

**UNIVERSITY DEPARTMENTS**  
**ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025**  
**REGULATIONS - 2009**  
**CURRICULUM I TO IV SEMESTERS (FULL TIME)**  
**M.TECH. INFORMATION TECHNOLOGY**  
**SEMESTER I (5+1)**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MA9110	<a href="#">Operations Research</a>	3	1	0	4
2	IT9112	<a href="#">Data Structures and Algorithm Design</a>	3	0	0	3
3	CP9113	<a href="#">Advanced Computer Architecture</a>	3	0	0	3
4	MM9112	<a href="#">Multimedia Communication and Networks</a>	3	0	0	3
5	IT9111	<a href="#">Software Engineering Methodologies</a>	3	0	0	3
<b>PRACTICAL</b>						
6	IT9115	<a href="#">Data Structures Laboratory</a>	0	0	3	2
<b>TOTAL</b>			<b>15</b>	<b>1</b>	<b>3</b>	<b>18</b>

**SEMESTER II (6+1)**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	IT9121	<a href="#">Object Oriented Analysis and Design</a>	3	0	0	3
2	IT9122	<a href="#">Applied Cryptography</a>	3	0	0	3
3	CP9121	<a href="#">UNIX Internals</a>	3	0	0	3
4	IT9123	<a href="#">Advances in Databases</a>	3	0	0	3
5	SW9121	<a href="#">Software Quality Assurance</a>	3	0	0	3
6	E1	Elective – I	3	0	0	3

PRACTICAL						
SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
7	IT9127	<a href="#">Unix Programming Laboratory</a>	0	0	3	2
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>3</b>	<b>20</b>

### SEMESTER III (3+1)

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	IT9131	<a href="#">Grid Computing</a>	3	0	0	3
2	E2	Elective - II	3	0	0	3
3	E3	Elective - III	3	0	0	3
<b>PRACTICAL</b>						
4	IT9135	Project Phase - I	0	0	12	6
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

### SEMESTER IV (0+1)

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>PRACTICAL</b>						
1	IT9141	Project Phase - II	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**Total No of Credits** : **65**  
**No of Theory courses** : **14**  
**No of Lab Courses** : **04**

**UNIVERSITY DEPARTMENTS**  
**ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025**  
**REGULATIONS - 2009**  
**CURRICULUM I TO VI SEMESTERS (PART TIME)**  
**M.TECH. INFORMATION TECHNOLOGY**

**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	MA9110	Operations Research	3	1	0	4
2	IT9112	Data Structures and Algorithm Design	3	0	0	3
3	CP9113	Advanced Computer Architecture	3	0	0	3
<b>TOTAL</b>			<b>9</b>	<b>1</b>	<b>0</b>	<b>10</b>

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	CP9121	Unix Internals	3	0	0	3
2	IT9123	Advances in Databases	3	0	0	3
3	E1	Elective I	3	0	0	3
<b>PRACTICAL</b>						
4	IT9127	Unix Programming Laboratory II	0	0	3	2
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>3</b>	<b>11</b>

**SEMESTER III**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	IT9111	Software Engineering Methodologies	3	0	0	3
2	MM9112	Multimedia Communication and Networks	3	0	0	3
<b>PRACTICAL</b>						
3	IT9115	Data Structures Laboratory	0	0	3	2
<b>TOTAL</b>			<b>6</b>	<b>0</b>	<b>3</b>	<b>8</b>

#### SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	IT9121	Object Oriented Analysis and Design	3	0	0	3
2	IT9122	Applied Cryptography	3	0	0	3
3	SW9121	Software Quality Assurance	3	0	0	3
<b>TOTAL</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>

#### SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	IT9131	Grid Computing	3	0	0	3
2	E2	Elective II	3	0	0	3
3	E3	Elective III	3	0	0	3
<b>PRACTICAL</b>						
4	IT9135	Project Work (phase I)	0	0	12	6

<b>TOTAL</b>	<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>
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**SEMESTER VI**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>PRACTICAL</b>						
1	IT9141	Project Work (Phase II)	0	0	24	12
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**List of Electives**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	IT9151	<a href="#">Advanced Digital Signal Processing</a>	3	0	0	3
2	CP9168	<a href="#">Adhoc and Sensor Networks</a>	3	0	0	3
3	IT9152	<a href="#">Enterprise Resource Planning</a>	3	0	0	3
4	IT9153	<a href="#">Software Reliability Metrics</a>	3	0	0	3
5	IT9154	<a href="#">Scientific Computing</a>	3	0	0	3
6	IT9155	<a href="#">Ontology and Semantic Web</a>	3	0	0	3
7	CP9158	<a href="#">Bioinformatics</a>	3	0	0	3
8	CP9159	<a href="#">Soft Computing</a>	3	0	0	3
9	CP9163	<a href="#">Embedded Systems</a>	3	0	0	3
10	CP9164	<a href="#">Data Warehousing and Data Mining</a>	3	0	0	3
11	SW9155	<a href="#">Supply Chain Management</a>	3	0	0	3
12	CP9165	<a href="#">Integrated Software Project Management</a>	3	0	0	3
13	CP9167	<a href="#">Digital Image Processing</a>	3	0	0	3
14	IT9156	<a href="#">Multicore Programming</a>	3	0	0	3
15	CP9172	<a href="#">Cloud Computing</a>	3	0	0	3
16	CP9169	<a href="#">Virtualization Techniques</a>	3	0	0	3
17	CP9170	<a href="#">Service Oriented Architecture</a>	3	0	0	3
18	IT9158	<a href="#">Information Retrieval Techniques</a>	3	0	0	3

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
19	CP9125	<a href="#">Mobile and Pervasive Computing</a>	3	0	0	3
20	CP9176	<a href="#">Human Resources Management</a>	3	0	0	3
21	CP9177	<a href="#">Multicore Architecture</a>	3	0	0	3
22	IT9160	<a href="#">Natural Language Processing</a>	3	0	0	3
23	SW9160	<a href="#">XML and WEB services</a>	3	0	0	3
	IT9161	<a href="#">Artificial Intelligence</a>	3	0	0	3

**MA9110**

**OPERATIONS RESEARCH**

**L T P C**

**3 1 0 4**

**UNIT I            QUEUEING MODELS**

**9**

Poisson Process – Markovian Queues – Single and Multi-server Models – Little's formula – Machine Interference Model – Steady State analysis – Self Service Queue.

**UNIT II            ADVANCED QUEUEING MODELS**

**9**

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

**UNIT III           SIMULATION**

**9**

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

**UNIT IV           LINEAR PROGRAMMING**

**9**

Formulation – Graphical solution – Simplex method – Two phase method Transportation and Assignment Problems.

**UNIT V            NON-LINEAR PROGRAMMING**

**9**

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

**L + T: 45+15 =60**

## TEXT BOOKS

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

## REFERENCES

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

## IT9112 DATA STRUCTURES AND ALGORITHM DESIGN

3 0 0 3

<b>1. Fundamentals</b>	<b>9</b>
Mathematical Induction - Asymptotic Notations – Properties of Big-oh Notation – Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – NP-Completeness – NP-Hard – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoff.	
<b>2. Data Structures</b>	<b>9</b>
Min/Max heaps – Leftist Heaps – Skew Heaps – AVL Trees – Red-Black Trees – B-Trees – Splay Trees – Tries.	
<b>3. Algorithm Design: I</b>	<b>9</b>
Divide and Conquer strategy – Selection of k-th Smallest Elements – Convex Hull – Strassen’s Matrix Multiplication – Greedy Approach – Container Loading – Tree Vertex Splitting – Optimal Merge Patterns.	
<b>4. Algorithm Design: II</b>	<b>9</b>
Dynamic Programming Approach – Principle of Optimality – String Editing – Flow Shop Scheduling – Connected Components – Bi-Connected Components Graph Coloring using Backtracking Technique – Branch and Bound Methodology.	
<b>5. Approximation Algorithms</b>	<b>9</b>
Planar Graph Coloring – Maximum Program Stored Problem – Bin Packing – Scheduling Independent Tasks – 0/1 Knapsack – Rounding – Interval Partitioning.	

**TOTAL = 45**

**References:**

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2007.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Printice –Hall, 1988.

**CP9113      ADVANCED COMPUTER ARCHITECTURE**

**L T P C**

**3 0 0 3**

**UNIT I      PIPELINING AND ILP      9**

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

**UNIT II      ADVANCED TECHNIQUES FOR EXPLOITING ILP      9**

Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation - Multithreading: Using ILP Support to Exploit Thread-level Parallelism - Performance and Efficiency in Advanced Multiple Issue Processors - Case Studies.

**UNIT III      MULTIPROCESSORS      9**

Symmetric and distributed shared memory architectures – Cache coherence issues - Performance Issues – Synchronization issues – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.

**UNIT IV      MULTI-CORE ARCHITECTURES      9**

Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- hp architecture.

**UNIT V      MEMORY HIERARCHY DESIGN      9**

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

**TOTAL - 45**

**REFERENCES**



## REFERENCES

1. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
2. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
3. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2<sup>nd</sup> Edition, Pearson Education, 2002.
4. Kurose and Ross, 'Computer Networks : A top down Approach', Pearson Education, 2002
5. Nalin K Sharda, 'Multimedia Information Networking', Prentice Hall of India, 1999
6. Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, 'Multimedia Wireless Networks: Technologies, Standards and QoS', Prentice Hall, 2003.
7. Ellen Kayata Wesel, 'Wireless Multimedia Communications: Networking Video, Voice and Data', Addison Wesley, 1998

## IT9111 SOFTWARE ENGINEERING METHODOLOGIES

**L T P C**

**3 0 0 3**

### UNIT I SOFTWARE LIFE CYCLE

**12**

Scope of Software Engineering – Historical, Economic and Maintenance Aspects – Software Process – Software Life Cycle Models – Tools.

### UNIT II TESTING

**7**

Quality – Non-Execution based Testing – Execution based Testing – Testing versus Correctness Proofs – Testing Distributed and Real Time Software

### UNIT III OBJECT ORIENTATION

**7**

Modules – Objects – Reusability – Portability and Interoperability – Planning and Estimation

### UNIT IV ANALYSIS AND DESIGN

**11**

Requirements Phase – Specification Phase – Object Oriented Analysis Phase – Design Phase.

### UNIT V IMPLEMENTATION AND INTEGRATION

**8**

Implementation Phase – Integration Phase – Maintenance Phase

**TOTAL = 45**

## TEXT BOOKS

1. Stephen R Schach, "Classical and Object-Oriented Software Engineering – With UML and C++", McGraw Hill, New Delhi, 2002.
2. Ivar Jacobson, "Object Oriented Software Engineering", Pearson Education, 1992

## **REFERENCES**

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, Fifth Edition , 2001.
2. Ian Sommerville, Software engineering, Pearson education Asia, Sixth edition, 2000.
3. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and Witold Pedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.

## **IT9115 DATA STRUCTURES LABORATORY**

**L T P C**  
**0 0 3 2**

1. Min/Max Heaps (Insertion, Deletion/Delete Max)
2. Binary Search Trees (Insertion, Deletion and Search)
3. AVL Trees (Insertion, Deletion and Search)
4. B-Trees (Insertion, Deletion and Search)
5. Finding Spanning Trees
6. Finding connected components of a graph
7. Knapsack problem
8. Graph coloring
9. Depth-first and Breadth-first searches

**IT9121 OBJECT ORIENTED ANALYSIS AND DESIGN**

**L T P C  
3 0 0 3**

**UNIT I 10**

Introduction to System Concepts - Managing Complex Software — Properties – Object Oriented Systems Development – Object Basics – Systems Development Life Cycle - Rumbaugh Methodology - Booch Methodology - Jacobson Methodology – Unified Process

**UNIT II 8**

Unified Approach – Unified Modeling Language – Static behavior diagrams – Dynamic behavior diagrams – Object Constraint Language

**UNIT III 9**

Inception – Evolutionary Requirements – Domain Models – Operation Contracts - Requirements to Design – Design Axioms – Logical Architecture - Designing Objects with Responsibilities – Object Design – Designing for Visibility

**UNIT IV 9**

Patterns – Analysis and Design patterns – GoF Patterns - Mapping designs to code – Test Driven development and refactoring – UML Tools and UML as blueprint

**UNIT V 9**

More Patterns – Applying design patterns – Architectural Analysis – Logical Architecture Refinement – Package Design – Persistence framework with patterns

**REFERENCES**

1. Craig Larman. “Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development”, 3rd ed, Pearson Education, 2005.
2. Fowler, Martin. UML Distilled. 3<sup>rd</sup> ed. Pearson Education. 2004.
3. Michael Blaha and James Rumbaugh, “Object-oriented modeling and design with UML”, Prentice-Hall of India, 2005.
4. Booch, Grady. Object Oriented Analysis and Design. 2<sup>nd</sup> ed. Pearson Education. 2000.
5. Ali Bahrami, “ Object Oriented Systems Development”, Tata McGrawHill, 1999.

**UNIT I** 9  
Classical Cryptography-The Shift Cipher,The Substitution Cipher,The Affine Cipher  
Cryptanalysis-Cryptanalysis of the Affine Cipher,Cryptanalysis of the Substitution  
Cipher,Cryptanalysis of the Vigenere Cipher,Shannon’s Theory.

**UNIT II** 9  
Block Cipher and the Advanced Encryption Standard-Substitution -Permutation  
Networks, Linear Cryptanalysis, Differential Cryptoanalysis , The Data Encryption  
Standard, The Advanced Encryption Standard, Modes of Operation ,Cryptography Hash  
Function- Hash Function and Data Integrity,Security of Hash Function ,Iterated  
Hash Functions, Message Authentication Codes.

**UNIT III** 9  
The RSA Cryptosystem and Factorin Integer- Intoduction to Public –key  
Cryptography, Number theory,The RSA Cryptosystem ,Other Attacks on RSA,The  
ELGamal Cryptosystem,Shanks’ Algorithm,Finint Fields,Elliptic Curves over the Reals,  
Elliptical Curves Modulo a Prime,Signature Scheme –Digital Signature Algorithm.

**UNIT IV** 9  
Identification Scheme and Entity Attenuation-Challenge – and – Response in the  
Secret-key Setting,Challenge – and – Response in the Public key Setting,The Schnorr  
Identificataon Scheme,Key distribution-Diffie-Hellman Key,  
Predistribution,Unconditionally Secure key Predistribution,Key Agreement Scheme-  
Diffie-Hellman Key agreement,Public key infrastructure-PKI,Certificates,Trust Models.

**UNIT V** 9  
Secret Sharing Schemes-The Shamir Threshold Scheme,Access Structure and General  
Scret key sharing,Informataion Rate and Construction of Effcient Schemes,Multicast  
Security and Copyright production-Multicast Security,Braodcast Encryption ,Multicast  
Re-keying,Copyright Protection ,Tracing Illegally Redistribution keys.

**TOTAL : 45**

**TEXT BOOK**

Douglas R. Stinson ,“Cryptography Theory and Practice ”, Third Edition, Chapman &  
Hall/CRC,2006

**REFERENCES**

1. Menges A. J , Oorschot P, Vanstone S.A,“Handbollk of Appliled Cryptography”  
CRC Press,1997.
2. William Stallings, “Cryptography and Network Security: Principles and Practices”,  
Third Edition, Pearson Education,2006.
3. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education,  
First Edition, 2006.
4. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth  
Edition, Pearson Education, 2007.

5. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007.

**CP9121 UNIX INTERNALS**

**L T P C  
3 0 0 3**

**UNIT I OVERVIEW 8**

General Overview of the System : History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel : Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

**UNIT II FILE SUBSYSTEM 8**

Internal representation of files: Inodes – Structure of a regular file – Directories – Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks.

**UNIT III SYSTEM CALLS FOR THE FILE SYSTEM 10**

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink.

**UNIT IV PROCESSES 10**

Process states and transitions – Layout of system memory – The context of a process – Saving the context of a process – Manipulation of the process address space - Sleep. Process Control : Process creation – Signals – Process termination – Awaiting process termination – Invoking other programs – user id of a process – Changing the size of a process - Shell – System boot and the INIT process– Process Scheduling.

**UNIT V MEMORY MANAGEMENT AND I/O 9**

Memory Management Policies : Swapping – Demand paging. The I/O Subsystem : Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.

**TOTAL = 45**

**TEXT BOOKS**

1. Maurice J. Bach, "The Design of the Unix Operating System", First Edition, Pearson Education, 1999.

**REFERENCES**



1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.

**SW9121 SOFTWARE QUALITY ASSURANCE**

**L T P C  
3 0 0 3**

<b>UNIT I</b>	<b>9</b>
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	
<b>UNIT II</b>	<b>9</b>
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	
<b>UNIT III</b>	<b>9</b>
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	
<b>UNIT IV</b>	<b>9</b>
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.	
<b>UNIT V</b>	<b>9</b>
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 Gopalaswamy Ramesh, Software testing – principles and practices , Pearson education, 2006
4. Ron Patton, Software testing , second edition, Pearson education, 2007
5. Alan C Gillies, “Software Quality Theory and Management”, Cengage Learning, Second edition, 2003

**IT9127            UNIX PROGRAMMING LABORATORY**

**L T P C  
0 0 3 2**

1. Use of Unix/Linux – User Commands – Editors - Shell programming
2. C/C++ programming on Unix/Linux – use of make, version control
3. Use of system calls – files – processes – I/O – IPC
4. Experiments using C of mini unix systems (such as Minix) – File system – Processes – Memory Management – Drivers
5. Unix / Linux sources – build, run kernel – small modifications

<b>UNIT I</b>	<b>CONCEPTS AND ARCHITECTURE</b>	<b>9</b>
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid- Web and Grid Services-Grid Standards - OGSA- WSRF - Trends, Challenges and applications.		
<b>UNIT II</b>	<b>GRID MONITORING</b>	<b>9</b>
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- R-GMA - GridICE – MDS- Service Level Agreements (SLAs) - Other Monitoring Systems- Ganglia, GridMon, Hawkeye and Network Weather Service.		
<b>UNIT III</b>	<b>GRID SECURITY AND RESOURCE MANAGEMENT</b>	<b>9</b>
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management, Gridway and Gridbus Broker-principles of Local Schedulers- Overview of Condor, SGE, PBS, LSF-Grid Scheduling with QoS.		
<b>UNIT IV</b>	<b>DATA MANAGEMENT AND GRID PORTALS</b>	<b>9</b>
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-Generations of Grid Portals.		
<b>UNIT V</b>	<b>GRID MIDDLEWARE</b>	<b>9</b>
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features. Features of Next generation grid.		

**TOTAL : 45**

**REFERENCES**

1. Ian Foster, Carl Kesselman, The Grid 2: Blueprint for a New Computing Infrastructure, Elsevier Series, 2004.
2. Vladimir Silva, Grid Computing for Developers, Charles River Media, January 2006.
3. Parvin Asadzadeh, Rajkumar Buyya, Chun Ling Kei, Deepa Nayar, and Srikumar Venugopal, Global Grids and Software Toolkits: A Study of Four Grid Middleware Technologies, High Performance Computing: Paradigm and Infrastructure, Laurence Yang and Minyi Guo (editors), Wiley Press, New Jersey, USA, June 2005.
4. Jarek Nabrzyski, Jennifer M. Schopf, Jan Weglarz, Grid Resource Management: State of the Art and Future Trends , (International Series in Operations Research & Management Science), Springer; First edition, 2003
5. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and Rajkumar Buyya,
6. Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience, Wiley Press, New York, USA, 2008.
7. Fran Berman , Geoffrey Fox, Anthony J.G. Hey, Grid Computing: Making The Global Infrastructure a Reality,Wiley, 2003
8. Maozhen Li , Mark Baker , The Grid: Core Technologies, Wiley, 2005
9. Joshy Joseph , Craig Fellenstein Grid Computing, IBM Press, 2004



**CP9168 AD-HOC AND SENSOR NETWORKS**

**L T P C  
3 0 0 3**

**UNIT I AD-HOC MAC**

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

**UNIT II AD-HOC NETWORK ROUTING & TCP**

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

**UNIT III WSN -MAC**

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

**UNIT IV WSN ROUTING, LOCALIZATION & QOS**

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

**UNIT V MESH NETWORKS**

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

**REFERENCES**

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

**IT9152 ENTERPRISE RESOURCE PLANNING**

**L T P C  
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**UNIT I INTRODUCTION TO ERP**

**9**

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On-line Analytical Processing – Supply Chain Management.

**UNIT II ERP IMPLEMENTATION 9**

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

**UNIT III BUSINESS MODULES 9**

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintenance – Materials Management – Quality Management – Sales and Distribution.

**UNIT IV ERP MARKET 9**

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

**UNIT V ERP – PRESENT AND FUTURE 9**

Turbo Charge the ERP System – EIA – ERP and E-Commerce – ERP and Internet – Future Directions in ERP.

**TOTAL = 45**

**REFERENCES:**

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning", Thomson Learning, 2001.
3. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning – concepts and Planning", Prentice Hall, 1998.
4. Jose Antonio Fernandez, " The SAP R /3 Hand book", Tata McGraw Hill

**IT9153 SOFTWARE RELIABILITY AND METRICS**

**L T P C  
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**UNIT I INTRODUCTION TO SOFTWARE RELIABILITY 7**

Basic Concepts – Failure and Faults – Environment – Availability –Modeling –uses.

**UNIT II SOFTWARE RELIABILITY MODELING 12**

Concepts – General Model Characteristic – Historical Development of models – Model Classification scheme – Markovian models – General concepts – General Poisson Type Models – Binomial Type Models – Poisson Type models – Fault reduction factor for Poisson Type models.

**UNIT III            COMPARISON OF SOFTWARE RELIABILITY MODELS            10**

Comparison Criteria – Failure Data – Comparison of Predictive Validity of Model Groups – Recommended Models – Comparison of Time Domains – Calendar Time Modeling – Limiting Resource Concept – Resource Usage model – Resource Utilization – Calendar Time Estimation and confidence Intervals.

**UNIT IV            FUNDAMENTALS OF MEASUREMENT            8**

Measurements in Software Engineering – Scope of Software metrics – Measurements theory – Goal based Framework – Software Measurement Validation.

**UNIT V            PRODUCT METRICS            8**

Measurement of Internet Product Attributes – Size and Structure – External Product Attributes – Measurement of Quality –Reliability Growth Model – Model Evaluation

**TOTAL = 45**

**REFERENCES**

1. John D. Musa, Anthony Iannino, Kazuhira Okumoto, "Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and Technology", McGraw Hill, 1987.
2. John D. Musa, "Software Reliability Engineering", Tata McGraw Hill, 1999.
3. Norman E . Fenton, Shari Lawrence Pfleeger, "Software metrics", Second Edition, International Student Edition, 2003.

**IT9154            SCIENTIFIC COMPUTING**

**L T P C  
3 0 0 3**

**UNIT I            INTRODUCTION TO SYSTEM MODELING            10**

.Modeling and General Systems Theory-Concepts of Simulation-Types of Simulation-Experimental Design Consideration- Comparison and Selection of Simulation Languages-Development of Simulation Models Using any one of the Languages for



<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>8</b>
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.		
<b>UNIT II</b>	<b>LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES</b>	<b>12</b>
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		
<b>UNIT III</b>	<b>ONTOLOGY LEARNING FOR SEMANTIC WEB</b>	<b>12</b>
Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms - Evaluation		
<b>UNIT IV</b>	<b>ONTOLOGY MANAGEMENT AND TOOLS</b>	<b>8</b>
Overview – need for management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. volution – Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.		
<b>UNIT V</b>	<b>APPLICATIONS</b>	<b>5</b>
Web Services – Semantic Web Services - Case Study for specific domain – Security issues – current trends.		
		<b>TOTAL = 45</b>

**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, Jul 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

- Dean Allemang (Author), James Hendler (Author) "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL" (Paperback), Morgan Kaufmann, 2008

**CP9158 BIO INFORMATICS**

**L T P C  
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**UNIT I INTRODUCTORY CONCEPTS**

**9**

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

**UNIT II SEARCH ENGINES AND DATA VISUALIZATION**

**9**

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

**UNIT III STATISTICS AND DATA MINING**

**9**

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

**UNIT IV PATTERN MATCHING**

**9**

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

**UNIT V MODELING AND SIMULATION**

**9**

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

**TOTAL = 45**

**REFERENCES**

- Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.



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.

**IT9160 NATURAL LANGUAGE PROCESSING**

**L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Natural Language Processing – Linguistic Background- Spoken language input and output Technologies – Written language Input - Mathematical Methods - Statistical Modeling and Classification Finite State methods Grammar for Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

**UNIT II INFORMATION RETRIEVAL 9**

Information Retrieval architecture - Indexing- Storage – Compression Techniques – Retrieval Approaches – Evaluation - Search engines- commercial search engine features- comparison- performance measures – Document Processing - NLP based Information Retrieval – Information Extraction.

**UNIT III TEXT MINING 9**

Categorization – Extraction based Categorization- Clustering- Hierarchical Clustering- Document Classification and routing- finding and organizing answers from Text search – use of categories and clusters for organising retrieval results – Text Categorization and efficient Summarization using Lexical Chains – Pattern Extraction.

**UNIT IV GENERIC ISSUES 9**

Multilinguality – Multilingual Information Retrieval and Speech processing - Multimodality – Text and Images – Modality Integration - Transmission and Storage – Speech coding- Evaluation of systems – Human Factors and user Acceptability.

**UNIT V APPLICATIONS 9**

Machine Translation – Transfer Metaphor - Interlingua and Statistical Approaches - Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.

**TOTAL = 45**

**TEXT BOOKS**

1. Daniel Jurafsky and James H. martin, " Speech and Language Processing" , 2000.
2. Ron Cole, J.Mariani, et.al "Survey of the State of the Art in Human Language Technology", Cambridge University Press, 1997.
3. Michael W. Berry " Survey of Text Mining: Culstering, Classification and Retrieval", Springer Verlag, 2003.
4. Christopher D.Manning and Hinrich Schutze, " Foundations of Statistical Natural Language Processing ", MIT Press, 1999.

## REFERENCES

1. James Allen “ Natural Language Understanding “, Benjamin/ Cummings Publishing Co. 1995.
2. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
3. Tomek Strzalkowski “ Natural Language Information Retrieval “, Kluwer academic Publishers, 1999.
4. Christopher D.Manning and Hinrich Schutze, “ Foundations of Statistical Natural Language Processing “, MIT Press, 1999.

## CP9163 EMBEDDED SYSTEMS

L T P C  
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### UNIT I EMBEDDED COMPUTING 9

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

### UNIT II EMBEDDED C PROGRAMMING 9

C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

### UNIT III OPTIMIZING ASSEMBLY CODE 9

Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

### UNIT IV PROCESSES AND OPERATING SYSTEMS 9

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling - Performance issues.

### UNIT V EMBEDDED SYSTEM DEVELOPMENT 9

Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Complete design of example embedded systems.

**TOTAL = 45**

## REFERENCES

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

**CP9164 DATA WAREHOUSING AND DATA MINING**

**L T P C  
3 0 0 3**

**UNIT I**

**9**

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

**UNIT II**

**9**

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

**UNIT III**

**9**

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

**UNIT IV**

**9**

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

**UNIT V**

**9**

Mining Object, Spatial, Multimedia, Text and Web Data:

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

**Total = 45**

**REFERENCES**

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and

- Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
  6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

## **SW9155 SUPPLY CHAIN MANAGEMENT**

**L T P C**  
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### **UNIT I FUNDAMENTALS OF SUPPLY CHAIN MANAGEMENT**

Supply chain networks, Integrated supply chain planning, Decision phases in a supply chain, process view of a supply chain, supply chain flows, Overview of supply chain models and modeling systems, Supply chain planning: Strategic, operational and tactical, Understanding supply chain through process mapping and process flow chart.

### **UNIT II SCM STRATEGIES, PERFORMANCE**

Supply chain strategies, achieving strategic fit, value chain, Supply chain drivers and obstacles, Strategic Alliances and Outsourcing, purchasing aspects of supply chain, Supply chain performance measurement: The balanced score card approach, Performance Metrics. Planning demand and supply: Demand forecasting in supply chain, Aggregate planning in supply chain, Predictable variability.

### **UNIT III PLANNING AND MANAGING INVENTORIES**

Introduction to Supply Chain Inventory Management. Inventory theory models: Economic Order Quantity Models, Reorder Point Models and Multiechelon Inventory Systems, Relevant deterministic and stochastic inventory models and Vendor managed inventory models.

### **UNIT IV DISTRIBUTION MANAGEMENT**

Role of transportation in a supply chain - direct shipment, warehousing, cross-docking; push vs. pull systems; transportation decisions (mode selection, fleet size), market channel structure, vehicle routing problem. Facilities decisions in a supply chain. Mathematical foundations of distribution management, Supply chain facility layout and capacity planning,

### **UNIT V STRATEGIC COST MANAGEMENT IN SUPPLY CHAIN**

The financial impacts, Volume leveraging and cross docking, global logistics and material positioning, global supplier development, target pricing, cost management enablers, Measuring service levels in supply chains, Customer Satisfaction/Value/Profitability/Differential Advantage.

## **REFERENCES**

1. David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies, Second Edition, , McGraw-Hill/Irwin, New York, 2003.



4. Grant, J.L. "Foundations of Economic Value Added", John Wiley & Sons, 1997.
5. Kaplan, R.S., Norton, D.P. "The Balanced Scorecard: Translating Strategy into Action", Harvard Business School Press, 1996.
6. Boehm, B. W. "Software Risk Management: Principles and Practices" in IEEE Software, January 1991, pp32-41.
7. Fenton, N.E., and Pfleeger, S.L.. "Software Metrics: A Rigorous and Practical Approach, Revised" Brooks Cole, 1998.
8. Demarco, T. and Lister, T. "Peopleware: Productive Projects and Teams, 2nd Ed.", Dorset House, 1999.

**CP9167          DIGITAL IMAGE PROCESSING**

**L T P C  
3 0 0 3**

**UNIT I          FUNDAMENTALS OF IMAGE PROCESSING          9**

Introduction – Elements of visual perception, Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats. Introduction to the Mathematical tools.

**UNIT II          IMAGE ENHANCEMENT AND RESTORATION          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., Noise models, Constrained and Unconstrained restoration models.

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

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

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

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets. Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards – JPEG/MPEG.

**UNIT V          APPLICATIONS OF IMAGE PROCESSING          9**

Representation and Description, Image Recognition- Image Understanding – Image Classification – Video Motion Analysis – Image Fusion – Steganography – Colour Image Processing.

**TOTAL = 45**

**REFERENCES**

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Third Edition, Brooks Cole, 2008.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice-Hall India, 2007.
4. Madhuri A. Joshi, 'Digital Image Processing: An Algorithmic Approach', Prentice-Hall

India, 2006.

5. Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB”, First Edition, Pearson Education, 2004.

**IT9156            MULTI-CORE PROGRAMMING**

**L T P C  
3 0 0 3**

**UNIT I            INTRODUCTION TO MULTIPROCESSORS AND SCALABILITY ISSUES            9**

Parallel computer models — Symmetric and distributed shared memory architectures — Performance Issues. Multi-core Architectures - Software and hardware multithreading — SMT and CMP architectures — Design issues — Case studies — Intel Multi-core architecture — SUN CMP architecture — IBM cell processor.

**UNIT II            PARALLEL PROGRAMMING            9**

Fundamental concepts — Designing for threads. Threading and parallel programming constructs — Synchronization — Critical sections — Deadlock. Threading APIs.

**UNIT III            Openmp Programming            9**

OpenMP — Threading a loop — Thread overheads — Performance issues — Library functions. Solutions to parallel programming problems — Data races, deadlocks and livelocks — Non-blocking algorithms — Memory and cache related issues.

**UNIT IV            MPI PROGRAMMING            9**

MPI Model — collective communication — data decomposition — communicators and topologies — point-to-point communication — MPI Library.

**UNIT V            MULTITHREADED APPLICATION DEVELOPMENT:            9**

Algorithms, program development and performance tuning.

**TOTAL : 45 HOURS**

**REFERENCES**

1. Michael J Quinn, “Parallel programming in C with MPI and OpenMP”, Tata McGraw Hill, 2003.
2. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
3. John L. Hennessey and David A. Patterson, “ Computer architecture – A quantitative approach”, Morgan Kaufmann/Elsevier Publishers, 4<sup>th</sup>. edition, 2007.
4. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/ software approach” , Morgan Kaufmann/Elsevier Publishers, 2004.
5. Wesley Petersen and Peter Arbenz, “Introduction to Parallel Computing”, Oxford University Press, 2004.

**CP9172 CLOUD COMPUTING**

**L T P C  
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6**

**UNIT I UNDERSTANDING CLOUD COMPUTING**

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

**UNIT II DEVELOPING CLOUD SERVICES 10**

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

**UNIT III CLOUD COMPUTING FOR EVERYONE 10**

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

**UNIT IV USING CLOUD SERVICES 10**

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

**UNIT V OTHER WAYS TO COLLABORATE ONLINE 9**

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

**TOTAL=45**

**REFERENCES**

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

**CP9169 VIRTUALIZATION TECHNIQUES**

**L T P C**  
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**10**

**UNIT I OVERVIEW OF VIRTUALIZATION**

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages - Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts

**UNIT II SERVER CONSOLIDATION 8**

Hardware Virtualization – Virtual Hardware Overview - Server Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Server Virtualization – Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform

**UNIT III NETWORK VIRTUALIZATION 10**

Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design - WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFI's Virtual Firewall Contexts Network Device Virtualization - Data-Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsec L2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

**UNIT IV VIRTUALIZING STORAGE 8**

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.

**UNIT V VIRTUAL MACHINES PRODUCTS 9**

Xen Virtual machine monitors- Xen API – VMware – VMware products - VMware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server

**TOTAL NUMBER OF PERIODS 45HRS**

## REFERENCES

1. William von Hagen, Professional Xen Virtualization, Wrox Publications, January, 2008.
2. Chris Wolf , Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress 2005.
3. Kumar Reddy, Victor Moreno, Network virtualization, Cisco Press, July, 2006.
4. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
5. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications, 2006.

**UNIT I 9**  
Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models

**UNIT II 9**  
Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

**UNIT III 9**  
SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software s a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

**UNIT IV 9**  
Meta data management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in web service framework - advanced messaging

**UNIT V 9**  
Transaction processing – paradigm – protocols and coordination – transaction specifications – SOA in mobile – research issues

**REFERENCES**

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



**CP9125 MOBILE AND PERVASIVE COMPUTING**

**L T P C**

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**UNIT I**

**9**

Wireless networks- emerging technologies- Blue tooth, WiFi, WiMAX, 3G ,WATM.- Mobile IP protocols -WAP push architecture-Wml scripts and applications.

**UNIT II**

**8**

Mobile computing environment—functions-architecture-design considerations ,content architecture -CC/PP exchange protocol ,context manager. Data management in WAE- Coda file system- caching schemes- Mobility QOS. Security in mobile computing.

**UNIT III**

**8**

Handoff in wireless mobile networks-reference model-handoff schemes. Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement ,profile and distance based update strategies. All technologies.

**UNIT IV**

**10**

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices-embedded controls.- smart sensors and actuators -Context communication and access services

**UNIT V**

**10**

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications. Context aware security.

**TOTAL ; 45**

**REFERENCES**

1. Ivan Stojmenovic , Handbook of Wireless Networks and Mobile Computing, John Wiley & sons Inc, Canada, 2002.
2. Asoke K Taukder, Roopa R Yavagal, Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Uwe Hansmann etl , Pervasive Computing, Springer, New York, 2001.

**CP9176 HUMAN RESOURCE MANAGEMENT**

**L T P C**

**3 0 0 3**

**UNIT I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 9**

Evolution of human resource management – the importance of the human factor – objectives of human resource management – role of human resource manager – human resource policies – computer applications in human resource management.

**UNIT II THE CONCEPT OF BEST FIT EMPLOYEE 9**

Importance of human resource planning – forecasting human resource requirement – internal and external sources. Selection process-screening – tests - validation – interview - medical examination – recruitment introduction – importance – practices – socialization benefits.

**UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 9**

Types of training, methods, purpose, benefits and resistance. Executive development programmes – common practices - benefits – self development – knowledge management.

**UNIT IV SUSTAINING EMPLOYEE INTEREST 9**

Compensation plan – reward – motivation – theories of motivation – career management – development, mentor – protégé relationships.

**UNIT V PERFORMANCE EVALUATION AND CONTROL PROCESS 9**

Method of performance evaluation – feedback – industry practices. Promotion, demotion, transfer and separation – implication of job change. The control process – importance – methods – requirement of effective control systems grievances – causes – implications – redressal methods.

**TOTAL = 45**

**TEXT BOOKS**

1. Decenzo and Robbins, Human Resource Management, Wilsey, 6<sup>th</sup> edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India,2001.

**REFERENCES**

1. Human Resource Management, Eugence Mckenna and Nic Beach, Pearson Education Limited, 2002.
2. Dessler Human Resource Management, Pearson Education Limited, 2002.
3. Mamoria C.B. and Mamoria S.Personnel Management, Himalaya Publishing Company, 1997.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.
5. Ivancevich, Human Resource Management, McGraw Hill 2002.

**CP9177      MULTICORE ARCHITECTURE**

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**UNIT I** **9**  
Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture – Chip Multiprocessing, homogeneous Vs heterogeneous design - SMP – Multicore Vs Multithreading.

**UNIT II** **9**  
Shared memory architectures– synchronization – Memory organization – Cache Memory – Cache Coherency Protocols - Design of Levels of Caches.

**UNIT III** **9**  
Multicore programming Model – Shared memory model, message passing model, transaction model – OpenMP and MPI Programming.

**UNIT IV** **9**  
PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management Power 5 Multicore architecture design, Power 6 Architecture.

**UNIT V** **9**  
Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element), Cell Software Development Kit, Programming for Multicore architecture.

**TOTAL : 45**

**TEXT BOOK:**

1. Hennessey & Pateterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999
2. Joseph JaJa, Introduction to Parallel Algorithms, Addison-Wesley, 1992.
3. IBM Journals for Power 5, Power 6 and Cell Broadband engine architecture.

**REFERENCES**

1. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill, 1993
2. Richard Y. Kain, “Advanced Computer Architecture: A System Design Approach”, PHI, 1999
3. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, Parallel Programming in OpenMP, Morgan Kaufmann, 2000.

**UNIT I XML TECHNOLOGY FAMILY 9**

XML – benefits – Advantages of XML over HTML – EDL –Databases – XML based standards – DTD –XML Schemas – X- Files – XML processing – DOM –SAX- presentation technologies – XSL – XFORMS – XHTML – voice XML – Transformation – XSLT – XLINK – XPATH –XQ

**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 BLOCK 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 – Ad-Hoc Discovery – Securing web services.

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

B2B - B2C Applications – Different types of B2B interaction – Components of e-business XML systems – ebXML – Rosetta Net Applied XML in vertical industry – Web services for mobile devices.

**UNIT V XML AND CONTENT MANAGEMENT 9**

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

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

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

**REFERENCES:**

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



4. George F. Luger, "Artificial Intelligence-Structures And Strategies For Complex Problem Solving", Pearson Education / PHI, 2002.