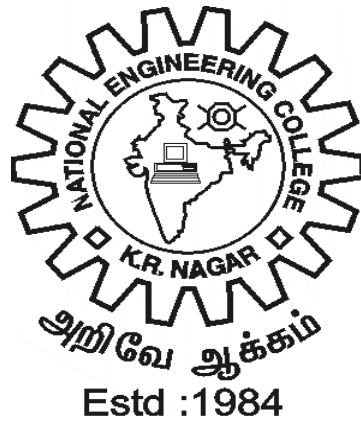


# **NATIONAL ENGINEERING COLLEGE**

*(An Autonomous Institution Affiliated to Anna University Chennai)*

**K.R.NAGAR, KOVILPATTI – 628 503**

## **REGULATIONS – 2011**



**DEPARTMENT OF  
COMPUTER SCIENCE AND ENGINEERING**

**CURRICULUM AND SYLLABI OF  
M.E. – COMPUTER SCIENCE AND ENGINEERING**

**NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI**  
(An Autonomous Institution Affiliated to Anna University Chennai)

**M.E. (COMPUTER SCIENCE AND ENGINEERING)**

**REGULATIONS – 2011 CURRICULUM**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>SEMESTER I</b>						
<b>THEORY</b>						
1	MME101	Operations Research	3	0	0	3
2	MCS101	Computer Architecture	3	0	0	3
3	MCS102	Data Structures and Algorithms	3	0	0	3
4	MCS103	Object Oriented Software Engineering	3	0	0	3
5	MCS104	Computer Networks and Management	3	0	0	3
<b>PRACTICAL</b>						
6	MCS131	Data Structures Laboratory	0	0	3	2
7	MCS132	Networking Laboratory	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>0</b>	<b>6</b>	<b>19</b>
<b>SEMESTER II</b>						
<b>THEORY</b>						
1	MCS201	Database Technology	3	0	0	3
2	MCS202	Advanced Operating Systems	3	0	0	3
3	MCS203	Advanced System Software	3	0	0	3
4	MCS204	Information Security	3	0	0	3
5	MCS205	Web Technology	3	0	0	3
6	E1	Elective	3	0	0	3
<b>PRACTICAL</b>						
7	MCS231	Operating System Laboratory	0	0	3	2
8	MCS232	Internet Programming Laboratory	0	0	3	2
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>6</b>	<b>22</b>

<b>SEMESTER III</b>						
<b>THEORY</b>						
1	E2	Elective	3	0	0	3
2	E3	Elective	3	0	0	3
3	E4	Elective	3	0	0	3
<b>PRACTICAL</b>						
4	MCS331	Project Work (Phase I)	0	0	12	6
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

<b>SEMESTER IV</b>						
<b>PRACTICAL</b>						
1	MCS431	Project Work (Phase II)	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE – 68**

**NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI**  
(An Autonomous Institution Affiliated to Anna University Chennai)

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

<b>SEMESTER I (Part time)</b>						
<b>SL. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>						
1	MME101	Operations Research	3	0	0	3
2	MCS101	Computer Architecture	3	0	0	3
3	MCS102	Data Structures and Algorithms	3	0	0	3
<b>PRACTICAL</b>						
4	MCS131	Data Structures Laboratory	0	0	3	2
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>3</b>	<b>11</b>
<b>SEMESTER – II (Part time)</b>						
<b>THEORY</b>						
1	MCS201	Database Technology	3	0	0	3
2	MCS202	Advanced Operating Systems	3	0	0	3
3	MCS203	Advanced System Software	3	0	0	3
<b>PRACTICAL</b>						
4	MCS231	Operating System Laboratory	0	0	3	2
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>3</b>	<b>11</b>
<b>SEMESTER – III (Part time)</b>						
<b>THEORY</b>						
1	MCS103	Object Oriented Software Engineering	3	0	0	3
2	MCS104	Computer Networks and Management	3	0	0	3
<b>PRACTICAL</b>						
3	MCS132	Networking Laboratory	0	0	3	2
<b>TOTAL</b>			<b>6</b>	<b>0</b>	<b>3</b>	<b>8</b>

<b>SEMESTER IV (Part time)</b>						
<b>THEORY</b>						
1	MCS204	Information Security	3	0	0	3
2	MCS205	Web Technology	3	0	0	3
3	E1	Elective	3	0	0	3
<b>PRACTICAL</b>						
4	MCS232	Internet Programming Laboratory	0	0	3	2
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>3</b>	<b>11</b>

<b>SEMESTER V (Part time)</b>						
<b>THEORY</b>						
1	E2	Elective	3	0	0	3
2	E3	Elective	3	0	0	3
3	E4	Elective	3	0	0	3
<b>PRACTICAL</b>						
4	MCS331	Project Work (Phase I)	0	0	12	6
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

<b>SEMESTER VI (Part time)</b>						
<b>PRACTICAL</b>						
1	MCS431	Project Work (Phase II)	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE – 68**

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

<b>S.NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	MCS001	XML and Web Services	3	0	0	3
2	MCS002	Distributed Computing	3	0	0	3
3	MCS003	Digital Image Processing	3	0	0	3
4	MCS004	Network Routing Algorithms	3	0	0	3
5	MCS005	Internetworking Multimedia	3	0	0	3
6	MCS006	Soft Computing	3	0	0	3
7	MCS007	Mobile Computing	3	0	0	3
8	MCS008	Theory of Computation	3	0	0	3
9	MCS009	Multimedia Systems	3	0	0	3
10	MCS010	Software Quality Assurance	3	0	0	3
11	MCS011	Software Project Management	3	0	0	3
12	MCS012	Grid Computing	3	0	0	3
13	MCS013	Pattern Recognition	3	0	0	3
14	MCS014	Bio Informatics	3	0	0	3
15	MCS015	Ontology and Semantic Web	3	0	0	3
16	MCS016	Pervasive Computing	3	0	0	3
17	MCS017	Digital Imaging	3	0	0	3
18	MCS018	Information Retrieval Techniques	3	0	0	3
19	MCS019	Data Warehousing and Data Mining	3	0	0	3
20	MCS020	Performance Evaluation of Computer Systems and Networks	3	0	0	3
21	MCS021	Agent Based Intelligent Systems	3	0	0	3
22	MCS022	Visualization Techniques	3	0	0	3
23	MCS023	Advanced Databases	3	0	0	3
24	MCS024	Component Based Technology	3	0	0	3
25	MCE001	Communication Network Security	3	0	0	3
26	MCE010	Embedded Systems	3	0	0	3
27	MCC007	Adhoc Networks	3	0	0	3

**MME101****OPERATIONS RESEARCH**L T P C  
3 0 0 3**Objectives:**

1. To introduce the various queuing models of Operations Research.
2. Emphasize the important mathematical procedures of nonlinear programming search techniques.
3. To study about advanced topics in linear and non-linear programming.
4. Relate the course material to research activities.

**UNIT I      QUEUEING MODELS      9**

Poisson Process – Markovian Queues – Single and Multi-Server Models – Little’s Formula – Machine Interference Model – Steady State Analysis – Self Service Queue.

**UNIT II      ADVANCED QUEUEING MODELS      9**

Non- Markovian Queues – Pollaczek Khintchine Formula – Queues in Series – Open Queueing Networks – Closed Queueing Networks.

**UNIT III      SIMULATION      9**

Discrete Even Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queueing Systems.

**UNIT IV      LINEAR PROGRAMMING      9**

Formulation – Graphical solution – Simplex Method – Two Phase Method – Transportation and Assignment Problems.

**UNIT V      NON-LINEAR PROGRAMMING      9**

Lagrange Multipliers – Equality constraints – Inequality constraints – Kuhn – Tucker conditions – Quadratic Programming.

**TOTAL: 45****TEXT BOOKS:**

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

**REFERENCES:**

1. Robertazzi. T.G. “Computer Networks and Systems – Queuing Theory and Performance Evaluation”, 3<sup>rd</sup> Edition, Springer, 2002 Reprint.
2. Ross S.M, “Probability Models for Computer Science”, Academic Press, 2002.





<b>MCS102</b>	<b>DATA STRUCTURES AND ALGORITHMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

To gain a solid understanding of the following topics:

1. The fundamental design, analysis, and implementation of basic data structures and algorithms.
2. Principles for good program design, especially the uses of data abstraction and modular program composition.
3. Basic concepts in the specification and analysis of programs.

**UNIT I COMPLEXITY ANALYSIS & ELEMENTARY DATA STRUCTURES 9**

Asymptotic notations – Properties of big oh notation – Asymptotic notation with several parameters – Conditional Asymptotic notation – Amortized Analysis – NP-completeness – NP hard – Recurrence equations – Solving recurrence equations – Arrays – Linked lists – Trees.

**UNIT II HEAP STRUCTURES 9**

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

**UNIT III SEARCH STRUCTURES 9**

Binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – B-trees – Splay trees – Tries.

**UNIT IV GREEDY & DIVIDE AND CONQUER 9**

Quicksort – Strassen’s matrix multiplication – Convex hull – Tree-vertex splitting – Job sequencing with deadlines – Optimal storage on tapes

**UNIT V DYNAMIC PROGRAMMING AND BACKTRACKING 9**

Multistage graphs – 0/1 knapsack using dynamic programming – Flow shop scheduling – 8- queens problem – Graph coloring – Knapsack using backtracking

**TOTAL: 45****REFERENCES:**

1. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, Galgotia, 1999.
2. E. Horowitz, S.Sahni and S. Rajasekaran, “Computer Algorithms / C++”, Galgotia, 1999.
3. Adam Drozdex, Data Structures and algorithms in C++, 2<sup>nd</sup> Edition, Thomson learning, vikas Publishing House, 2001.
4. G. Brassard and P. Bratley, “Algorithmics: Theory and Practice”, Prentice –Hall, 1988.
5. Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, “Introduction to Algorithms”, 2<sup>nd</sup> Edition, PHI 2003.

**MCS103                      OBJECT ORIENTED SOFTWARE ENGINEERING                      L T P C**  
**3 0 0 3**

**Objectives:**

1. To learn object-oriented (OO) analysis and design using UML and other techniques.
2. To learn how OO languages support abstraction and polymorphism.
3. To learn an agile software process, with multiple iterations, design patterns, test-driven development & pair programming.
4. To improve analyzing skills in the context of software development.

**UNIT I                      INTRODUCTION                      9**  
 System Concepts – Software Engineering Concepts – Development Activities – Managing Software Development – Unified Modeling Language – Project Organization – Communication.

**UNIT II                      ANALYSIS                      9**  
 Requirements Elicitation – Concepts – Activities – Management – Analysis Object Model – Analysis Dynamic Models.

**UNIT III                      SYSTEM DESIGN                      9**  
 Decomposing the system – Overview of System Design – System Design Concepts – System Design Activities – Addressing Design Goals – Managing System Design.

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

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

**TOTAL: 45**

**REFERENCES:**

1. Bernd Bruegge, Alan H Dutoit, “Object-Oriented Software Engineering”, 2<sup>nd</sup> Edition, Pearson Education, 2004.
2. Craig Larman, “Applying UML and Patterns”, 3<sup>rd</sup> Edition, Pearson Education, 2005.
3. Stephen Schach, “Software Engineering”, 7<sup>th</sup> Edition, Mc-Graw Hill, 2007.

<b>MCS104</b>	<b>COMPUTER NETWORKS AND MANAGEMENT</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To make the students to learn the basics of ATM and the features of Wireless LANs.
2. To provide an up-to-date survey of developments in High Speed Networks.
3. Enable the students to know techniques involved to support real-time traffic and congestion control.
4. To provide different levels of quality of service (QoS) to different applications.

**UNIT I HIGH SPEED NETWORKS 9**

Frame Relay Networks – Asynchronous Transfer Mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LAN's.

**UNIT II CONGESTION AND TRAFFIC MANAGEMENT 9**

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

**UNIT III TCP AND ATM CONGESTION CONTROL 10**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO 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 9**

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

**UNIT V PROTOCOLS FOR QoS SUPPORT 8**

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

**TOTAL: 45****TEXT BOOK:**

1. William Stallings, "High speed networks and Internet", 2<sup>nd</sup> Edition, Pearson Education, 2002.

**REFERENCES:**

1. Warland and Pravin Varaiya, "High performance communication networks", 2<sup>nd</sup> Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Volume 1 and 2, Cisco Press, 2003.

MCS131

**DATA STRUCTURES LABORATORY**L T P C  
0 0 3 2**Lab Objectives:**

1. To learn how to implement some useful concepts of data structures.
2. To understand the effect of data structures on an algorithm's complexity.

**List of Experiments:**

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**

Required Software: Java, C++

**MCS132****NETWORKING LABORATORY****L T P C**  
**0 0 3 2****Lab Objectives:**

1. To study about various network programming and socket system calls.
2. To understand the concepts of data transfer between client and server.
3. To simulate various networking protocols.

**List of Experiments:**

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**

Required Software: C, Java, opnet, NS2

<b>MCS201</b>	<b>DATABASE TECHNOLOGY</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To know the different types of databases.
2. To understand the emerging systems.
3. To make awareness about current issues related to databases.

**UNIT I      DISTRIBUTED DATABASES      5**

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

**UNIT II      OBJECT ORIENTED DATABASES      10**

Introduction to Object Oriented Databases – Approaches – Modeling and Design – Persistence – Query Languages – Transaction – Concurrency – MultiVersion Locks – Recovery.

**UNIT III      EMERGING SYSTEMS      10**

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

**UNIT IV      DATABASE DESIGN ISSUES      10**

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

**UNIT V      CURRENT ISSUES      10**

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

**TOTAL: 45****REFERENCES:**

1. Elisa Bertino, Barbara Catania, Gian Piero Zarri, “Intelligent Database Systems”, Addison-Wesley, 2001.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, R.T.Snodgrass, V.S.Subrahmanian, “Advanced Database Systems”, Morgan Kaufman, 1997.
3. N.Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Prentice Hall International Inc., 1999.
4. C.S.R Prabhu, “Object-Oriented Database Systems”, Prentice Hall of India, 1998.
5. Abdullah Uz Tansel et al, “Temporal Databases: Theory, Design And Principles”, Benjamin Cummings Publishers, 1993.
6. Raghuram Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGrawHill, 3<sup>rd</sup> Edition 2004.
7. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, 4<sup>th</sup> Edition, Mc-Graw Hill, 2002.
8. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Pearson Education, 2004.

**MCS202****ADVANCED OPERATING SYSTEMS**L T P C  
3 0 0 3**Objectives:**

1. To introduce mechanisms for synchronization.
2. To study the distributed operating systems.
3. To know the distributed file systems.
4. To know how to recover the failures and basic approaches to recovery.

**UNIT I INTRODUCTION****9**

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

**UNIT II DISTRIBUTED OPERATING SYSTEMS****9**

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

**UNIT III DISTRIBUTED RESOURCE MANAGEMENT****9**

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

**UNIT IV FAILURE RECOVERY AND FAULT TOLERANCE****9**

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

**UNIT V MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS****9**

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

**TOTAL: 45****TEXT BOOK:**

1. Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, Mc-Graw Hill, 2000.

**REFERENCES:**

1. Abraham Silberschatz, Peter B. Galvin, G. Gagne, “Operating System Concepts”, 6<sup>th</sup> Edition, Addison Wesley Publishing Co., 2003.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 2<sup>nd</sup> Edition, Addison Wesley, 2001.



**MCS203****ADVANCED SYSTEM SOFTWARE**L T P C  
3 0 0 3**Objectives:**

1. To study the basic compiler functions.
2. To study the symbol table structure and various optimization techniques.
3. To introduce virtual machines.

**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 – Inline Expansion – Leaf Routine Optimization and Shrink Wrapping – Register Allocation and Assignment – Graph Coloring – Data Flow Analysis – Constant Propagation – Alias Analysis – Register Allocation – Global References – Optimization for Memory Hierarchy – Code Scheduling – Instruction Scheduling – Speculative Scheduling – Software Pipelining – Trace Scheduling – Run-Time Support – Register Usage – Local Stack Frame – Run-Time Stack – Code Sharing – Position-Independent Code.

**UNIT IV****9**

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

**UNIT V****8**

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

**TOTAL: 45****TEXT BOOKS:**

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

**REFERENCES:**

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



**MCS205****WEB TECHNOLOGY**L T P C  
3 0 0 3**Objectives:**

1. To understand the client server concepts and study the markup languages.
2. To know about client side and server side programming.
3. To build web applications.

**UNIT I** **9**

Web essentials – Clients – Servers – Communication – Markup Languages – XHTML – simple XHTML pages style sheets – CSS

**UNIT II** **9**

Client side programming – Java script language – Java script objects – Host objects: Browsers and the DOM.

**UNIT III** **9**

Server side programming – Java servlets – Basics – Simple program – Separating Programming and Presentation – ASP/JSP – JSP basics ASP/JSP objects – simple ASP/JSP pages.

**UNIT IV** **9**

Representing Web data – Database connectivity – JDBC – Dynamic Web pages – XML – DTD – XML schema – DOM – SAX – Xquery.

**UNIT V** **9**

Building Web applications – Cookies – Sessions – Open source environment – PHP – MYSQL – Case studies.

**TOTAL: 45****TEXT BOOKS:**

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

**REFERENCES:**

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
2. Bates, “Developing Web Applications”, Wiley, 2006
3. Marty Hall and Larry Brown, “Core Web Programming” Second Edition, Volume I and II, Pearson Education, 2001

**MCS231 OPERATING SYSTEM LABORATORY**L T P C  
0 0 3 2**Objectives:**

1. To implement semaphores and multithreading.
2. To implement the concurrency conflict that occurs between multiple client applications..
3. To identifying Local Area Network Hardware.
4. To explore Local Area Network Configuration Options.

**LIST OF EXPERIMENTS:****MULTIPROCESSOR OPERATING SYSTEMS****Program 1 – Semaphores – Multiprocessor operating systems**

Assume there are three processes: Pa, Pb, and Pc. Only Pa can output the letter A, Pb B, and Pc C. Utilizing only semaphores (and no other variables) the processes are synchronized so that the output satisfies the following conditions:

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

Examples

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

**MULTITHREADING – MULTIPROCESSOR OPERATING SYSTEMS****Program 2 – 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. Investigate and implement the Object Store's concurrency options.

Implement the concurrency conflict that occurs between multiple client applications. Observe and implement the implication of nested transactions.

## DISTRIBUTED OPERATING SYSTEMS

### Program 7 – Distributed operating systems

1. Design a RMI Lottery application. Each time you run the client program -- “**java LotteryClient n**”, the server program “**LotteryServer**” will generate **n** set of Lottery numbers. Here **n** is a positive integer, representing the money you will spend on Lottery in sterling pounds. Write this program in a proper engineering manner, i.e. there should be specifications, design (flow chart, FD, or pseudo code), coding, test/debug, and documentation.

2. Consider a distributed system that consists of two processes which communicate with each other. Let **P** be a state predicate on the local state of one process and **Q** be a state predicate on the local state of the other process. Assume that neither **P** nor **Q** are stable (i.e. closed).

Design a superimposed computation which detects that there exists an interleaving of underlying events in this system where at some state  $P \wedge Q$  holds. (A superposed computation is one that does not affect 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.]

**TOTAL: 45**

Required Software: Java

MCS232

**INTERNET PROGRAMMING LABORATORY**L T P C  
0 0 3 2**Objectives:**

1. To design Web Pages using Client Side Scripting and DHTML.
2. To develop web services and E-business applications.
3. To implement server side applications using JSP.

**List of Experiments:**

1. Designing Web Pages using Client Side Scripting and DHTML.
2. Client Server Scripting Programs.
3. Simulation of Email and File Transfer Protocols.
4. Development of Web Services.
5. XML and Databases.
6. Server Side Application Using JSP.
7. Web Customization.
8. Development of E-Business Application.

**TOTAL: 45**

Required Software: Java, XML, HTML, Scripting languages



<b>MCS001</b>	<b>XML AND WEB SERVICES</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To introduce the XML technology.
2. To study and understand the web services technology.
3. To implement XML in E-business.
4. To know how to secure web services.

**UNIT I XML TECHNOLOGY FAMILY 9**

XML – Benefits – Advantages of XML over HTML – EDI – Databases – XML Based standards– Structuring with schemas – DTD – XML schemas – XML processing – DOM –SAX– Presentation technologies – XSL – XFORMS – XHTML – Transformation – XSLT–XLINK– XPATH–XQuery.

**UNIT II ARCHITECTING WEB SERVICES 9**

Business motivations for web services – B2B – B2C – Technical motivations – Limitations of CORBA and DCOM – Service Oriented Architecture (SOA) – Architecting web services – Implementation view– Web services technology stack – Logical view–Composition of web services–Deployment view from application server to peer to peer–Process view–Life in the runtime.

**UNIT III WEB SERVICES BUILDING BLOCKS 9**

Transport protocols for web services – Messaging with web services – Protocols – SOAP – Describing web services – WSDL – Anatomy of WSDL – Manipulating WSDL – Web service policy–Discovering web services – UDDI – Anatomy of UDDI – Web service inspection–Adhoc discovery–Securing web services.

**UNIT IV IMPLEMENTING XML IN E-BUSINESS 9**

B2B – B2C applications – Different types of B2B interaction – Components of EBusiness XML systems – EBXML – RosettaNet – Applied XML in vertical industry – Web services for mobile devices.

**UNIT V XML CONTENT MANAGEMENT AND SECURITY 9**

Semantic web – Role of meta data in web content – Resource description framework – RDFschema – Architecture of semantic web – Content management workflow – XLANG – WSFL – Securing web services.

**TOTAL: 45****TEXTBOOKS:**

1. Ron Schmelzer and Travis Vandersypen, “XML and Web Services unleashed”, Pearson Education, 2002.
2. Keith Ballinger, “.NET Web Services Architecture and Implementation”, Pearson Education, 2003.

**REFERENCES:**

1. David Chappell, “Understanding .NET A Tutorial and Analysis”, Addison Wesley, 2002.
2. Kennard Scibner and Mark C. Stiver, “Understanding SOAP”, SAMS Publishing, 2000.
3. Alexander Nakhimovsky and Tom Myers, “XML Programming: Web Applications and Web Services with JSP and ASP”, Apress, 2002.

**MCS002** **DISTRIBUTED COMPUTING** **L T P C**  
**3 0 0 3**

**Objectives:**

1. To introduce the various paradigms in distributed environment.
2. To know about distributed operating systems.
3. To study the file systems.
4. To understand the concepts of fault tolerance system.

**UNIT I COMMUNICATION IN DISTRIBUTED ENVIRONMENT 8**

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

**UNIT II DISTRIBUTED OPERATING SYSTEMS 12**

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

**UNIT III DISTRIBUTED RESOURCE MANAGEMENT 10**

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

**UNIT IV FAULT TOLERANCE AND CONSENSUS 7**

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

**UNIT V CASE STUDIES 8**

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

**TOTAL: 45****REFERENCES:**

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



**MCS004 NETWORK ROUTING ALGORITHMS****L T P C  
3 0 0 3****UNIT I INTRODUCTION 7**

ISO OSI Layer Architecture, TCP/IP Layer Architecture, Functions of Network layer, General Classification of routing, Routing in telephone networks, Dynamic Non Hierarchical Routing (DNHR), Trunk Status Map Routing (TSMR), Real-Time network routing (RTNR), Distance vector routing, Link state routing, Hierarchical routing.

**UNIT II INTERNET ROUTING 10**

Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast Routing: Pros and cons of Multicast and Multiple Unicast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

**UNIT III ROUTING IN OPTICAL WDM NETWORKS 10**

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements, Wavelength Rerouting- Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG.

**UNIT IV MOBILE – IP NETWORKS 9**

Macro-mobility Protocols, Micro-mobility protocol - Tunnel based Hierarchical Mobile IP, Intra domain Mobility Management, Routing based: Cellular IP, Handoff Wireless Access Internet Infrastructure (HAWAII).

**UNIT V MOBILE AD –HOC NETWORKS 9**

Internet-based mobile ad-hoc networking communication strategies, Routing algorithms – Proactive routing: destination sequenced Distance Vector Routing (DSDV), Reactive routing: Dynamic Source Routing (DSR), Adhoc On-Demand Distance Vector Routing (AODV), Hybrid Routing: Zone Based Routing (ZRP).

**TOTAL: 45****REFERENCES:**

1. William Stallings, “High speed networks and Internets Performance and Quality of Service”, 2<sup>nd</sup> Edition, Pearson Education Asia. Reprint India 2002.
2. M. Steen Strub, “Routing in Communication network”, Prentice Hall International, Newyork, 1995.
3. C.E Perkins, “Adhoc Networking”, Addison Wesley, 2001.
4. Ian F. Akyildiz, Jiang Xie and Shantidev Mohanty, “A Survey of mobility Management in Next generation All IP- Based Wireless Systems”, IEEE Wireless Communications, pp 16-27, Aug.2004.
5. A.T Campbell et al., “ Comparison of IP Micromobility Protocols,” IEEE Wireless Communications, pp 72-82, Feb.2002.
6. Canhui (Sam) Ou and Biswanath Mukherjee “Survivable Optical WDM Networks (Optical Networks)”, Springer, 2011.

**MCS005 INTERNETWORKING MULTIMEDIA L T P C**  
**3 0 0 3**

**UNIT I INTRODUCTION 9**

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/video transform, multimedia coding and compression for text, image, audio and video. Multimedia communication in wireless network.

**UNIT II SUBNETWORK TECHNOLOGY 9**

Broadband services, ATM and IP , IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling and policing, throughput, delay and jitter performance.

**UNIT III MULTICAST AND TRANSPORT PROTOCOL 9**

Multicast over shared media network, multicast routing and addressing, scaping multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP.

**UNIT IV MEDIA – ON – DEMAND 9**

Storage and media servers, voice and Video Over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

**UNIT V APPLICATIONS 9**

MIME, Peer-to-peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

**TOTAL: 45**

**REFERENCES:**

1. Jon Crowcroft, Mark Handley, Ian Wakeman. “Internetworking Multimedia”, Harcourt Asia Pvt.Ltd.Singapore, 1998.
2. B.O. Szuprowicz, “Multimedia Networking”, McGraw Hill, NewYork. 1995
3. Tay Vaughan, “Multimedia making it to work”, 4<sup>th</sup> Edition, Tata McGraw Hill, NewDelhi, 2000.
4. Ellen kayata wesel, Ellen Khayata, “Wireless Multimedia Communication: Networking Video, Voice and Data”, Addison Wesley Longman Publication, USA, 1998.
5. Parag Havaladar and Gerard Medioni “Multimedia Systems: Algorithms, Standards, and Industry Practices”, Cengage Learning, 2009
6. Lawrence Harte “Introduction to Data Multicasting, IP Multicast Streaming for Audio and Video Media Distribution”, Althos, 2008

**MCS006****SOFT COMPUTING**

L T P C

3 0 0 3

**Objectives:**

1. To introduce soft computing constituents.
2. To study the applications of Genetic algorithms.
3. To study the different classifications of neural networks.
4. To understand the fuzzy logic.

**UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9**

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

**UNIT II GENETIC ALGORITHMS 9**

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

**UNIT III NEURAL NETWORKS 9**

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

**UNIT IV FUZZY LOGIC 9**

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

**UNIT V NEURO-FUZZY MODELING 9**

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

**TOTAL: 45****TEXT BOOKS:**

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

**REFERENCES:**

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

**MCS007** **MOBILE COMPUTING** **L T P C**  
**3 0 0 3**

**Objectives:**

1. To know the fundamentals of wireless communication.
2. To understand the telecommunication systems.
3. To study the different network layers.
4. To study about various protocols.

**UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9**

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

**UNIT II TELECOMMUNICATION SYSTEMS 11**

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

**UNIT III WIRELESS NETWORKS 9**

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

**UNIT IV NETWORK LAYER 9**

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

**UNIT V TRANSPORT AND APPLICATION LAYERS 7**

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

**TOTAL: 45****TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, 2<sup>nd</sup> Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

**REFERENCES:**

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

**MCS008****THEORY OF COMPUTATION**L T P C  
3 0 0 3**Objectives:**

1. To know about the finite automata and transitions.
2. To study about regular expressions and languages.
3. To know the properties of context free grammar.
4. To understand the programming techniques for turing machines.

**UNIT I AUTOMATA****9**

Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata (FA) – Deterministic Finite Automata – Non deterministic Finite Automata – Finite Automata with Epsilon Transitions.

**UNIT II REGULAR EXPRESSIONS AND LANGUAGES****9**

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

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

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

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

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

**UNIT V UNDECIDABILITY****9**

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

**TOTAL: 45****TEXT BOOK:**

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", 2<sup>nd</sup> Edition, Pearson Education, 2003

**REFERENCES:**

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, Prentice Hall of India, 2003.
2. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata Mc-Graw Hill, 2003.
3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.



<b>MCS009</b>	<b>MULTIMEDIA SYSTEMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To study the concepts of operating systems.
2. To understand the traditional and multimedia file systems.
3. To know about the MBone applications.
4. To study the various Multimedia Synchronization Methods.

<b>UNIT I</b>	<b>INTRODUCTION AND QoS</b>	<b>9</b>
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Introduction – QoS Requirements and Constraints – Concepts – Resources – Establishment Phase – Run-Time Phase – Management Architectures.

<b>UNIT II</b>	<b>OPERATING SYSTEMS</b>	<b>9</b>
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Real-Time Processing – Scheduling – Interprocess Communication – Memory and Management – Server Architecture – Disk Management.

<b>UNIT III</b>	<b>FILE SYSTEMS AND NETWORKS</b>	<b>9</b>
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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.

<b>UNIT IV</b>	<b>COMMUNICATION</b>	<b>9</b>
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Transport Subsystem – Protocol Support for QoS – Transport of Multimedia-Computer Supported Cooperative Work – Architecture-Session Management – MBone Applications.

<b>UNIT V</b>	<b>SYNCHRONIZATION</b>	<b>9</b>
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Synchronization in Multimedia Systems-Presentation-Synchronization Types- Multimedia Synchronization Methods-Case Studies-MHEG-MODE-ACME.

**TOTAL : 45**

**TEXT BOOK:**

1. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Systems”, 1<sup>st</sup> Edition, Springer, 2004.

**REFERENCES:**

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

**MCS010****SOFTWARE QUALITY ASSURANCE**

L T P C

3 0 0 3

**Objectives:**

1. To introduce the SQA components in project life cycle.
2. To study the basics of software testing.
3. To know about the testing strategies.
4. To know the hierarchical models of software quality.
5. To know the quality management standards.

**UNIT I****9**

Introduction to software quality – challenges – objectives – quality factors – components of SQA – contract review – development and quality plans – SQA components in project life cycle – SQA defect removal policies – Reviews.

**UNIT II****9**

Basics of software testing – test generation from requirements – finite state models – combinatorial designs – test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement.

**UNIT III****9**

Testing strategies – white box and black box approach – integration testing – system and acceptance testing – performance testing – regression testing – internationalization testing – Adhoc testing – website testing – usability testing – accessibility testing – Test plan – management – execution and reporting – software test automation – automated testing tools.

**UNIT IV****9**

Hierarchical models of software quality – software quality metrics –function points – Software product quality – software maintenance quality – effect of case tools – software quality infrastructure – procedures – certifications – configuration management – documentation control.

**UNIT V****9**

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

**TOTAL : 45****REFERENCES:**

1. Daniel Galin, “Software quality assurance – from theory to implementation”, Pearson Education, 2009.
2. Aditya Mathur, “Foundations of software testing”, Pearson Education, 2008.
3. Srinivasan Desikan and Gopaldaswamy Ramesh, “Software testing – principles and practices”, Pearson Education, 2006.

**MCS011****SOFTWARE PROJECT MANAGEMENT**L T P C  
3 0 0 3**Objectives:**

1. To study the product life cycle.
2. To understand the emerging models relevance to project management.
3. To know the engineering and people issues in project management.

**UNIT I BASIC CONCEPTS 9**

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

**UNIT II FORMAT PROCESS MODELS AND THEIR USE 9**

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

**UNIT III UMBRELLA ACTIVITIES IN PROJECTS 9**

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

**UNIT IV INSTREAM ACTIVITIES IN PROJECTS 9**

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

**UNIT V ENGINEERING AND PEOPLE ISSUES IN PROJECT MANAGEMENT 9**

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

**TOTAL: 45****REFERENCES:**

1. Ramesh, Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Humphrey, Watts, "Managing the Software Process", Addison Wesley, 1986.
3. Pressman, Roger, "Software Engineering, A Practitioner's approach", McGraw Hill, 1997.
4. Bob Hughes and Mike Cotterell, "Software Project Management", 4<sup>th</sup> Edition, Tata McGraw Hill, 2005
5. Wheelwright and Clark, "Revolutionising product development", The Free Press, 1993.

**MCS012****GRID COMPUTING**L T P C  
3 0 0 3**Objectives:**

1. To introduce the grid computing.
2. To study the technologies and tool kit for grid computing.
3. To know the high level grid services.

**UNIT I INTRODUCTION TO GRID COMPUTING 7**  
Introduction – The Grid – Past, Present and Future – Applications of grid computing Organizations and their roles.

**UNIT II GRID COMPUTING ARCHITECTURE 8**  
Grid Computing anatomy – Next generation of Grid computing initiatives – Merging the Grid services architecture with Web services architecture.

**UNIT III GRID COMPUTING TECHNOLOGIES 11**  
OGSA – Sample use cases that drive the OGSA platform components – OGSI and WSRF–OGSA Basic Services – Security standards for grid computing.

**UNIT IV GRID COMPUTING TOOL KIT 10**  
Globus Toolkit –Versions – Architecture –GT Programming model –A sample grid service implementation.

**UNIT V HIGH LEVEL GRID SERVICES 9**  
High level grid services – OGSI .NET middleware Solution - Mobile OGSI.NET for Grid computing on Mobile devices.

**TOTAL : 45****TEXT BOOK:**

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

**REFERENCES:**

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

<b>MCS013</b>	<b>PATTERN RECOGNITION</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To introduce pattern recognition and its applications.
2. To understand the clustering analysis, supervised and unsupervised learning.
3. To study the neural networks.

**UNIT I INTRODUCTION TO PATTERN RECOGNITION 9**

Patterns and pattern Recognition – Pattern Recognition System – significance – Configurations – Representation of Patterns and Machine recognition – Applications.

**UNIT II SUPERVISED LEARNING 9**

Non-Parametric Classification: Decision theoretic Classification – Decision Surfaces – Discriminant Functions and their types – Potential Functions – Discriminant Function Training – Weight Space – Training Procedure – Training Methods – Statistical Discriminant Functions – Statistical Design Theory – Problem Formulation – Optimal functions – Training – Example of a Large Data-Set Problem.

**UNIT III CLUSTERING ANALYSIS AND UNSUPERVISED LEARNING, DIMENSIONALITY REDUCTION 9**

Introduction to Clustering – Clustering with Unknown Number of Classes and Known Number of Classes – Evaluation of Clustering Results – Graph Theoretical Methods – Mixture Statistics and Unsupervised Learning – Dimensionality Reduction: Feature selection for Multivariate Gaussian Data – Feature Ordering – Canonical Analysis, Optimum Classification – Non-Parametric feature Selection.

**UNIT IV NEURAL NETWORKS 9**

Multilayer perception-Preliminaries – Pattern Mapping – Radial Basis Function Networks-Training – Formulation for Pattern Classification – Comparison of RBF with Multilayer Perception. Hamming Net and Kohonen Self – Organizing Feature Map – Hopfield Model.

**UNIT V IMAGE UNDERSTANDING 9**

Image Understanding Control Strategies – Parallel and Serial Processing Control – Hierarchical Control – Bottom Up Control Strategies – Model Based Control Strategies – Combined Control Strategies – Non-hierarchical Control, Active Contour Models – Point Distribution Models – Pattern Recognition Methods in Image Understanding – Scene Labeling and constraint Propagation – Semantic Image Segmentation and Understanding.

**TOTAL: 45****REFERENCES:**

1. Singtze Bow, “Pattern Recognition and Image Preprocessing”, Marcel Dekker, Inc, 2<sup>nd</sup> Edition, 2002.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, PWS publishing, 1999.
3. Earl Gose R.JohnsonBaugh and Steve Jost, “Pattern Recognition and Image Analysis”, PHI, 2007.
4. Richard O.Duda, Peter E.Hart and David G.Stork, “Pattern Classification”, Wiley India, 2<sup>nd</sup> Edition, 2006.

**MCS014****BIO INFORMATICS**L T P C  
3 0 0 3**Objectives:**

1. To introduce the process of search engines and data visualization.
2. To study the statistics concepts.
3. To know about the pattern matching and data mining.

**UNIT I INTRODUCTORY CONCEPTS 9**

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

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

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

**UNIT III STATISTICS AND DATA MINING 9**

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

**UNIT IV PATTERN MATCHING 9**

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

**UNIT V MODELING AND SIMULATION 9**

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

**TOTAL: 45****REFERENCES:**

1. Bryan Bergeron, “Bio Informatics Computing”, 2<sup>nd</sup> Edition, Pearson Education, 2003.
2. T.K.Attwood and D.J. Perry Smith, “Introduction to Bio Informatics”, Longman Essen, 1999.

<b>MCS015</b>	<b>ONTOLOGY AND SEMANTIC WEB</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To introduce the top level ontologies.
2. To know the languages for semantic web.
3. To introduce the tools for ontology.
4. To understand the ontology management.

**UNIT I INTRODUCTION 8**

Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background -Sample – Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation – Layers – Architecture.

**UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 12**

Web Documents in XML – RDF – Schema – Web Resource Description using RDF- RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics – Traditional Ontology Languages – LOOM- OKBC – OCML – Flogic Ontology Markup Languages – SHOE – OIL – DAML + OIL- OWL.

**UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB 12**

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms – Evaluation.

**UNIT IV ONTOLOGY MANAGEMENT AND TOOLS 8**

Overview – Need for management – Development process – Target ontology – Ontology mapping – Skills management system – Ontological class – Constraints – Issues – Evolution – Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

**UNIT V APPLICATIONS 5**

Web Services – Semantic Web Services – Case Study for specific domain – Security issues – current trends.

**TOTAL: 45****REFERENCES:**

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez, “Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web”, Springer, 2004.
2. Grigoris Antoniou, Frank van Harmelen, “A Semantic Web Primer (Cooperative Information Systems)”, The MIT Press, 2004.
3. Alexander Maedche, “Ontology Learning for the Semantic Web”, Springer; 1 Edition, 2002.
4. John Davies, Dieter Fensel, Frank Van Harmelen, “Towards the Semantic Web: Ontology Driven Knowledge Management”, John Wiley & Sons Ltd., 2003.
5. John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) “Semantic Web Technologies: Trends and Research in Ontology-based Systems”, Wiley Publications, July 2006.

6. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, “Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential”, The MIT Press, 2002
7. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, “The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management”, Wiley, 2003.
8. Steffen Staab (Editor), Rudi Studer, “Handbook on Ontologies (International Handbooks on Information Systems)”, Springer 1st edition, 2004 .
9. Dean Allemang (Author), James Hendler (Author), “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL” (Paperback), Morgan Kaufmann, 2008 .



**MCS016****PERVASIVE COMPUTING**L T P C  
3 0 0 3**Objectives:**

1. To introduce the pervasive computing devices and interfaces.
2. To know the voice standards and speech applications.
3. To know the issues in pervasive computing.

**UNIT I****9**

Pervasive Computing Application – Pervasive Computing devices and Interfaces – Device technology trends, Connecting issues and protocols.

**UNIT II****9**

Pervasive Computing and web based Applications – XML and its role in Pervasive Computing – Wireless Application Protocol (WAP) Architecture and Security – Wireless Mark-Up language (WML) - Introduction.

**UNIT III****9**

Voice Enabling Pervasive Computing – Voice Standards – Speech Applications in Pervasive Computing and security.

**UNIT IV****9**

PDA in Pervasive Computing – Introduction – PDA software Components, Standards, emerging trends – PDA Device characteristics – PDA Based Access Architecture.

**UNIT V****9**

User Interface Issues in Pervasive Computing – Architecture – Smart Card- based Authentication Mechanisms – Wearable computing Architecture.

**TOTAL: 45****TEXT BOOKS:**

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff, “Pervasive Computing Technology and Architecture of Mobile Internet Applications”, Addison Wesley, Reading, 2002.
2. Uwe Hansman, Lothar Merk, Martin S Nicklous & Thomas Stober, “Principles of Mobile Computing”, Second Edition, Springer- Verlag, New Delhi, 2003.

**REFERENCES:**

1. Rahul Banerjee, “Internetworking Technologies: An Engineering Perspective”, Prentice Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5)
2. Rahul Banerjee, “Lecture Notes in Pervasive Computing”, Outline Notes, BITS-Pilani, 2003.

**MCS017****DIGITAL IMAGING**L T P C  
3 0 0 3**Objectives:**

1. To study the fundamentals of image processing.
2. To study the various image enhancement techniques.
3. To know the various image compression standards.
4. To know the applications of image processing.

**UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9**

Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

**UNIT II IMAGE ENHANCEMENT 9**

Spatial Domain – Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening – Frequency Domain: Filtering in Frequency Domain – DFT – FFT – DCT – Smoothing and Sharpening filters – Homomorphic Filtering.

**UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS 9**

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological Water Sheds – Motion Segmentation – Feature Analysis and Extraction.

**UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS 9**

Multi Resolution Analysis – Image Pyramids – Multi resolution expansion – Wavelet Transforms – Image Compression – Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

**UNIT V APPLICATIONS OF IMAGE PROCESSING 9**

Image Classification – Image Recognition – Image Understanding – Video Motion Analysis – Image Fusion – Steganography – Digital Compositing – Mosaics – Colour Image Processing.

**TOTAL: 45****REFERENCES:**

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” 2<sup>nd</sup> Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, 2<sup>nd</sup> Edition, Thomson Learning, 2001.
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
4. Ron Patton, Software testing, 2<sup>nd</sup> Edition, Pearson education, 2007.
5. Alan C Gillies, “Software Quality Theory and Management”, Cengage Learning, 2<sup>nd</sup> Edition, 2003.

<b>MCS018</b>	<b>INFORMATION RETRIEVAL TECHNIQUES</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To introduce the various information retrieval models.
2. To know about pattern matching.
3. To study the Query languages and data models.

**UNIT I INTRODUCTION 9**

Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation – Word Sense Disambiguation.

**UNIT II QUERYING 9**

Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages.

**UNIT III TEXT OPERATIONS AND USER INTERFACE 9**

Document Preprocessing – Clustering – Text Compression – Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points – Query Specification – Context – User relevance Judgment – Interface for Search.

**UNIT IV MULTIMEDIA INFORMATION RETRIEVAL 9**

Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction.

**UNIT V APPLICATIONS 9**

Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards.

**TOTAL: 45****REFERENCES:**

1. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education Asia, 2005.
2. G.G. Chowdhury, “Introduction to Modern Information Retrieval”, Neal - Schuman Publishers, 2<sup>nd</sup> Edition, 2003.
3. Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Pearson Education, 2000.
4. David A. Grossman, Ophir Frieder, “Information Retrieval: Algorithms, and Heuristics”, Academic Press, 2000
5. Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, “Text Information Retrieval Systems”, Academic Press, 2000.



**MCS020 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS** L T P C  
3 0 0 3

**Objectives:**

1. To study the queuing models.
2. To know the mobile networks.
3. To study the performance evaluation methods.

**UNIT I** **9**

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

**UNIT II** **9**

Random variables – Stochastic process –Link Delay components – Queuing Models – Little’s Theorem – Birth and Death process – Queuing Disciplines.

**UNIT III** **9**

Markovian FIFO Queuing Systems – M/M/1 – M/M/a – M/M/∞ – M/G/1 – M/M/m/m and other Markov – Non-Markovian and self similar models – Network of Queues –Burke’s Theorem – Jackson’s Theorem.

**UNIT IV** **9**

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

**UNIT V** **9**

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

**TOTAL : 45****TEXT BOOKS:**

1. James D.McCabe, “Network Analysis, Architecture and Design”, 2<sup>nd</sup> Edition, Elsevier, 2003.
2. Bertsekas and Gallager , “Data Networks”, 2<sup>nd</sup> Edition, Pearson Education, 2003
3. Sheldon Ross, “Introduction to Probability Models”, 8th edition, Academic Press, New York, 2003

**REFERENCES:**

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









<b>MCS024</b>	<b>COMPONENT BASED TECHNOLOGY</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**Objectives:**

1. To introduce the various software components and their fundamental properties.
2. To know the java component technologies.
3. To study the CORBA technologies.
4. To understand the component frame works and the development.

**UNIT I INTRODUCTION 9**

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

**UNIT II JAVA COMPONENT TECHNOLOGIES 9**

Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI and RMI-IIOP.

**UNIT III CORBA TECHNOLOGIES 9**

Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture.

**UNIT IV COM AND .NET TECHNOLOGIES 9**

COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components – assemblies – appdomains – contexts – reflection – remoting.

**UNIT V COMPONENT FRAMEWORKS AND DEVELOPMENT 9**

Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools – assembly tools.

**TOTAL : 45****TEXT BOOK:**

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

**REFERENCE:**

1. Ed Roman, “Enterprise Java Beans”, 3<sup>rd</sup> Edition, Wiley, 2004.

**MCE001      COMMUNICATION NETWORK SECURITY**L T P C  
3 0 0 3**Objectives:**

1. To know about Various Networks problem
2. To study the Network Security
3. To understand the how to protect the data in Network

**UNIT I      INTRODUCTION ON SECURITY      9**

Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality - attacks on Integrity and availability - Security services and mechanisms - Techniques Cryptography – Steganography - Revision on Mathematics for Cryptography.

**UNIT II      SYMMETRIC & ASYMMETRIC KEY ALGORITHMS      9**

Substitutional Ciphers - Transposition Ciphers - Stream and Block Ciphers - Data Encryption Standards (DES) - Advanced Encryption Standard (AES) - RC4 - principle of asymmetric key algorithms - RSA Cryptosystem

**UNIT III      INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT      9**

Message Integrity, Hash functions – SHA - Digital signatures - Digital signature standards Authentication - Entity Authentication – Biometrics - Key management Techniques.

**UNIT IV      NETWORK SECURITY, FIREWALLS AND WEB SECURITY      9**

Introduction on Firewalls - Types of Firewalls - Firewall Configuration and Limitation of Firewall - IP Security Overview - IP security Architecture - authentication Header - Security payload - security associations - Key Management - Web security requirement - secure sockets layer - transport layer security - secure electronic transaction - dual signature

**UNIT V      WIRELESS NETWORK SECURITY      9**

Security Attack issues specific to Wireless systems: Worm hole - Tunneling, DoS - WEP for Wi-Fi network - Security for 4G networks - Secure Adhoc Network - Secure Sensor Network.

**TOTAL: 45****REFERENCES:**

1. Behrouz A. Fourcuzan, “Cryptography and Network security”, Tata McGraw Hill, 2008
2. William Stallings, "Cryptography and Network Security", 3<sup>rd</sup> Edition, Pearson Education, New Delhi, 2003
3. Tom Karygiannis, Les Owens, "Wireless Network Security 802.11, Bluetooth and Handheld Devices", National Institute of Standards and Technology, US Dept. of Commerce Special Publication 800-48, 2002
4. B.A. Forouzan, "Cryptography and Network Security", Tata McGraw Hill, 2007
5. Eric Cole “Network Security Bible”, 2<sup>nd</sup> Edition, Wiley, 2009
6. Mark D. Ciampa, “Security+ Guide to Network Security Fundamentals”, 2008.
7. William Stallings “Network Security Essentials: Applications and Standards”, 4<sup>th</sup> Edition, Course Technology, 2010.
8. Stuart McClure, Joel Scambray and George Kurtz “Hacking Exposed: Network Security Secrets and Solutions”, 6<sup>th</sup> Edition, McGraw Hill, 2009.
9. Chris McNab, “Network Security Assessment: Know Your Network”, 2<sup>nd</sup> Edition, O'Reilly Media, 2007

10. Fahim Hussain Yusuf Bhaiji “Network Security Technologies and Solutions” CCIE Professional Development Series, 2008.

<b>MCE010</b>	<b>EMBEDDED SYSTEMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**UNIT I EMBEDDED SYSTEM BASICS 9**  
 Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process, Overview of embedded system development-embedded system IDE- ARM Family-Core Types,-Memory Mapping-and ARM Based embedded development system.

**UNIT II ARM ARCHITECTURE 9**  
 Organization of CPU – Bus architecture –Memory management unit: virtual memory to physical memory address translation, TLB, Domains and memory access permission ,cache and write buffer ,single stage and two stage cache accessing ,significance of co-processor 15 Fast Context Switch Extension.

**UNIT III EMBEDDED PROGRAMMING AND COMPUTING PLATFORM 9**  
 Basic Embedded system Development Tools-Embest embedded IDE for ARM-Embest, Study of S3C3V40 based University Teaching Kit and Unet ICE JTAG emulator.-Embedded software development based on ARM including: ARM basic instruction set, Thumb instruction set-assembly programming- ARM processor mode switching-embedded C programming- C and assembly language mix programming.

**UNIT IV ARM BASIC PERIPHERAL INTERFACING 9**  
 I/O interface concepts-interrupts-types of interrupts-ARM interrupts-serial communication real-time clock and simple digital LED interface - LCD display interfacing- GLCD display interfacing – TFT display interfacing -the keyboard interfacing-the touch screen interfacing.

**UNIT V ARM COMMUNICATION INTERFACING 9**  
 Synchronous and asynchronous data transfer- UART based communication-I2C Protocol basics - serial communication using I2C bus: RTC Interfacing, EEPROM data transfer Ethernet communication – I2S voice bus interface communication.

**TOTAL: 45**

**REFERENCES:**

1. “ARM Architecture Reference Manual”, 2011, ARM Ltd.
2. “The ARM-Thumb Procedure Call Standard”, 2011 ARM Ltd.
3. Steve Furber, “ARM Shystem-on-Chip Architecture”, 2<sup>nd</sup> Edition, Addison-Wesley, 2000.
4. Todd D. Morton, “Embedded Microcontrollers”, Prentice Hall, 2001.
5. “Embest ARM Teaching System User Manual”, Embest Info & Tech, Ltd, Version2.01.
6. Embedded System Development and Labs for ARM, (Edited, revised and updated by Radu Muresan).

**MCC007****ADHOC NETWORKS**L T P C  
3 0 0 3**Objective:**

1. To learn about the MAC address spoofing concepts and basics of networks
2. To learn about the routing principles and Adhoc network types.
3. To learn about the IEEE standards, MESH networks and its heterogeneous models.

**UNIT I ADHOC MAC****9**

Introduction – Issues in Adhoc Wireless Networks. MAC Protocols – Issues, Classifications of MAC protocols, Multi channel MAC and Power control MAC protocol.

**UNIT II ADHOC NETWORK ROUTING AND TCP****9**

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

**UNIT III WSN – MAC****9**

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

**UNIT IV WSN ROUTING, LOCALIZATION AND QoS****9**

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

**UNIT V MESH NETWORKS****9**

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

**TOTAL: 45****REFERENCES:**

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