. Real-Time Simulation Technologies: Principles, Methodologies, and Applications by Katalin Popovici, Pieter J. Mosterman.
2. Guide to Modeling and Simulation of Systems of Systems by Bernard P. Zeigler, Hessam S. Sarjoughian.

Course Outcome:

After completion of the course study, students will be able to:

1. Understand Basic Model Forms.
2. Understand Basic Simulation Approaches.
3. Understand Handling Stepped and Event-based Time in Simulations.
4. Understand Discrete versus Continuous Modelling.
5. Understand Numerical Techniques.
6. Understand Sources and Propagation of Error.

Semester – III

S. No.	Code	Subject	Periods Per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	MTCSE 321X	Professional Elective - II	4	-	-	70	30	4
2.	MTCSE 322X	Professional Elective - III	4	-	-	70	30	4
3.	MTCSE 323	Computational Techniques Using MATLAB	-	-	3	30	20	2
4.	MTCSE 324	Project Work Phase-I	-	-	24	140	60	12
	Total		**8**	**0**	**27**	**310**	**140**	**22**

Professional Elective II

S. No	Subject Code	Name Of Subject
1.	MTCSE 3210	Agent Based Intelligent System
2.	MTCSE 3211	ADHOC Networks
3.	MTCSE 3212	Grid Computing
4.	MTCSE 3213	Software Project Management
5.	MTCSE 3214	Component Based Technology

Professional Elective III

S. No	Subject code	Name of Subject
1.	MTCSE 3220	Data Warehousing & Data Mining
2.	MTCSE 3221	Design and Analysis of Parallel Algorithms
3.	MTCSE 3222	Digital Image Processing
4.	MTCSE 3223	Embedded Systems
5.	MTCSE 3224	Advanced Web Technology

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,

P – Practical,   IM – Internal Marks (Include Class Test & Teacher's Assessments)

AGENT BASED INTELLIGENT SYSTEMS (MTCSE3210)

Course Objective:

1. To study the fundamentals of intelligent system.
2. To learn the machine inference using predicate logic.
3. To study the use of agents in planning.
4. To study the machine learning concepts and it applicability using artificial intelligence.

UNIT – I INTRODUCTION

Definitions, Foundations, History, Intelligent Agents, Problem Solving, Searching, Heuristics, Constraint Satisfaction Problems, Game playing.

UNIT – II KNOWLEDGE REPRESENTATION AND REASONING

Logical Agents, First order logic, First Order Inference, Unification, Chaining, Resolution Strategies, Knowledge Representation, Objects, Actions, Events.

UNIT – III PLANNING AGENTS

Planning Problem, State Space Search, Partial Order Planning, Graphs, Nondeterministic Domains, Conditional Planning, Continuous Planning, Multi Agent Planning.

UNIT – IV AGENTS AND UNCERTAINITY

Acting under uncertainty, Probability Notation, Bayes Rule and its use, Bayesian Networks Other Approaches, Time and Uncertainty, Temporal Models, Utility Theory, Decision Network, Complex Decisions.

UNIT – V HIGHER LEVEL AGENTS

Knowledge in Learning, Relevance Information, Statistical Learning Methods, Reinforcement Learning, Communication, Formal Grammar, Augmented Grammars, Future of AI.

Text Book:

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

Reference Books:

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

Course Outcome:

After completion of the course study, students will be able to

1. Explain and develop agent based intelligent system.
2. Apply machine inference using predicate logic.
3. Use agents in planning system.
4. Apply machine learning concept while developing artificial intelligent system.

AD-HOC NETWORKS (MTCSE3211)

Course Objective:
1. To understand the state of the art in network protocols, architectures and applications.
2. To provide comprehensive knowledge of various techniques in mobile networks/Adhoc networks and sensor based networks.
3. To facilitate the understanding of Infrastructure less networks and their importance in the future directions for ad-hoc communications.

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.

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

Course Outcome:
After completion of the course study, students will be able to
1. Explain protocol, architecture and applications of Ad-hoc Networks.
2. Implement mobile networks, sensor networks and ad-hoc networks.
3. Develop infrastructure based networks.

GRID COMPUTING (MTCSE3212)

Course Objectives:
1. To understand the need for and evolution of Grids in the context of processor, and data intensive applications.
2. To be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.

UNIT – I INTRODUCTION TO GRID COMPUTING

Introduction: The Grid-Past - Present and Future, Applications of grid computing organizations and their roles.

UNIT – II GRID COMPUTING ARCHITURE

Grid computing anatomy, Next generation of Grid computing initiatives–Merging the Grid services architecture with Web services architecture.

UNIT – III GRID COMPUTING TECHNOLOGIES

OGSA, Sample use cases that drives the OGSA platform components, OGSI and WSRF– OGSA Basic Services, Security standards for grid computing.

UNIT – IV GRID COMPUTING TOOL KIT

Globus Toolkit –Versions, Architecture, GT Programming model –A sample grid service implementation.

UNIT – V HIGH LEVEL GRID SERVICES

High level grid services, OGSI.NET middleware Solution Mobile OGSI.NET for Grid computing on Mobile devices.

Text Book:
1. Grid Computing, Joshy Joseph & Craig Fellenstein, Pearson/PHI PTR,2003.

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

Course Outcome:
After completion of the course study, students will be able to
1. Justify the applicability, or non-applicability of Grid technologies for a specific application.
2. Evaluate enabling technologies such as high-speed links and storage area networks for building computer grids.
3. Design a grid computing application in one of the key application areas e.g. Computer Animation, EResearch.

SOFTWARE PROJECT MANAGEMENT (MTCSE3213)

Course Objective:
1. To understand the fundamental principles of Software Project management.
2. To have a good knowledge of responsibilities of project manager and how to handle these.
3. To be familiar with the different methods and techniques used for project management.
4. To understand the issues and challenges faced while doing the Software project Management.

UNIT – I BASIC CONCEPTS
Product, Process and Project, Definition, Product Life Cycle, Project Life Cycle Models.

UNIT – II FORMAT PROCESS MODELS AND THEIR USE
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
Metrics, Configuration Management, Software Quality Assurance, Risk Analysis.

UNIT – IV IN STREAM ACTIVITIES IN PROJECTS
Project Initiation, Project Planning, Execution and Tracking, Project Wind up, Concept of Process/Project Database.

UNIT – V ENGINEERING AND PEOPLE ISSUES IN PROJECT MANAGEMENT
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.

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

Course Outcome:
After completion of the course study, students will be able to
1. Explain principles of Software Project Management.
2. Handle any project efficiently as Project Manager.
3. Apply various project management techniques.
4. Deal with issues related to project management.

COMPONENT BASED TECHNOLOGY (MTCSE3214)

Course Objective:

1. To enable the students to develop the necessary skills for developing robust & high performance applications.
2. To learn JAVA Component Technology.
3. To study technologies associated with distributed environment.
4. To learn relevant application development.

UNIT – I INTRODUCTION

Software Components, objects, fundamental properties of Component technology, modules, Interfaces, callbacks, directory services, component architecture, components and middleware.

UNIT – II JAVA COMPONENT TECHNOLOGIES

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

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

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

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.

Text Book:

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

Reference Book:

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

Course Outcome:

After completion of the course study, students will be able to

1. Develop robust and high performance applications required for component technology/ distributed environment using JAVA and other relevant technologies.

DATA WAREHOUSING AND DATA MINING (MTCSE3220)

Course Objectives:
1. To understand the overall architecture of a data warehouse.
2. To discuss different data mining models and techniques.
3. To evaluate different models used for OLAP and data pre-processing.
4. To design and implement systems for data mining and evaluate the performance of different data mining algorithms.
5. To propose data mining solutions for different applications.
6. To differentiate online transaction processing and online analytical processing.
7. To learn the concepts of web mining.

UNIT – I DATA WAREHOUSING
Introduction, ETL, Data warehouses– design guidelines for data warehouse implementation, Multidimensional Models; OLAP- introduction, Characteristics, Architecture, Multidimensional view and data cube, Data cube operations, data cube computation. Review of the Basic Data Analytic Methods using R: Introduction to R –look at the data, Analyzing and Exploring the Data, Statistics for Model Building and Evaluation.

UNIT – II DATA MINING
Introduction, association rules mining, Naive algorithm, Apriori algorithm, direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent pattern without candidate generation(FP, growth), performance evaluation of algorithms.

UNIT – III 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 CLUSTER ANALYSIS
Types of Data in Cluster Analysis, Categorization of 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 WEB MINING
Search Engines: Characteristics of Search engines, Search Engine Functionality, Search Engine Architecture, Ranking of web pages, the search engine history, Enterprise Search, Enterprise Search Engine Software. Web Data Mining: Web Terminology and Characteristics, Locality and Hierarchy in the Web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web Mining Software.

Text/Reference Books:
1. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Second Edition,
2. Business Intelligence: Data mining and Optimization for Decision Making, Carlo Vercellis, WILEY.
3. Data Mining Concepts and Techniques, Han J., Kamber M. and Pei J. B., Morgan Kaufmann Publishers (2011) 3rd ed.
4. Data Mining, Pudi V., Krishana P.R., Oxford University press, (2009) 1st ed.
5. Data Mining Methods and Models, Daniel T.Larose, Wile-Interscience, 2006.

Course Outcome:
After completion of the course study, students will be able to
1. Design a data warehouse for an organization.
2. Write queries using DMQL.
3. Extract knowledge using data mining techniques.
4. Adapt new data mining tools.
5. Explore recent trends and advancement in data mining such as web mining, spatial-temporal mining.
6. Develop Web Mining applications.

DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS (MTCSE3221)

Course objective:
1. To learn how to better design and analyze parallel algorithms.
2. To learn designing of scalable algorithms that perform well on the machines of tomorrow as well as the machines we have today.

UNIT – I INTRODUCTION TO PARALLELISM
Introduction to Parallel computers - SIMD - EREW, CREW SM-SIMD algorithms, shared memory SIMD, Tree and mesh interconnection computers.

UNIT – II SORTING IN PARALLEL ENVIRONMENT
Sorting - Sorting on a Linear Array, Sorting on a Mesh, Sorting on EREW SIMD computer, MIMD Enumeration Sort, MIMD Quick sort. Sorting on other Networks.

UNIT – III MATRIX OPERATIONS
Matrix operations - Mesh Transpose, Shuffle Transpose, EREW transpose – Mesh multiplication, Cube multiplication, Matrix by vector Multiplication, Tree Multiplication.

UNIT – IV MATHEMATICAL SOLUTIONS
Numerical problems- Linear Equations, SIMD algorithm, Roots of Nonlinear Equations, MIMD algorithm, partial Differential Equations, computing Eigen values.

UNIT – V GRAPH THEORY
Graph Theoretical Problems - computing the connectivity matrix. Finding connected components, Traversing. The minimal Alpha-Beta Tree, Storage requirements.

Text Books:
1. The Design and Analysis of Parallel Algorithms, S.G. Akl, Prentice Hall of India. 1989.
2. Parallel Sorting Algorithms, S. G. Akl, Academic Press, 1985.

Reference Book:
1. Analysis and Design of Parallel Algorithms - Arithmetic and Matrix Problems, S. Lakshmivarahan and S.Kdhall, McGraw Hill, 1990.

Course Outcome:
After completion of the course study, students will be able to
1. Design and analyze parallel algorithm.
2. Designing and implement scalable algorithms that perform well on the machines of tomorrow as well as the machines we have today.

DIGITAL IMAGE PROCESSING (MTCSE3222)

Course Objectives:
1. To learn the basic theory and algorithms that is widely used in digital image processing.
2. To give exposure to the students about current technologies and issues that is specific to image processing systems.
3. To develop idea of using computers to process images.
4. To develop critical thinking about shortcomings of the state of the art in image processing.

UNIT – I INTRODUCTION
Goal of Image processing and computer vision, Human visual perception – phenomena, Digital Image basics- Tessellation, Pixel and spatial resolutions, Image formation, Relations between pixels – neighborhoods, connectivity, distances, Basic problems in IP – enhancement, compression, restoration, image analysis.

UNIT – II SPATIAL DOMAIN PROCESSING
Point and neighborhood operations Image enhancement using above operations – contrast stretching, histogram proc., filtering, Geometric transformations, zooming. Image Arithmetic: Addition, subtraction, multiplication and division of images, Implementation issues. Color IP: Color definitions and models, False and Full colour IP.

UNIT – III IMAGE TRANSFORMS AND RESTORATION
Basis images and expansion of images using them Unitary transforms, DFT – properties and freq domain filtering (LPF, HPF etc), Directional filtering, DCT, Walsh Hadamard transform. Image Restoration: Restoration vs enhancement, Type of degradations, Geometric correction, Linear degradation models – Inverse filtering, Deconvolution.

UNIT – IV IMAGE COMPRESSION
Principles behind compression – types of redundancies, Entropy, compression ratios, SNR of compression, Lossy vs Lossless methods, Spatial approaches – Coding based, Transform based – DCT, JPEG.

UNIT – V MORPHOLOGICAL PROCESSING AND IMAGE ANALYSIS
Morphological processing – erosion, dilation, opening, closing, Skeletonisation, boundary detection
IMAGE ANALYSIS: Edge Detection, Segmentation, Thresholding, Region-Based, Edge Based Approaches.

Text Books:
1. Digital Image Processing, Gozalez and Woods; Addison- Wesley.
2. Fundamentals of Digital Image Processing, A. K. Jain; Prentice Hall.

Reference Books:
1. Digital Image processing using Matlab, R. Gonzalez; Addison- Wesley.
2. Image Processing: The fundamentals, M Petrou; Wiley and Sons.

Course Outcome:
After completion of the course study, students will be able to
1. Describe, analyze and reason about how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.
2. Apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
3. Analyze and implement image processing algorithms.

EMBEDDED SYSTEM (MTCSE3223)

Course Objective:

1. To introduce modern embedded systems.
2. To understand and program such systems using a concrete platform built around a modern embedded processor.

UNIT – I INTRODUCTION

Introduction to Embedded systems, hardware/software code sign, Embedded micro controller cores, embedded memories, Examples of embedded systems, sensors and interfacing techniques, Real-time concepts.

UNIT – II REAL TIME OPERATING SYSTEM

Real-time operating systems, Required RTOS services/capabilities (in contrast with traditional OS), Resource Management/scheduling paradigms: static priorities, static schedules, dynamic scheduling, best effort current best practice in scheduling (e.g. Rate Monotonic vs. static schedules).

UNIT – III ISSUES REALTED TO EMBEDDED SYSTEM

Real world issues: blocking, unpredictability, interrupts, caching, Examples of OSs for embedded systems - RT Linux, VRTX.

UNIT – IV PROGRAMMING LANGUAGES

Programming languages for embedded systems e.g., Handel-C and Esterel, system support for embedded systems, selected embedded system-based applications: process control, robotics, etc.

UNIT – V SOFTWARE DEVELOPMENT METHODOLOGY

Software Development Methodology: Model based development, Statecharts, etc. Case studies, controlling an Injection molding process, Flight simulator, digital call center handler, codec.

Text/ Reference Books:

1. Specification and Design of Embedded Systems, D. Gajski, F. Vahid, S. Narayan, and J. Gong, Pearson Education.
2. Hardware Software Co-design: Principles and Practice, Syaunstrup and W. Wolf, Kluwer Academic Publishers.

Course Outcome:

After completion of the course study, students will be able to

1. Explain the concept of modern embedded systems.
2. To develop and program such systems using a concrete platform built around a modern embedded processor.

ADVANCED WEB TECHNOLOGY (MTCSE 3224)

Course Objective:
1. To familiar with client server architecture
2. To learn web application development using various technologies.
3. To have skills and project based experience into web application development.

UNIT – I INTRODUCTION
Web Essentials, Clients, Servers, Communication, Markup Languages, XHTML, Simple XHTML pages style sheets – CSS.

UNIT – II CLIENT SIDE PROGRAMMING
Client side programming, Java script language, java script objects, host objects: Browsers and the DOM.

UNIT – III SERVER SIDE PROGRAMMING
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 WEB DATABASE
Representing Web Data, Database Connectivity, JDBC, Dynamic Web Pages, XML, DTD, XML Schema, DOM, SAX, XQuery.

UNIT – V WEB APPLICATIONS
Building Web Applications, Cookies, Sessions, Open Source Environment, PHP, MYSQL, Case Studies.

Text Books:
1. Web Technology – A computer Science perspective, Jeffrey C Jackson, Persoson Education, 2007.
2. Web Programming – Building Internet Applications, Chris Bates, Wiley India, 2006.

Course Outcome:
After completion of the course study, students will be
1. To explain and develop client server architecture of Web.
2. To develop web applications using various technologies.
3. Skilled to deal with the run time problems of web.

COMPUTATIONAL TECHNIQUES USING MATLAB (MTCSE 323)

1. WAP to use MATLAB tool box for ANN.

2. WAP to use MATLAB tool box for Fuzzy Logic.

3. WAP to use MATLAB tool box for Optimization.

4. WAP to use MATLAB tool for implementing Neural Network.

5. WAP to use MATLAB tool for generating different types of activation functions in ANN.

6. WAP in MATLAB for training and testing of ANN.

7. WAP in MATLAB for load forecasting using ANN.

8. WAP in MATLAB for generating different types of Fuzzy membership functions.

9. WAP in MATLAB for feeder load balancing problem by fuzzy logic.

10. WAP in MATLAB for solving standard benchmark functions using Genetic algorithm.

11. WAP in MATLAB for solving economic load dispatch problem using Genetic Algorithm.

Semester – IV

S.N.	Code	Subject	Periods Per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	MTCSE420	Project Work Phase – II + Seminar	-	-	36	315	135	18
	Total		**0**	**0**	**36**	**315**	**135**	**18**

P – Practical,   IM – Internal Marks (Include Class Test & Teacher's Assessments)

L – Lecture,   T – Tutorial,   ESE – End Semester