# M.E. COMPUTER SCIENCE AND ENGINEERING
## I TO VI SEMESTERS (PART TIME) CURRICULUM AND SYLLABUS

### SEMESTER I

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MA9219</td>
<td>Operations Research</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>CS9212</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>CS9213</td>
<td>Computer Networks and Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS 9215</td>
<td>Data Structures Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

### SEMESTER II

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CS9221</td>
<td>Data Base Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>CS9222</td>
<td>Advanced Operating Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>CS9223</td>
<td>Advanced System Software</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS9227</td>
<td>Operating System Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>9</td>
<td>0</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

### SEMESTER III

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CS9211</td>
<td>Computer Architecture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>SE9213</td>
<td>Object Oriented Software Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CS9216</td>
<td>Networking Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>6</td>
<td>0</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>
### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CS9224</td>
<td>Information Security</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>CS9225</td>
<td>Web Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>E1</td>
<td>Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS9228</td>
<td>Web Technology Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>9</td>
<td>0</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

### SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>E2</td>
<td>Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>E3</td>
<td>Elective III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>E4</td>
<td>Elective IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS9234</td>
<td>Project Work (phase I)</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CS9241</td>
<td>Project Work (Phase II)</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

Total credit 12+11+8+11+15+12 = 69
## LIST OF ELECTIVES FOR M.E.COMPUTER SCIENCE AND ENGINEERING*

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

UNIT II  ADVANCED QUEUEING MODELS  
Non-Markovian Queues – Pollaczek Khintchine Formula – Queues in Series – Open Queueing Networks – Closed Queueing networks.

UNIT III  SIMULATION  
Discrete Even Simulation – Monte Carlo Simulation – Stochastic Simulation – Applications to Queueing systems.

UNIT IV  LINEAR PROGRAMMING  

UNIT V  NON-LINEAR PROGRAMMING  

TEXT BOOKS:  

REFERENCES:  

CS9212  DATA STRUCTURES AND ALGORITHMS  
UNIT I  COMPLEXITY ANALYSIS & ELEMENTARY DATA STRUCTURES  

UNIT II  HEAP STRUCTURES  

UNIT III  SEARCH STRUCTURES  
UNIT IV  
GREEDY & DIVIDE AND CONQUER  
9
Quick sort – 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

REFERENCES:

TOTAL : 45 PERIODS

CS9213  
COMPUTER NETWORKS AND MANAGEMENT  
L T P C 3 0 0 3

UNIT I  
HIGH SPEED NETWORKS  
9

UNIT II  
CONGESTION AND TRAFFIC MANAGEMENT  
9

UNIT III  
TCP AND ATM CONGESTION CONTROL  
10

UNIT IV  
INTEGRATED AND DIFFERENTIATED SERVICES  
9

UNIT V  
PROTOCOLS FOR QoS SUPPORT  
8

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

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

TOTAL : 45 PERIODS

CS9221       DATABASE TECHNOLOGY          L T P C
3 0 0 3

UNIT I       DISTRIBUTED DATABASES

UNIT II      OBJECT ORIENTED DATABASES

UNIT III     EMERGING SYSTEMS
Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases.

UNIT IV      DATABASE DESIGN ISSUES

UNIT V       CURRENT ISSUES
Rules - Knowledge Bases - Active And Deductive Databases - Parallel Databases – Multimedia Databases – Image Databases – Text Database

TOTAL : 45 PERIODS
REFERENCES:

CS9222 ADVANCED OPERATING SYSTEMS L T P C 3 0 0 3

UNIT I INTRODUCTION

UNIT II DISTRIBUTED OPERATING SYSTEMS

UNIT III DISTRIBUTED RESOURCE MANAGEMENT

UNIT IV FAILURE RECOVERY AND FAULT TOLERANCE
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
Memory Management – Reliability / Fault Tolerance; Database Operating Systems –
Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control
Algorithms.

TOTAL : 45 PERIODS

TEXT BOOK:
Hill, 2000

REFERENCES:

CS9223  ADVANCED SYSTEM SOFTWARE  L T P C
3 0 0 3

UNIT I  9
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
Garbage Collection – Optimization
UNIT V

TOTAL : 45 PERIODS

TEXT BOOKS:
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)

REFERENCES:

CS9227 OPERATING SYSTEM LAB

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

<table>
<thead>
<tr>
<th>Output</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AACB</td>
<td>invalid, violates a)</td>
</tr>
<tr>
<td>ABACAC</td>
<td>invalid, violates b)</td>
</tr>
<tr>
<td>ABCABC</td>
<td>invalid, violates c)</td>
</tr>
<tr>
<td>ABCAAABC</td>
<td>valid</td>
</tr>
<tr>
<td>AAAABCBC</td>
<td>valid</td>
</tr>
<tr>
<td>AB</td>
<td>valid</td>
</tr>
</tbody>
</table>

TOTAL : 45 PERIODS
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 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, 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 \lor Q holds. (A superimposed computation is one that does not affect the underlying system; it may ‘read’ but not ‘write’ the state of the underlying system. Events in a superimposed computation may occur in the same instant as the underlying events and/or at different instants.) State any assumptions you make.
   [Hint: Use vector clocks.]
UNIT I  FUNDAMENTALS OF COMPUTER DESIGN AND PIPELINING  9

UNIT II  INSTRUCTION LEVEL PARALLELISM WITH DYNAMIC APPROACHES  9

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

UNIT V  MEMORY AND I/O  9

REFERENCES:

TOTAL : 45 PERIODS
UNIT III  SYSTEM DESIGN  9

UNIT IV  OBJECT DESIGN AND IMPLEMENTATION ISSUES  9
Reusing Pattern Solutions – Specifying Interfaces – Mapping Models to Code – Testing

UNIT V  MANAGING CHANGE  9
Rationale Management – Configuration Management – Project Management – Software Life Cycle

TOTAL : 45 PERIODS

REFERENCES:

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.

TOTAL : 45 PERIODS

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
UNIT IV
Malicious Logic, Vulnerability Analysis, Auditing and Intrusion Detection

UNIT V

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:

CS9225 WEB TECHNOLOGY L T P C 3 0 0 3

UNIT I

UNIT II
Client side programming – Java script language – java script objects – host objects : Browsers and the DOM

UNIT III

UNIT IV

UNIT V

TOTAL : 45 PERIODS

TEXT BOOKS:
CS9228  WEB TECHNOLOGY LAB  L T P C
          0 0 3 2

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

TOTAL : 45 PERIODS

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
– TDMA – CDMA – Cellular Wireless Networks.

UNIT II TELECOMMUNICATION SYSTEMS  11
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
ODMR.

UNIT V TRANSPORT AND APPLICATION LAYERS  7
TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit /
– WAE – WTA.

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

CS9252 GRID COMPUTING

UNIT I INTRODUCTION TO GRID COMPUTING

UNIT II GRID COMPUTING ARCHITECTURE
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 drive the OGSA platform components – OGSI and WSRF–OGSA Basic Services – Security standards for grid computing.

UNIT IV GRID COMPUTING TOOL KIT

UNIT V HIGH LEVEL GRID SERVICES
High level grid services – OGSI .NET middleware Solution Mobile OGSI.NET for Grid computing on Mobile devices.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I  AUTOMATA

UNIT II  REGULAR EXPRESSIONS AND LANGUAGES
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

UNIT IV  PROPERTIES OF CONTEXT FREE LANGUAGES
Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V  INDECIDABILITY
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 PERIODS

TEXT BOOK:

REFERENCES:
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

UNIT IV  FUZZY LOGIC  9

UNIT V  NEURO-FUZZY MODELING  9

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

CP9264  DISTRIBUTED COMPUTING  L T P C 3 0 0 3

UNIT I  COMMUNICATION IN DISTRIBUTED ENVIRONMENT  8
UNIT II DISTRIBUTED OPERATING SYSTEMS 12

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

UNIT V CASE STUDIES 8
Distributed Object-Based System – CORBA – COM+ – Distributed Coordination-Based System – JINI.

TOTAL : 45 PERIODS

REFERENCES:

CS9256 MULTIMEDIA SYSTEMS L T P C 3 0 0 3

UNIT I INTRODUCTION AND QOS 9

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
UNIT V  SYNCHRONIZATION
Synchronization in Multimedia Systems—Presentation—Synchronization Types—Multimedia Synchronization Methods—Case Studies—MEG-MODE-ACME.

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:

CS 9257  XML AND WEB SERVICES  L T P C  3 0 0 3

UNIT I  XML TECHNOLOGY FAMILY

UNIT II  ARCHITECTING WEB SERVICES

UNIT III  WEB SERVICES BUILDING BLOCK

UNIT IV  IMPLEMENTING XML IN E-BUSINESS

UNIT V  XML AND CONTENT MANAGEMENT

TOTAL: 45 PERIODS
TEXT BOOK

REFERENCES

CS9258 BIO INFORMATICS L T P C 3 0 0 3

UNIT I INTRODUCTORY CONCEPTS 9

UNIT II SEARCH ENGINES AND DATA VISUALIZATION 9

UNIT III STATISTICS AND DATA MINING 9

UNIT IV PATTERN MATCHING 9

UNIT V MODELING AND SIMULATION 9

TOTAL : 45 PERIODS
REFERENCES:

CS9259 NETWORK SECURITY L T P C 3 0 0 3


UNIT II PUBLIC KEY ENCRYPTION RSA - Elliptic Curve Cryptography - Number Theory Concepts

UNIT III MESSAGE AUTHENTICATION Hash Functions - Digest Functions - Digital Signatures - Authentication Protocols.


TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:

CS9260 EMBEDDED SYSTEMS L T P C 3 0 0 3

UNIT I EMBEDDED COMPUTING Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets

UNIT III  OPTIMIZING ASSEMBLY CODE  9

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 PERIODS

REFERENCES:

CS9261  DIGITAL IMAGING  L T P C
3 0 0 3

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9

UNIT II  IMAGE ENHANCEMENT  9

UNIT III  IMAGE SEGMENTATION AND FEATURE ANALYSIS  9

UNIT IV  MULTI RESOLUTION ANALYSIS AND COMPRESSIONS  9

UNIT V  APPLICATIONS OF IMAGE PROCESSING  9

TOTAL : 45 PERIODS
REFERENCES:

CS9262 SOFTWARE QUALITY ASSURANCE

UNIT I

UNIT II
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
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

UNIT V
Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

TOTAL : 45 PERIODS

REFERENCES:
UNIT I  AD-HOC MAC

UNIT II  AD-HOC NETWORK ROUTING & TCP

UNIT III  WSN -MAC

UNIT IV  WSN ROUTING, LOCALIZATION & QOS

UNIT V  MESH NETWORKS

REFERENCES:

CS9264  DATA WAREHOUSING AND DATA MINING
UNIT I  9

UNIT II  9
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

UNIT IV

UNIT V

TOTAL : 45 PERIODS

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

UNIT V

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
2. Nader F.Mir Computer and Communication Networks,Pearson Education.2007

CS9266 AGENT BASED INTELLIGENT SYSTEMS

UNIT I INTRODUCTION

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

UNIT IV AGENTS AND UNCERTAINTY

UNIT V HIGHER LEVEL AGENTS
Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning-Communication-Formal Grammar-Augmented Grammars- Future of AI.

TOTAL : 45 PERIODS
TEXT BOOK:

REFERENCES:

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

UNIT IV MULTIDIMENSIONAL VISUALIZATION 9

UNIT V CASE STUDIES 9
Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCE:
UNIT I  PARALLEL AND DISTRIBUTED DATABASES  9
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  9
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
feature sine SQL/Oracle – Case Studies.

UNIT III  XML DATABASES  9
JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT IV  MOBILE DATABASES  9
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  9
Multidimensional Data Structures – Image Databases – Text/Document Databases- Video
Databases – Audio Databases – Multimedia Database Design.

TOTAL : 45 PERIODS

REFERENCES:
   Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design,
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth
UNIT I  BASIC CONCEPTS  

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  

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  

TOTAL : 45 PERIODS

REFERENCES:
4. Bob Hughes and Mike Cotterell,"Software Project Management".

UNIT I  INTRODUCTION  

UNIT II  JAVA COMPONENT TECHNOLOGIES  

UNIT III  CORBA TECHNOLOGIES  
UNIT IV  COM AND .NET TECHNOLOGIES

UNIT V  COMPONENT FRAMEWORKS AND DEVELOPMENT

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE: