

**NOORUL ISLAM CENTRE FOR HIGHER EDUCATION**  
**NOORUL ISLAM UNIVERSITY, KUMARACOIL**  
**M.E.COMPUTER SCIENCE AND ENGINEERING**  
**CURRICULUM & SYLLABUS**  
**SEMESTER – I**

| <b>SL. NO.</b>   | <b>SUBJECT CODE</b> | <b>SUBJECT</b>                                     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|------------------|---------------------|--|----------|----------|----------|----------|
| <b>THEORY</b>    |                     |  |          |          |          |          |
| 1.               | MA1505              | Operations Research                                | 3        | 1        | 0        | 4        |
| 2.               | CS1501              | Advanced Computer Architecture                     | 3        | 0        | 0        | 3        |
| 3.               | CS1502              | Advanced Data Structures and Algorithms            | 3        | 0        | 0        | 3        |
| 4.               | CS1503              | Advanced Operating Systems                         | 3        | 0        | 0        | 3        |
| 5.               | CS1504              | Network Engineering and Management                 | 3        | 0        | 0        | 3        |
| 6.               | XX5E1               | Elective I   | 3        | 0        | 0        | 3        |
| <b>PRACTICAL</b> |                     |  |          |          |          |          |
| 7.               | CS1571              | Advanced Data Structures and Operating Systems Lab | 0        | 1        | 2        | 2        |
| <b>TOTAL</b>     |                     |  | 18       | 2        | 2        | 21       |

**UNIT I LINEAR PROGRAMMING****9**

Formulation – Graphical solution – Simplex method –Artificial Variable Technique - Two Phase method - Transportation and Assignment Problems.

**UNIT II DYNAMIC PROGRAMMING****9**

Bellman's principle of optimality – Characteristics of the dynamic programming model – The recursive equation - Backward and Forward approach – Applications of Dynamic programming problem in Allocation problems , Shortest route problem and Cargo loading Problem .

**UNIT III QUEUEING MODELS****9**

Birth and Death Process - Poisson Process – Markovian Queues – Single Server Models – Little's formula - Queues in Series – Open Queueing Networks –Closed Queueing networks.

**UNIT IV NETWORK MODEL****9**

Shortest Route, Minimal Spanning tree and Maximal flow models – Critical Path Method – Project Evaluation and Review Technique

**UNIT V SIMULATION****9**

Discrete Event Simulation – Stochastic Simulation - Monte Carlo Simulation – Generation of Random Numbers using Congruent method – Applications to Queueing systems.

**L: 45 + T: 15, TOTAL: 60 PERIODS****REFERENCES:**

1. Taha, H.A. "Operations Research: An Introduction", Ninth Edition, Pearson Education Edition, Asia, New Delhi, 2002.
2. Robertazzi. T.G. "Computer Networks and Systems – Queuing Theory and Performance Evaluation", Third Edition, Springer, 2002 Reprint.
3. S.S. Rao "Optimization Techniques "Prentice Hall of India , 2004.
4. Philips and Raveendran " Operations Research- Principles and Practice"
5. J.K Sharma "Operations Research" Macmillan, 2003

**AIM**

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

**OBJECTIVES:**

- To understand the evolution of computer architecture.
- To understand the state-of-the-art in computer architecture.
- To understand the design challenges in building a system.

**UNIT I PIPELINING AND ILP****11**

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 THREAD-LEVEL PARALLELISM****8**

Multi-threading – Multiprocessors - Centralized and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-Stage Switches – Multi-Core Processor Architectures - Case Study.

**UNIT III SIMD AND GPU ARCHITECTURES****8**

SIMD Extensions for Multimedia – Graphics Processing Units – GPU Computational Structures – GPY ISA – GPU Memory Structures – Case Study.

**UNIT IV MEMORY HIERARCHY DESIGN****9**

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations – Name Mapping Implementations - Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

**UNIT V WAREHOUSE-SCALE COMPUTERS****9**

Programming Models and Workloads – Storage Architectures – Physical Infrastructure – Cloud Infrastructure – Case Study

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

1. John L. Hennessy and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, Fifth edition, 2012.
2. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, PHI, 2011.

**AIM**

To provide an in-depth knowledge in problem solving techniques and data structures with C++.

**OBJECTIVE**

- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To learn to program in C++
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

**UNIT I FUNDAMENTALS 9**

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.

**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 – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.

**UNIT IV MULTIMEDIA STRUCTURES 9**

Segment Trees – k-d Trees – Point Quad Trees – MX-Quad Trees – R-Trees – TV-Trees.

**UNIT V ALGORITHMS 9**

Huffman Coding – Convex Hull – Topological Sort – Tree Vertex Splitting – Activity Networks – Flow Shop Scheduling – Counting Binary Trees – Introduction to Randomized Algorithms.

**TOTAL: 45 PERIODS**

**REFERENCES**

1. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
2. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2007.
3. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Printice –Hall, 1988.
4. V.S. Subramanian, Principles of Multimedia Database systems, Morgan Kaufman, 1998.

**AIM**

To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems in an operating system.

**OBJECTIVE**

- To have an overview of different types of operating systems
- To know the components of an operating system.
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file systems.

**UNIT I INTRODUCTION****7**

Main frame Systems, Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time systems – Hand held Systems, Operating Systems Structures: System Components – Operating System Services - System calls - System Programs – System Design and Implementation - CPU scheduling: Basic Concepts – Scheduling Algorithms.

**UNIT II PROCESS MANAGEMENT****11**

Process Concepts - Process Scheduling - Operation on Process - Co-Operating process - Inter Process Communication - Threads: Multithreading Models - Process Synchronization: The Critical Section Problem – Synchronization Hardware - Semaphores – classical problem of Synchronization – Monitors - Deadlock: Deadlock Characterization - Methods for handling Deadlocks - Deadlock Prevention – Deadlock Avoidance - Deadlock Detection – Recovery from Deadlock.

**UNIT III MEMORY MANAGEMENT****9**

Background – Swapping - Contiguous Memory Allocation - Paging - Segmentation – Segmentation with paging - Virtual Memory: Demand paging - Page Replacement - Thrashing.

**UNIT IV FILE SYSTEMS****9**

File Concepts - Access methods - Directory Structure - File Protection - File System Implementation: File System Structure and Implementation – Directory Implementation – Allocation methods Free Space Management – Recovery - Disk Structure – Disk Scheduling.

**UNIT V DISTRIBUTED OPERATING SYSTEM****9**

Design issues in distributed operating system-Distributed file systems - Naming and Transparency-Remote File Access-Stateful versus Stateless service – Distributed Coordination- Event Ordering-Mutual Exclusion- Atomicity- Concurrency Control- Deadlock Handling-Election Algorithms-Case Study-Linux.

**TOTAL: 45 PERIODS**

## **REFERENCES**

1. Silberschatz, Galvin, Gagne “ Operating System Concepts” Sixth Edition, 2003
2. Pradeep K.Sinha, “ Distributed OS concepts and Design ”, IEEE computer Society Press, PHI 1998
3. Andrew S. Tanenbaum , “Modern Operating Systems”, PHI , 2<sup>nd</sup> Edition 2001
4. Achut S. Godbole and Kahate Atul , “Operating Systems & Systems Programming ”, Tata Mcgraw Hill, 2003.
5. Charles Crowley, “ Operating systems: A Design Oriented Approach”, Tata McGraw Hill, 1999.

## **CS1504 NETWORK ENGINEERING AND MANAGEMENT 3 0 0 3**

### **UNIT I FOUNDATIONS OF NETWORKING 9**

Communication Networks – Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration – Modern Applications

### **UNIT II QUALITY OF SERVICE 9**

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic

### **UNIT III HIGH PERFORMANCE NETWORKS 9**

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behaviour – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP

### **UNIT IV HIGH SPEED NETWORKS 9**

Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM Reference Model – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks

### **UNIT V NETWORK MANAGEMENT 9**

ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

**TOTAL: 45 PERIODS**

## **REFERENCES**

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
2. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007.
3. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
4. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.
5. Mani Subramaniam, 'Network Management: Principles and Practices', Pearson Education, 2000
6. Kasera and Seth, 'ATM Networks: Concepts and Protocols', Tata McGraw Hill, 2002.

## **CS1571 ADVANCED DATA STRUCTURES AND OPERATING SYSTEMS LAB**

**0 1 2 2**

### **AIM**

To teach the principles of good programming practice and to give a practical training in writing efficient programs in C++.

### **OBJECTIVE**

- To teach the students to write programs in C++
- To implement the various data structures as Abstract Data Types
- To write programs to solve problems using the ADTs
- To make them work with different operating system
- To implement scheduling , deadlock etc.,

### **PART-A**

1. Implementation of Singly, Doubly and Circular linked list.
2. Implementation of Multistack in a Single Array.
3. Implementation of Circular Queue.
4. Implementation of Binary Search trees.
5. Implementation of Hash table.
6. Implementation of Heaps.
7. Implementation of AVL Rotations.
8. Implementation of Breadth First Search Techniques.
9. Implementation of Depth First Search Techniques.
10. Implementation of Prim's Algorithm.
11. Implementation of Dijkstra's Algorithm.
12. Implementation of Kruskal's Algorithm
13. Implementation of Searching Techniques
14. Implementation of Sorting Techniques

## **PART-B**

1. Implement the following CPU Scheduling Algorithms.  
i) FCFS    ii) Round Robin    iii) Shortest Job First.
2. Implement the Mutual Exclusion Problem Using Dekker's Algorithm.
3. Implement Inter Process Communication Problem (Producer-Consumer / Reader- Writer Problem) Using Semaphores.
4. Implement Best fit, First Fit Algorithm for Memory Management.
5. Implement Memory Allocation with Pages.
6. Implement FIFO page Replacement Algorithm.
7. Implement LRU page Replacement Algorithm.
8. Implement the creation of Shared memory Segment.
9. Implement File Locking.
10. Implement Banker's algorithm.

**TOTAL: 45 PERIODS**

## **REFERENCES**

1. Silberschatz, Galvin, Gagne "Operating System Concepts" Sixth Edition, 2003
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2002.
3. K.R Venugopal, Rajkumar Buyya, T. Ravishankar, "Mastering C++", TMH 2003.



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**SEMESTER – II**

| <b>SL. NO.</b>   | <b>SUBJECT CODE</b> | <b>SUBJECT</b>                       | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|------------------|---------------------|--------------------------------------|----------|----------|----------|----------|
| <b>Theory</b>    |                     |                                      |          |          |          |          |
| 1.               | CS1505              | Distributed Computing                | 3        | 0        | 0        | 3        |
| 2.               | CS1506              | Advanced Data Base Technologies      | 3        | 0        | 0        | 3        |
| 3.               | CS1507              | Software Engineering Methodologies   | 3        | 0        | 0        | 3        |
| 4.               | CS1508              | Compiler Optimization                | 3        | 0        | 0        | 3        |
| 5.               | CS1509              | Advanced Web Technologies            | 3        | 0        | 0        | 3        |
| 6.               | XX2E2               | Elective II                          | 3        | 0        | 0        | 3        |
| <b>Practical</b> |                     |                                      |          |          |          |          |
| 7.               | CS1572              | Advanced DBMS & Web Technologies Lab | 0        | 1        | 2        | 2        |
| Total            |                     |                                      | 18       | 1        | 2        | 20       |

**AIM**

To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems in distributed operating system.

**OBJECTIVE**

- To have an overview of different types of operating systems
- To know the components of an operating system.
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file systems.

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

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies.

**UNIT II PROCESSES AND DISTRIBUTED OBJECTS****9**

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

**UNIT III OPERATING SYSTEM ISSUES – I****9**

The OS Layer - Protection - Processes and Threads - Communication and Invocation – OS Architecture - Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies - Distributed File Systems - File Service Architecture - Sun Network File System - The Andrew File System

**UNIT IV OPERATING SYSTEM ISSUES – II****9**

Name Services -Domain Name System - Directory and Discovery Services - Global Name Service - X.500 Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time And Logical Clocks - Global States - Distributed Debugging - Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

**UNIT V DISTRIBUTED TRANSACTION PROCESSING****9**

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, 3<sup>rd</sup> Edition, 2002.
2. Sape Mullender, Distributed Systems, Addison Wesley, 2<sup>nd</sup> Edition, 1993.
3. Albert Fleishman, Distributes Systems- Software Design and Implementation, Springer-Verlag, 1994
4. M.L.Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.
5. Andrew S Tanenbaum , Maartenvan Steen,Distributed Systems –Principles and Paradigms, Pearson Education, 2002
6. Mugesh Singhal,Niranjan G Shivaratri,Advanced Concepts in Operating Systems, Tata McGraw Hill Edition, 2001

**CS1506**

**ADVANCED DATA BASE TECHNOLOGIES**

**3 0 0 3**

**AIM**

To provide a strong foundation in database technology and an introduction to the current trends in this field.

**OBJECTIVES:**

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of advanced data models.
- To learn emerging databases such as XML, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

**UNIT I PARALLEL AND DISTRIBUTED DATABASES**

**9**

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

**UNIT II OBJECT AND OBJECT RELATIONAL DATABASES**

**9**

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

### **UNIT III INTELLIGENT DATABASES**

**9**

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

### **UNIT IV ADVANCED DATA MODELS**

**9**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

### **UNIT V EMERGING TECHNOLOGIES**

**9**

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

**TOTAL: 45 PERIODS**

### **REFERENCES:**

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2008.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
4. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers,2006.
6. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.
7. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.

**CS1507**

**SOFTWARE ENGINEERING METHODOLOGIES**

**3 0 0 3**

### **AIM**

To introduce the methodologies involved in the development and maintenance of software

### **OBJECTIVE**

To know about

- Analysis modeling and specification
- Architectural and detailed design methods
- Implementation and testing strategies
- Verification and validation techniques
- Project planning and management
- Use of CASE tools

**UNIT I INTRODUCTION 11**

A Generic View Of Processes – Process Maturity – Process Models – Agile Process And Models – Software Cost Estimation – Risk Analysis – Software Project Planning & Scheduling.

**UNIT II REQUIREMENT ANALYSIS 6**

System Engineering Hierarchy – Requirement Engineering: Tasks, Initiating The Process, Eliciting Requirements, Developing Use Cases – Negotiating Requirements – Validating Requirements – Building The Analysis Models: Concepts – Object Oriented Analysis – Scenario Based Modeling – Data & Control Flow Oriented Model – Class Based Model – Behavioral Model.

**UNIT III SOFTWARE DESIGN 8**

Design Concepts – Design Models – Pattern Based Design – Architectural Design – Component Level Design – Class Based And Conventional Components Design – Real-time System Design - User Interface : Analysis And Design.

**UNIT IV SOFTWARE TESTING 7**

Software Testing – Strategies – Issues – Test Strategies For Conventional And Object Oriented Software – Validation And System Testing - Testing Tactics: White Box Testing, Basis Path Testing – Control Structure Testing – Black Box Testing - Object Oriented Testing – Testing GUI – Testing Client/Server – Test Documentation.

**UNIT V SOFTWARE QUALITY ASSURANCE 13**

Software Quality Concepts – Quality Assurance – Software Technical Reviews – Formal Approach To Software Quality Assurance - Reliability – Quality Standards – Software Quality Assurance Plan – Software Maintenance - Software Configuration Management – Reverse Engineering & Reengineering – Use of CASE Tools

**TOTAL: 45 PERIODS**

**REFERENCES**

1. Roger S. Pressman., Software Engineering: A Practitioner’s Approach (Sixth Edition), McGraw Hill, 2005
2. I.Sommerville, Software Engineering, V Edition: Addison Wesley, 1996.
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. Fairely, “Software Engineering Concepts”, McGraw Hill, 1995

**UNIT I INTRODUCTION 9**

Principles Of Compiler – Compiler Structure – Properties of a Compiler – Optimization – Importance of Code optimization – Structure of Optimizing compilers – placement of optimizations in optimizing compilers – ICAN – Introduction and Overview – Symbol table structure – Local and Global Symbol table management

**UNIT II CODE OPTIMIZATION 9**

Intermediate representation – Issues – High level, medium level, low level intermediate languages – MIR, HIR, LIR – ICAN for Intermediate code – Optimization – Early optimization – Constant folding – scalar replacement of aggregates – Simplification – value numbering – constant propagation – redundancy elimination – loop optimization

**UNIT III PROCEDURE OPTIMIZATION 9**

Procedure optimization – in-line expansion – leaf routine optimization and shrink wrapping – register allocation and assignment – graph coloring – code scheduling – control flow and low level optimizations – inter-procedural analysis and optimization – call graph – data flow analysis – constant propagation – alias analysis – register allocation – global references – Optimization for memory hierarchy

**UNIT IV CODE SCHEDULING 9**

Code Scheduling – Instruction scheduling – Speculative scheduling – Software pipelining – trace scheduling – percolation scheduling – Run-time support – Register usage – local stack frame – run-time stack – Code sharing – position-independent code – Symbolic and polymorphic language support

**UNIT V CASE STUDIES 9**

Case Studies – Sun Compilers for SPARC – IBM XL Compilers – Alpha compilers – PA –RISC assembly language – COOL – ( Classroom Object oriented language) – Compiler testing tools – SPIM

**TOTAL: 45 PERIODS**

**REFERENCES :**

1. Steven S. Muchnick, “Advanced Compiler Design Implementation”, Morgan Koffman – Elsevier Science, India, Indian Reprint 2003
2. Keith D Cooper and Linda Torczon, “ Engineering a Compiler, Elsevier Science, India,
3. Allen Holub “Compiler Design in C”, Prentice Hall of India, 1990.
4. Alfred Aho, V. Ravi Sethi, D. Jeffery Ullman, “Compilers Principles, Techniques and Tools”, Addison Wesley, 1988.
5. Charles N. Fischer, Richard J. Leblanc, “Crafting a compiler with C”, Benjamin Cummings, 1991.

**AIM:**

To explain Internet Programming concepts and related programming and scripting languages.

**OBJECTIVE**

- To describe basic Internet Protocols.
- Explain JAVA and HTML tools for Internet programming.
- Describe scripting languages – Java Script.
- Explain dynamic HTML programming.
- Explain Server Side Programming tools.

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

Introduction – Network concepts – Web concepts – Internet addresses - Retrieving Data with URL – HTML – DHTML: Cascading Style Sheets - Scripting Languages: Javascript – Vbscript.

**UNIT II COMMON GATEWAY INTERFACE****9**

Common Gateway Interface: Programming CGI Scripts – HTML Forms – Custom Database Query Scripts – Server Side Includes – Server security issues – XML.

**UNIT III JAVA PROGRAMMING****9**

Java fundamentals: Classes – Inheritance – Packages – Interfaces – Exceptions Handling – Multi threading - Applets

**UNIT IV SERVER SIDE PROGRAMMING****9**

Server side Programming – Active server pages – Java server pages – Java Servlets: Servlet container – Exceptions – Sessions and Session Tracking – Using Servlet context – Dynamic Content Generation – Servlet Chaining and Communications.

**UNIT V APPLICATIONS****9**

Simple applications – Internet Commerce – Database connectivity – Online databases – EDI Applications in Business – Plug-ins – Firewalls

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

1. Deitel, Deitel and Neito, “INTERNET and WORLD WIDE WEB – How to program”, Pearson education asia, 2001
2. D.Norton and H. Schildt, “Java 2: The complete Reference”, TMH, 2000.
3. Elliotte Rusty Herold , “Java Network Programming”, O’Reilly Publications, 3<sup>rd</sup> Edition, 2004.
4. Eric Ladd and Jim O’Donnell, et al, “USING HTML 4, XML, and JAVA1.2”, PHI publications, 2003.
5. Jeffy Dwight, Michael Erwin and Robert Nikes “USING CGI”, PHI Publications, 1997

**CS1572          ADVANCED DBMS & WEB TECHNOLOGIES LAB 0 1 2 2**

**AIM**

To work with Internet Programming concepts and related programming, scripting languages.

**OBJECTIVE**

- To implement basic Internet Protocols.
  - Use JAVA and HTML tools for Internet programming.
  - Use scripting languages – Java Script.
  - Use dynamic HTML programming.
  - Implement Server Side Programming tools and database.
- 
1. Study of all SQL commands
  2. Implement the concept of Normalization
  3. Implement the inventory control system with a reorder level
  4. Develop a package for a bank to maintain its customer details
  5. Develop a package for the payroll of a company
  6. Designing a web site using HTML, DHTML and Client side Scripting
  7. Write a program in java for getting time and data information from the server using TCP/UDP
  8. Write a program in java to implement Database Connectivity
  9. Write a JSP program for order processing
  10. Write a ASP program using the components

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Abraham Silberschatz, Henry. F. Korth, S.Sudharsan, Database System Concepts, 4<sup>th</sup> Edition, Tata McGraw Hill, 2002
2. D.Norton and H. Schildt, “Java 2: The complete Reference”, TMH, 2000.
3. Elliotte Rusty Herold , “Java Network Programming”, O’Reilly Publications, 3<sup>rd</sup> Edition, 2004.



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**SEMESTER – III**

| <b>SL. NO.</b>   | <b>SUBJECT CODE</b> | <b>SUBJECT</b>          | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|------------------|---------------------|-------------------------|----------|----------|----------|----------|
| <b>THEORY</b>    |                     |                         |          |          |          |          |
| 1.               | XX2E3               | Elective III            | 3        | 0        | 0        | 3        |
| 2.               | XX2E4               | Elective IV             | 3        | 0        | 0        | 3        |
| 3.               | XX2E5               | Elective V              | 3        | 0        | 0        | 3        |
| <b>PRACTICAL</b> |                     |                         |          |          |          |          |
| 4.               | CS1573              | Advanced Networking Lab | 0        | 1        | 2        | 2        |
| 5.               | CS15P1              | Project Work Phase – I  | 0        | 0        | 12       | 6        |
| Total            |                     |                         | 9        | 1        | 14       | 17       |

1. Simulation of ARP / RARP.
2. Write a program that takes a binary file as input and performs bit stuffing and CRC Computation.
3. Develop an application for transferring files over RS232.
4. Simulation of Sliding-Window protocol.
5. Simulation of BGP / OSPF routing protocol.
6. Develop a Client – Server application for chat.
7. Develop a Client that contacts a given DNS Server to resolve a given host name.
8. Write a Client to download a file from a HTTP Server.
- 9 &10 Study of Network Simulators like NS2/Glomosim / OPNET.

**TOTAL: 45 PERIODS**

**NOORUL ISLAM CENTRE FOR HIGHER EDUCATION**  
**NOORUL ISLAM UNIVERSITY, KUMARACOIL**  
**M.E.COMPUTER SCIENCE AND ENGINEERING**  
**CURRICULUM & SYLLABUS**  
**SEMESTER – IV**

| <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>PRACTICAL</b> |                    |                         |          |          |          |          |
| 1                | CS15P5             | Project Work Phase - II | 0        | 0        | 36       | 18       |
| <b>TOTAL</b>     |                    |                         | 0        | 0        | 36       | 18       |

## M.E.COMPUTER SCIENCE AND ENGINEERING

### LIST OF ELECTIVES

### CURRICULUM & SYLLABUS

| <b>I SEMESTER ELECTIVES</b>   |        |   |   |   |   |   |
|-------------------------------|--------|---|---|---|---|---|
| 1.                            | CS15A1 | XML and Web Services                                    | 3 | 0 | 0 | 3 |
| 2.                            | CS15A2 | Service Oriented Architecture                           | 3 | 0 | 0 | 3 |
| 3.                            | CS15A3 | Parallel Algorithm                                      | 3 | 0 | 0 | 3 |
| 4.                            | CS15A4 | Multimedia Systems                                      | 3 | 0 | 0 | 3 |
| 5.                            | CS15A5 | Digital Image Processing and Applications               | 3 | 0 | 0 | 3 |
| <b>II SEMESTER ELECTIVES</b>  |        |   |   |   |   |   |
| 6.                            | CS15A6 | Soft Computing Techniques                               | 3 | 0 | 0 | 3 |
| 7.                            | CS15A7 | Performance Evaluation of Computer Systems and Networks | 3 | 0 | 0 | 3 |
| 8.                            | CS15A8 | Agent Based Intelligent Systems                         | 3 | 0 | 0 | 3 |
| 9.                            | CS15A9 | Visualization Techniques                                | 3 | 0 | 0 | 3 |
| 10.                           | CS15B1 | Network Security  | 3 | 0 | 0 | 3 |
| <b>III SEMESTER ELECTIVES</b> |        |   |   |   |   |   |
| 11.                           | CS15B2 | Software Project Testing                                | 3 | 0 | 0 | 3 |
| 12.                           | CS15B3 | Adhoc Networks  | 3 | 0 | 0 | 3 |
| 13.                           | CS15B4 | Wireless Sensor Networks                                | 3 | 0 | 0 | 3 |
| 14.                           | CS15B5 | Trust Computing   | 3 | 0 | 0 | 3 |
| 15.                           | CS15B6 | Software Quality Assurance                              | 3 | 0 | 0 | 3 |
| 16.                           | CS15B7 | Data Mining Techniques                                  | 3 | 0 | 0 | 3 |
| 17.                           | CS15B8 | Natural Language Understanding                          | 3 | 0 | 0 | 3 |
| 18.                           | CS15B9 | Grid Computing  | 3 | 0 | 0 | 3 |
| 19.                           | CS15C1 | Nano Computing  | 3 | 0 | 0 | 3 |
| 20.                           | CS15C2 | Cloud Computing   | 3 | 0 | 0 | 3 |
| 21.                           | CS15C3 | Information Storage & Management                        | 3 | 0 | 0 | 3 |
| 22.                           | CS15C4 | Mobile and Pervasive Computing                          | 3 | 0 | 0 | 3 |

**CS15A1**

**XML AND WEB SERVICES**

**3 0 0 3**

**UNIT I INTRODUCTION 9**

Role Of XML – XML and The Web – XML Language Basics – SOAP – Web Services – Revolutions Of XML – Service Oriented Architecture (SOA).

**UNIT II XML TECHNOLOGY 9**

XML – Name Spaces – Structuring With Schemas and DTD – Presentation Techniques – Transformation – XML Infrastructure.

**UNIT III SOAP 9**

Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments.

**UNIT IV WEB SERVICES 9**

Overview – Architecture – Key Technologies - UDDI – WSDL – ebXML – SOAP And Web Services In E-Com – Overview Of .NET And J2EE.

**UNIT V XML SECURITY 9**

Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines For Signing XML Documents – XML In Practice.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
2. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, “ Developing Java Web Services”, Wiley Publishing Inc., 2004.
3. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services”, Pearson Education, 2004.
4. McGovern, et al., “Java Web Services Architecture”, Morgan Kaufmann Publishers,2005.

**CS15A2**

**SERVICE ORIENTED ARCHITECTURE**

**3 0 0 3**

**UNIT I INTRODUCTION 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 ANALYSIS AND DESIGN 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 IMPLEMENTATION 9**

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

**UNIT IV XML SECURITY 9**

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

**UNIT V TRANSACTION PROCESSING 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.

**CS15A3 PARALLEL ALGORITHMS 3 0 0 3**

**UNIT I INTRODUCTION 9**

PRAM Model – PRAM Algorithms – Parallel Reduction – Prefix Sums – List Ranking – Preorder Tree Traversal – Merging Two Sorted Lists – Graph Coloring – Reducing Number of Processors – NC Class.

**UNIT II MIMD 9**

Classifying MIMD Algorithms – Hypercube SIMD Model – Shuffle Exchange SIMD Model – 2D Mesh SIMD Model – UMA Multiprocessor Model – Broadcast – Prefix Sums.

**UNIT III SORTING 9**

Enumeration Sort – Lower Bound on Parallel Sorting – Odd-Even Transposition Sort – Bitonic Merge – Parallel Quick Sort – Complexity of Parallel Search – Searching on Multiprocessors.

**UNIT IV SEARCHING 9**

P-Depth Search – Breadth Depth Search – Breadth First Search – Connected Components – All pair Shortest Path – Single Source Shortest Path – Minimum Cost Spanning Tree.

**UNIT V ALGORITHMS****9**

Matrix Multiplication on 2-D Mesh, Hypercube and Shuffle Exchange SIMD Models – Algorithms for Multiprocessors – Algorithms for Multicomputers – Mapping Data to Processors.

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

1. Michael J. Quinn, Parallel Computing : Theory & Practice, Tata McGraw Hill Edition, 2003.
2. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, Introduction to Parallel Computing, 2nd Edition, Addison Wesley, 2003

**CS15A4****MULTIMEDIA SYSTEMS****3 0 0 3****UNIT I INTRODUCTION AND QOS****9**

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

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

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

**UNIT III FILE SYSTEMS AND NETWORKS****9**

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

**UNIT IV COMMUNICATION****9**

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

**UNIT V SYNCHRONIZATION****9**

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

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

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

**CS15A5      DIGITAL IMAGE PROCESSING AND APPLICATIONS      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 – FT, 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 PERIODS**

**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.



**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 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 III 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 IV 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.

**UNIT V GENETIC ALGORITHMS 9**

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

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.
4. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
5. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.
6. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer, 2007.
7. S.N.Sivanandam · S.N.Deepa, “ Introduction to Genetic Algorithms”, Springer, 2007.
8. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, PWS Publishers, 1992.

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

Need for performance evaluation – Role of performance evaluation - performance evaluation Methods – Performance Metrics and Evaluation Criteria – CPU and I/O Architectures – Distributed and Network Architectures– Secondary Storage – Topologies – Computer Architecture - Fundamental Concepts and Performance Measures.

**UNIT II PROBABILITY AND STOCHASTIC PROCESSES****9**

Scheduling Algorithms – Workloads – Random Variables – Probability Distributions – Densities – Expectation – Stochastic Processes – Poisson Process – Birth-Death Process – Markov Process.

**UNIT III QUEUING THEORY****9**

Queuing Systems – Networks of Queues - Estimating Parameters and Distributions – Computational Methods – Simulation Process – Time Control – Systems and Modeling.

**UNIT IV PETRI NETS AND SYSTEM PERFORMANCE****9**

Petri Nets – Classical Petri Nets – Timed Petri Nets – Priority-based Petri Nets – Colored Petri Nets – Generalized Petri Nets – Tool Selection – Validation of Results – Performance Metrics – Evaluation – Multiple Server Computer System Analysis.

**UNIT V ANALYSIS****9**

OS Components – System Architecture – Workloads – Design – Simulation – Analysis - Database System Performance – Computer Networks Components – Simulation Modeling of LAN.

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

1. Paul J. Fortier, Howard E. Michael, “Computer Systems Performance Evaluation and Prediction”, Elsevier Science (USA), 2003.
2. Thomas G. Robertazzi, “Computer Networks and Systems: Queuing theory and Performance Evaluation”, 3<sup>rd</sup> Edition, Springer, 2000.
3. Domenico Ferrari , Giuseppe Serazzi ,Alexandro Zeijher, Measurement & Tuning of Computer Systems –Prentice Hall Inc, 1983.
4. Michael F.Mories and Paul F.Roth,. Tools and techniques, Computer Performance Evaluation, Van Nostrand, New York, 1982.

**CS15A8                      AGENT BASED INTELLIGENT SYSTEMS                      3 0 0 3**

**UNIT I INTRODUCTION                      9**

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

**UNIT II KNOWLEDGE REPRESENTATION AND REASONING                      9**

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

**UNIT III PLANNING AGENTS                      9**

Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic Domains-Conditional Planning-Continuous Planning-MultiAgent Planning.

**UNIT IV AGENTS AND UNCERTAINTY                      9**

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

**UNIT V HIGHER LEVEL AGENTS                      9**

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

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2<sup>nd</sup> Edition, Prentice Hall, 2002
2. Michael Wooldridge, "An Introduction to Multi Agent System", John Wiley, 2002.
3. Patrick Henry Winston, Artificial Intelligence, III Edition, AW, 1999.
4. Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1992.

**CS15A9                      VISUALIZATION TECHNIQUES                      3 0 0 3**

**UNIT I INTRODUCTION                      9**

Introduction to Visualization - Principles of 2D & 3D Computer Graphics - Models and Simulation strategies.

**UNIT II POPULAR TECHNIQUES                      9**

Surface Plots - City scopes - Fish eye views - Benediktine Space - Perspective walls - Cone trees and Cam trees - Sphere Visualization - Rooms - Emotical icons.

**UNIT III ADVANCED TECHNIQUES 9**

Self-Organising graphs - Spatial Data arrangements - Benediktine Cyberspace - Statistical Clustering and Proximity measures - Hyper Structures - Human Centered Approaches - Information Cube.

**UNIT IV VISUALIZATION SYSTEMS 9**

Database Visualisation - Populated Information Terrains - Legibility enhancement - Hyper structure Visualisation - Information Visualisation.

**UNIT V SOFTWARE VISUALIZATION 9**

Rapid Prototyping - Models for user interaction - Formal Specification of Software - DFD – Software Architecture.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Chaomei Chan, Information Visualisation and Virtual Environment, Springer - Verlag, 1999.
2. Benedikt. M, Cyberspace: First Steps, MIT Press, 1991.
3. Pauline Wills, Visualisation: A Beginner's Guide, Hodder & Stoughton, 1999.
4. Sheryl A Sorby exal, 3D Visualisation for Engineering Graphics, Prentice Hall, 1998.

**CS15B1**

**NETWORK SECURITY**

**3 0 0 3**

**AIM:**

To understand the basic concepts of networking and security .

**OBJECTIVES:**

- To introduce students to the new technologies in network.
- To understand the various types of key management techniques.
- To study the concept of security.

**UNIT I INTRODUCTION 9**

Attacks - Services - Mechanisms - Conventional Encryption - Classical And Modern Techniques– Encryption Algorithms - Confidentiality.

**UNIT II PUBLIC KEY ENCRYPTION 9**

RSA - Cryptography -Elliptic Curve Cryptography - Key management – Session and Interchange keys, Key exchange and generation, Cryptographic Key Infrastructure, Storing and Revoking Keys-Cipher Techniques

**UNIT III MESSAGE AUTHENTICATION 9**

MAC-Hash Functions - Digest Functions - Digital Signatures - Authentication Protocols-SHA-HMAC.

**UNIT IV NETWORK SECURITY PRACTICE 9**  
Authentication-Kerberos, Applications - Electronic Mail Security-PGP-S/MIME - IP Security - Web Security-SSL-TSL-SET.

**UNIT V SYSTEM SECURITY 9**  
Intruders-Intrusion Detection - Password management – Viruses – Virus counter measures-Distributed denial of service attack-Worms – Firewalls Design Principles – Types of Firewalls -Trusted Systems.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Stallings, Cryptography & Network Security - Principles & Practice, Prentice Hall, 3rd Edition 2002.
2. Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education.
3. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.
4. Man Young Rhee, “Internet Security”, Wiley, 2003.
5. Pfleeger & Pfleeger, “Security in Computing”, Pearson Education, 3rd Edition,2003.

**CS15B2 SOFTWARE PROJECT TESTING 3 0 0 3**

**UNIT I INTRODUCTION 9**  
Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management

**UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9**  
Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process

**UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9**  
Iterative Process Planning - Organization and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process

**UNIT IV MANAGED AND OPTIMIZED PROCESS 9**  
Data Gathering and Analysis: Principles of Data Gathering, Data Gathering Process, Software Measures, Data Analysis - Managing Software Quality – Defect Prevention

**UNIT V CASE STUDIES 9**  
COCOMO Cost Estimation Model – context for the case study – Change Metrics-Metric Derivation-Collected statistics - End product quality metrics – CCPDS - context for the case study.

**TOTAL: 45 PERIODS**

## **REFERENCES:**

1. Walker Royce “Software Project Management – A Unified Framework “, Pearson Education, 2004 (Unit I, II, III & V)
2. Humphrey, Watts: “Managing the software process “, Addison Wesley, 1989. (Unit IV)
3. Ramesh Gopaldaswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
4. Bob Hughes, Mikecotterell, “Software Project Management”, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2004.

**CS15B3**

**AD HOC NETWORKS**

**3 0 0 3**

### **UNIT I INTRODUCTION 9**

Introduction-Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio Propagation Mechanisms - Characteristics of the Wireless Channel - IEEE 802.11a,b Standard – Origin Of Ad hoc: Packet Radio Networks - Technical Challenges - Architecture of PRNETs - Components of Packet Radios – Ad hoc Wireless Networks -What Is an Ad Hoc Network? Heterogeneity in Mobile Devices - Wireless Sensor Networks - Traffic Profiles - Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Challenges Facing Ad Hoc Mobile Networks-Ad hoc wireless Internet

### **UNIT II AD HOC ROUTING PROTOCOLS 9**

Introduction - Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks - Classifications of Routing Protocols -Table-Driven Routing Protocols - Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand Approaches - Ad Hoc On-Demand Distance Vector Routing (AODV) - Dynamic Source Routing (DSR) - Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) - Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP)

### **UNIT III MULTICASTROUTING IN AD HOC NETWORKS 9**

Introduction - Issues in Designing a Multicast Routing Protocol - Operation of Multicast Routing Protocols - An Architecture Reference Model for Multicast Routing Protocols - Classifications of Multicast Routing Protocols - Tree-Based Multicast Routing Protocols- Mesh-Based Multicast Routing Protocols - Summary of Tree-and Mesh-Based Protocols - Energy-Efficient Multicasting - Multicasting with Quality of Service Guarantees - Application-Dependent Multicast Routing - Comparisons of Multicast Routing Protocols

### **UNIT IV TRANSPORT LAYER, SECURITY PROTOCOLS 9**

Introduction - Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks - Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks - Classification of Transport Layer Solutions - TCP Over Ad Hoc Wireless Networks - Other Transport Layer Protocols for Ad Hoc Wireless Networks - Security in Ad Hoc Wireless Networks - Network Security Requirements - Issues and Challenges in Security

Provisioning - Network Security Attacks - Key Management - Secure Routing in Ad Hoc Wireless Networks

**UNIT V QoS AND ENERGY MANAGEMENT 9**

Introduction - Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad Hoc Wireless Networks –Introduction - Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. C. Siva Ram Murthy and B.S. Manoj “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR,2004
2. C.K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR ,2001
3. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000

**CS15B4**

**WIRELESS SENSOR NETWORKS**

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

**AIM**

To study the various Sensor networks, tools and techniques for implementation

**OBJECTIVES :**

- Sensor Networks, Models, Network Sensor
- Sensor tasking and Control, Sensor network databases
- Sensor network platforms and tools

**UNIT I INTRODUCTION TO SENSOR NETWORKS. 9**

Unique Constraints and Challenges – Advantages of Sensor networks – Sensor network applications – Collaborative processing – Key definition of sensor networks – A tracking scenario – problem formulation – Distribution representation and inference of states – Tracking multiple objects – Sensor models – Reference compression and metrics.

**UNIT II NETWORK SENSOR 9**

Key assumptions – Medium access control – General Issues – geographic Energy aware routing – Attribute based routing.

**UNIT III INFRASTRUCTURE ESTABLISHMENT, SENSOR TASKING AND CONTROL 9**

Topology control – Clustering – Time Synchronization – Localization and localization services - Task driven sensing Roles of Sensor nodes and Utilizes – Information based sensor tasking – Joint routing and Information Aggregation.

**UNIT IV SENSOR NETWORK DATA BASES 9**

Sensor Data base challenges – Querying the Physical Environment – Query Interfaces – High level Data Base organization – In Network aggregation – Data Centric storage – Data indices and Range queries – Distributed hierarchical aggregation – temporal Data .

**UNIT V SENSOR NETWORK PLATFORMS AND TOOLS. 9**

Sensor node hardware – sensor network programming challenges – node level software platform – node level simulators – Programming beyond individual modes state – centric programming – Emerging applications of wireless sensor networks.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Fenz Zhan.Leonidas Guibas “ Wireless Sensor Networks “ – An information processing approach. Elsevir Inc – 2004. ISBN 1-55860-914-8
2. Edger H.Dr.Calleway Edger .H auerbach Publication “Wireless Sensor Networks – Architecture and Protocols “. Auerbach Publications (August 26,2003 ) ISBN 0849318238

**CS15B5 TRUST COMPUTING L T P C  
3 0 3**

**AIM**

To study the Trust management techniques for distributed computing environment

**UNIT I LOGIC PROGRAMMING 9**

Introduction Basics of logic and logic programming – definite logic programs – SLD resolution principle.

**UNIT II TRUST MANAGEMENT APPROACHES 9**

Overview of trust management approach - Distributed authorization – trust management approach – characteristics – Public Key Certificates –Existing Public key infrastructures – X.509 and PGP.

**UNIT III TRUST MANAGEMNET LANGUAGES 9**

Early trust management languages and approaches - PolicyMaker – KeyNote – SPKI(Simple Public Key Infrastructure) – Simple Distributed Security Infrastructure (SDSI) – Datalog based trust management languages – other closely related logic based security languages.

**UNIT IV DISTRIBUTED TRUST MODEL & DESIGN 9**

Decentralized trust management - Distributed credential chain discovery in trust management – Design of a role based trust management framework.- Distributed trust model

**UNIT V TRUST MODELING AND MANAGEMENT IN AD HOC NETWORKS 9**

Related Work on Trust Modeling and Management in Ad hoc Networks Distributed Trust Model – Trust Evaluation and Metrics in Mobile Ad hoc Network – Establishing Trust in



Pure Ad hoc Networks – Incorporating trust and reputation in DSR for dependable routing – Performance Comparison of Trust-Based reactive routing protocols – Trust Management vulnerabilities in distributed networks.

**TOTAL: 45 PERIODS**

**REFERENCES :**

1. Krzysztof R. Apt. Logic Programming . *Handbook of theoretical computer science*, Elsevier 1990.
2. Matt Blaze, Joan Feigenbaum, and Jack Lacy. Decentralized Trust Management. In *Oakland*, 1996.
3. M. Blaze, J. Feigenbaum, J. Ioannidis, and A. Keromytis. The KeyNote Trust-Management System Version 2. Network Working Group RFC 2704, September 1999.
4. N. Li, W. Winsborough, and J. C. Mitchell. Distributed Credential Chain Discovery in Trust Management. *Journal of Computer Security*, 11(1):35-86. February 2003.
5. N. Li, J. C. Mitchell, and W. Winsborough. Design of a Role-Based Trust Management Framework. Proceedings of the 2002 IEEE Symposium on Security and Privacy (Oakland), May 2002.
6. Ninghui Li and John C. Mitchell. Datalog with Constraints: A Foundation for Trustmanagement Languages . In *Proceedings of the Fifth International Symposium on Practical Aspects of Declarative Languages (PADL 2003)*, LNCS 2562, Springer, pp. 58-73.
7. A. A. Pirzada, A. Datta and C. McDonald, Incorporating Trust and Reputation in the DSR protocol for Dependable Routing, Computer Communications, Special issue on Internet Communications Security, Vol. 29, pages 2806-2821, Elsevier Press, 2006.
8. Alvarez Abdul-Rahman and Stephen Hailes. A distributed trust model. NSPW '97: Proceedings of the 1997 workshop on New security paradigms, pages 48-60, 1998, ACM, New York.
9. George Theodorakopoulos and John S. Baras. Trust evaluation in ad-hoc networks. WiSe '04: Proceedings of the 3rd ACM workshop on Wireless security, 2004, pages 1-10, ACM, New York, USA.
10. George Theodorakopoulos and John S. Baras, On Trust Models and Trust Evaluation Metrics for Ad Hoc Networks. IEEE JSAC, Vol.24. No.2, February 2006.
11. Y.Sun *et al.*, Defense of trust management vulnerabilities in distributed networks, IEEE Communications Magazine, February 2008.

**CS15B6**

**SOFTWARE QUALITY ASSURANCE**

**3 0 0 3**

**UNIT I CONCEPTS**

**9**

Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools - 7 QC Tools and Modern Tools; Other related topics - Business Process Re-engineering –Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

**UNIT II SOFTWARE ENGINEERING CONCEPTS**

**9**

Software Engineering Principles, Software Project Management, Software Process, Project and Product Metrics, Risk Management, Software Quality Assurance; Statistical

Quality Assurance - Software Reliability, Muse Model; Software Configuration Management; Software Testing; CASE (Computer Aided Software Engineering).

**UNIT III QUALITY ASSURANCE MODELS 9**

Models for Quality Assurance-ISO-9000 - Series, CMM, SPICE, Malcolm Baldrige Award.

**UNIT IV SOFTWARE QUALITY ASSURANCE RELATED TOPICS 9**

Software Process - Definition and implementation; internal Auditing and Assessments; Software testing -Concepts, Tools, Reviews, Inspections & Walkthroughs; P-CMM.

**UNIT V INDUSTRIAL TRENDS 9**

PSP and TSP, CMMI, OO Methodology, Clean-room software engineering, Defect injection and prevention.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Watts Humphery, "Managing Software Process ", Addison - Wesley, 1998.
2. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.
3. Roger Pressman, "Software Engineering ", Sixth Edition, McGraw Hill, 2005.

**CS15B7 DATA MNING TECHNIQUES 3 0 0 3**

**AIM**

To do an advanced study of data mining techniques, data processing and association rules, data warehousing techniques and their applications.

**OBJECTIVES**

- To study the architecture and functionalities of Data mining systems.
- To do the detailed study of data preprocessing and mining association rules.
- To study in detail about the predictive modeling
- To do the detailed study of data warehousing approaches.
- To study the applications of data mining in detail.

**UNIT I INTRODUCTION 9**

Relation To Statistics, Databases- Data Mining Functionalities-Steps In Data Mining Process-Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems - Overview Of Data Mining Techniques.

**UNIT II DATA PREPROCESSING AND ASSOCIATION RULES 9**

Data Preprocessing-Data Cleaning, Integration, Transformation, Reduction, Discretization Concept Hierarchies-Concept Description: Data Generalization And Summarization Based Characterization- Mining Association Rules In Large Databases.

**UNIT III PREDICTIVE MODELING 9**

Classification And Prediction: Issues Regarding Classification And Prediction-

Classification By Decision Tree Induction-Bayesian Classification-Other Classification Methods-Prediction-Clusters Analysis: Types Of Data In Cluster Analysis-Categorization Of Major Clustering Methods: Partitioning Methods –Hierarchical Methods

**UNIT IV DATA WAREHOUSING**

**9**

Data Warehousing Components -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- -Mapping The Data Warehouse To Multiprocessor Architecture- OLAP.-Need- Categorization Of OLAP Tools.

**UNIT V APPLICATIONS**

**9**

Applications of Data Mining-Social Impacts Of Data Mining-Tools-An Introduction To DB Miner-Case Studies-Mining WWW-Mining Text Database-Mining Spatial Databases.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining, & OLAP", Tata Mcgraw- Hill, 2004.
3. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.

**CS15B8 NATURAL LANGUAGE UNDERSTANDING**

**L T P C**

**3 0 0 3**

**PURPOSE**

This course on Natural language Processing gives a better understanding of the machine translation of natural languages

**INSTRUCTIONAL OBJECTIVES**

- Understanding of NLP with respect to English language syntax and semantics
- Context and world knowledge
- Approaches to machine translation

**UNIT I INTRODUCTION**

**9**

Natural Language Understanding – The Different levels of Language Analysis – Representation and Understanding – the Organization of Natural Language Understanding Systems.

**UNIT II LINGUISTIC BACK GROUND 9**

Linguistic Back ground: The elements of Simple Sentences – Adjective Phrases and Adverbial Phrases Top – Down Parser – A Bottom – Up Chart Parser -Transition Networks Grammars.

**UNIT III FEATURES AND AUGMENTED GRAMMARS 9**

Features and Augmented Grammars: Some basic Feature systems for English - Parsing with features . Efficient Parsing: Shift Reduce Parser – Deterministic Parser . Semantic and Logical Form – Encoding Ambiguity in the logical form – Thematic Roles.

**UNIT IV SEMANTIC INTERPRETATION 9**

Semantic Interpretation and Compositionality – Lexicalized Semantic Interpretation and Semantic roles - semantic Interpretation Using Feature Unification . A Representation Based on FOPC – Handling Natural Language Quantification .

**UNIT V TECHNIQUES 9**

Local Discourse Context and Discourse Entities – Ellipses – Surface Anaphora – Establishing Coherence – Reference and Matching Expectations – Using Hierarchical Plans. Need – Segmentation and Cue Phrases – Tense and aspect – Managing the Attentional Stack – an Example.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. James Allen – “Natural Language Understanding “, Pearson Education, 2004.
2. Ronald Hausser “ Foundations of Computational Linguistics”, Springer- Verlog, 1999.
3. Winograd , “ Language as a cognitive process- syntax” , Addison Wesley
4. Popov , “ Talking with computer in Natural language” springer verlog,1986
5. Akshar Bharathi, Vineet Chaitanya, Rajeev Sangal , “Natural Language Processing – A Paninian Perspective” , PHI , 2000

**CS15B9**

**GRID COMPUTING**

**L T P C**

**3 0 0 3**

**AIM**

This course provides a way to understand the Grid computing technology and its applications

**INSTRUCTIONAL OBJECTIVES**

- Types of Grids and its architecture
- Open Grid Service Architecture and management
- Parallel computing environment, Grid services and applications

**UNIT I INTRODUCTION 9**

Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids

**UNIT II TYPES OF GRIDS 9**

Desktop Grids : Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight –

application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture

**UNIT III ARCHITECTURE AND MANAGEMENT 9**

The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI)

**UNIT IV NATIVE PROGRAMMING AND SOFTWARE APPLICATIONS 9**

Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software applications

**UNIT V APPLICATIONS, SERVICES AND ENVIRONMENTS 9**

Application integration – application classification – Grid requirements – Integrating applications with Middleware platforms – Grid enabling Network services – managing Grid environments – Managing Grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Different application areas of Grid computing

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Ahmar Abbas, “ Grid Computing , A Practical Guide to Technology and Applications”, Firewall media , 2004
2. Joshy Joseph , Craig Fellenstein , “Grid Computing”, Pearson Education , 2004
3. Foster , “Grid Blue print foe new computing

**CS15C1 NANO COMPUTING 3 0 0 3**

**UNIT I DEVICES 9**

Overview of current research in nano-scale electronics and devices, Semiconductor and Device 1(Materials and building blocks),Semiconductor and Device 2(Photonic Device and Materials),CMOS Device ,Limit of CMOS technology-Scaling Theory

**UNIT II QUANTUM CONCEPTS 9**

Nano-Physics-Quantum Mechanics, Quantum Device 1-Length Scales/Transport, Quantum Device 2-Ballistic Electron Transport, Coulomb Blockade, RTD, Electron-Wave Coupling Devices

**UNIT III FUNDAMENTAL OF CHEMISTRY 9**

Fundamental of chemistry, Organic Chemistry, Molecular Electronics I,(Molecular Semiconductors and Metals),Molecular Electronics II(Logic Gates),Carbon Nano tube and Its Application, Spintronics I, Spintronics II

**UNIT IV QUANTUM COMPUTATION 9**  
Quantum Computation I ,Quantum Computation II,DNA Computation, Nano-Fabrication  
1-photolithography, Nano-Fabrication 2,e-beam lithography,Advanced Nano-lithography

**UNIT V NANO CONCEPTS 9**  
Nano-Fabrication 3, Thin Film Technology MBE, CVD, PECVD, LB and Self Assembly,  
Spun-Coating,Nano-Characterization 1- Scanning Probe Microscopy,- Electron  
Microscopy (TEM, SEM), Nano-Characterization 2- Photon Spectroscopy, Electron  
Spectroscopy, Nanomanipulator

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Rainer Waser, Published by Wiley-VCH, 2003.
2. Sandeep Shukla and Iris Bahar R, Nano, Quantum and Molecular Computing, Kluwer Academic Publishers, 2004.
3. Poole C.P, Owens F.J, Wiley, Introduction to Nanotechnology ,2003.
4. Petty M.C, Bryce M.R, and Bloor D, Edward Arnold, Introduction to Molecular Electronics, 1995.

**CS15C2 CLOUD COMPUTING 3 0 0 3**

**Unit I INTRODUCTION 9**  
Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –  
Types of cloud-cloud deployment model-Why Cloud Computing Matters – Advantages  
of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud  
Today – Cloud Services.

**Unit II VIRTUALIZATION 9**  
Types of Virtualization, Browser as a platform, Web 2.0, Autonomic Systems, Cloud  
Computing Operating System, Deployment of applications on the cloud, Introduction to  
Map Reduce, Information retrieval through Map Reduce, Hadoop File System, GFS,  
Page Ranking using Map Reduce,Case studies- Xen, VMware, Eucalyptus, Amazon  
EC2.

**Unit III SCHEDULING 9**  
Task Management- Job scheduling – Resource Scheduling – Workflow Allocation- Load  
Balancing on Virtual Machine- Scheduling Algorithms-Genetic Simulated Annealing  
Algorithm for Task Scheduling – Dynamic Scheduling Algorithm – Time-Cost  
Scheduling Algorithm - Applications.

**Unit IV SECURITY 9**  
What is privacy? - What are the key privacy concerns in the cloud?-Who is responsible  
for protecting privacy-legal and regulatory implications-Security in cloud computing -

The future of security in cloud computing, Examples in cloud service providers-Amazon Web Services(IaaS)-Google(SaaS,PaaS).

## **Unit V ONLINE COLLABORATION**

**9**

Collaborating on Calendars, 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, Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files

**TOTAL: 45 PERIODS**

### **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.
3. Tim Mather,Subra Kumaraswamy,Shahed Latif,Cloud Security and Privacy,An Enterprise Perspective on Risks and Compliance,O'Reily Media Publisher,September-2009.
4. Rajkumar Buyya ;James Broberg;Andrzej Goscinski,Cloud Computing ;Principles and Paradigms,Publisher;JohnWiley&Sons,2011.

## **CS15C3 INFORMATION STORAGE & MANAGEMENT**

**3 0 0 3**

### **AIM:**

To have knowledge in varied storage infrastructure components in classic and virtual environments.

### **OBJECTIVES:**

It gives idea in

- Evaluate storage architectures and key data center elements in classic, virtualized, and cloud environment
- Explains physical and logical components of a storage infrastructure
- Articulate Business continuity solutions
- Describes information security requirements and solutions and storage networking technologies

## **UNIT I STORAGE SYSTEMS**

**8**

Key data centre elements-Host, connectivity, storage and application in both classic and virtual environments. RAID implementations, techniques, and levels along with the impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system implementations.

## **UNIT II STORAGE NETWORKING TECHNOLOGIES**

**12**

Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism ‘zoning’, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP protocols for storage access over IP network , Converged protocol FCoE and its components, Network Attached Storage (NAS)- components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

## **UNIT III BACKUP, ARCHIVE, AND REPLICATION**

**10**

Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery- methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

## **UNIT IV CLOUD COMPUTING**

**6**

Business drivers for cloud computing, Definition of cloud computing, Steps involved in transitioning from classic data center to cloud computing environment services and deployment models, cloud infrastructure components, Cloud migration considerations.

## **UNIT V SECURING AND MANAGING STORAGE INFRASTRUCTURE**

**6**

Security threats and countermeasures in various domains Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering, Cloud service management activities.

## **REFERENCES:**

1. Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments, 2<sup>nd</sup> Edition, EMC Education Services, Wiley.
2. Networked Storage Concepts and Protocols Techbook (online).
3. <https://education.emc.com/ISMbookv2/default.aspx>.

**CS15C4**

**MOBILE AND PERVASIVE COMPUTING**

**3 0 0 3**

## **OBJECTIVES:**

- To understand the basics of Mobile computing and Personal computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To study about the underlying wireless networks.



- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms.

**UNIT I INTRODUCTION 9**

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices

**UNIT II 3G AND 4G CELLULAR NETWORKS 9**

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

**UNIT III SENSOR AND MESH NETWORKS 9**

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks

**UNIT IV CONTEXT AWARE COMPUTING 9**

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware

**UNIT V APPLICATION DEVELOPMENT 9**

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone.

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Mobile Computing: Technology,
2. Applications and Service Creation”, Second Edition, Tata McGraw Hill, 2010.
3. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
4. Pei Zheng and Lionel M Li, ‘Smart Phone & Next Generation Mobile Computing’, Morgan Kaufmann Publishers, 2006.

5. Frank Adelstein, 'Fundamentals of Mobile and Pervasive Computing', TMH, 2005
6. Jochen Burthardt et al, 'Pervasive Computing: Technology and Architecture of Mobile Internet Applications', Pearson Education, 2003
7. Feng Zhao and Leonidas Guibas, 'Wireless Sensor Networks', Morgan Kaufmann Publishers, 2004
8. Uwe Hansmaan et al, 'Principles of Mobile Computing', Springer, 2003
9. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
10. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley.