

# **COURSE STRUCTURE AND SYLLABUS**

For

**M.Tech**

**COMPUTER SCIENCE**

*(Applicable for batches admitted from 2016-17)*



## **PRAGATI ENGINEERING COLLEGE** **(AUTONOMOUS)**

Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with "A" Grade  
Recognized by UGC 2(f) and 12(b) under UGC act, 1956  
# 1-378, ADB Road, Surampalem – 533 437  
Near Peddapuram, E.G.Dist, Andhra Pradesh



**PRAGATI ENGINEERING COLLEGE : SURAMPALEM**  
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**I Semester**

| S.No.                | Subject Code | Subject                              | L | T | C         |
|----------------------|--------------|--------------------------------------|---|---|-----------|
| 1                    | 16031T01     | Advanced Data Structures             | 4 | - | 3         |
| 2                    | 16031T02     | Formal Languages And Automata Theory | 4 | - | 3         |
| 3                    | 16031T03     | Computer Organization                | 4 | - | 3         |
| 4                    | 16031T04     | Database Internals                   | 4 | - | 3         |
| 5                    | 16031T05     | Operating Systems                    | 4 | - | 3         |
| 6                    | 16031T06     | Data Warehousing and Data Mining     | 4 | - | 3         |
| 7                    | 16031L01     | CS Lab- I                            | - | 3 | 2         |
| <b>Total Credits</b> |              |                                      | - | - | <b>20</b> |

**II Semester**

| S.No.                | Subject Code                     | Subject  | L | T | C         |
|----------------------|----------------------------------|--|---|---|-----------|
| 1                    | 16032T07                         | Cyber Security   | 4 | - | 3         |
| 2                    | 16032T08                         | Big Data Analytics   | 4 | - | 3         |
| 3                    | 16032T09                         | Web Technologies   | 4 | - | 3         |
| 4                    | 16032D01<br>16032D02<br>16032D03 | <b>Elective 1</b><br>Machine Learning<br>Compiler Design<br>Advanced Unix Programming            | 4 | - | 3         |
| 5                    | 16032D04<br>16032D05<br>16032D06 | <b>Elective 2</b><br>Image Processing<br>Mobile Computing<br>Object Oriented Analysis and Design | 4 | - | 3         |
| 6                    | 16032D07<br>16032D08<br>16032D09 | <b>Elective 3</b><br>Artificial Intelligence<br>Cloud Computing<br>Software Engineering          | 4 | - | 3         |
| 7                    | 16032L02                         | CS Lab- II   | - | 3 | 2         |
| <b>Total Credits</b> |                                  |  | - | - | <b>20</b> |



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**III Semester**

| <b>S.No.</b>         | <b>Subject Code</b> | <b>Subject</b>        | <b>L</b> | <b>T</b> | <b>C</b>  |
|----------------------|---------------------|-----------------------|----------|----------|-----------|
| 1                    | 16033P01            | Comprehensive Viva    | -        | -        | 2         |
| 2                    | 16033S01            | Seminar-I             | -        | -        | 2         |
| 3                    | 16033P02            | Project Work Part - I | -        | -        | 16        |
| <b>Total Credits</b> |                     |                       | -        | -        | <b>20</b> |

**IV Semester**

| <b>S.No.</b>         | <b>Subject Code</b> | <b>Subject</b>         | <b>L</b> | <b>T</b> | <b>C</b>  |
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| 1                    | 16034S02            | Seminar-II             | -        | -        | 2         |
| 2                    | 16034P03            | Project Work Part - II | -        | -        | 18        |
| <b>Total Credits</b> |                     |                        | -        | -        | <b>20</b> |



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**ADVANCED DATA STRUCTURES**

**UNIT- I:**

Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms. Stacks and Queues: Algorithm Implementation using Linked Lists.

**UNIT-II:**

Searching-Linear and Binary Search Methods. Sorting-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. Trees- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees(Infix,prefix,postfix).Graphs-Basic Concepts , Storage Structures and Traversals.

**UNIT- III:**

Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Double Hashing.

**UNIT- IV:**

Priority queues- Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion, Deletion .Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

**UNIT –V:**

Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations, Insertion, Deletion and Searching. Search Trees- Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

**TEXT BOOKS:**

1. Data Structures: A Pseudocode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press.

**REFERENCES BOOKS:**

1. Data Structures And Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures And Algorithms, 3/e, Adam Drozdek, Cengage.
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad, S Chand & Co,2009.



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**FORMAL LANGUAGE AND AUTOMATA THEORY**

**UNIT – I: Finite Automata**

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String by a Finite Automata, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

**UNIT – II: Regular Expressions**

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

**UNIT – III: Context Free Grammars**

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

**UNIT – IV: Pushdown Automata**

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

**UNIT – V: Turing Machine and Computability**

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine. Decidable and Un-decidable Problems, Halting Problem of Turing Machines, Post's Correspondence Problem, Modified Post's Correspondence Problem, Classes of P and NP, NP-Hard and NP-Complete Problems.

**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3<sup>rd</sup> Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3<sup>rd</sup> Edition, PHI, 2007.



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**REFERENCE BOOKS:**

1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.



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**COMPUTER ORGANIZATION**

**UNIT -I:**

**Basic Structure of Computers:** Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

**UNIT -II:**

**Machine Instruction and Programs:**

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.

**UNIT -III:**

**Type of Instructions:** Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations.

**UNIT -IV:**

**INPUT/OUTPUT ORGANIZATION:** Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

**UNIT -V:**

**The MEMORY SYSTEMS:** Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING **Secondary Storage:** Magnetic Hard Disks, Optical Disks, **Processing Unit:** Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, **Micro programmed Control:** Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field.

**TEXT BOOKS:**

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Saeaf Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

**REFERENCE BOOKS:**

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals of Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition.



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**DATABASE INTERNALS**

**UNIT- I:**

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, History of Database Systems. Introduction to Database design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.

**UNIT- II:**

Relational Algebra and Calculus: Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus. Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

**UNIT- III:**

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

**UNIT- IV:**

Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL. Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log , Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery





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**UNIT-V:**

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations. Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks. Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

**TEXT BOOKS:**

1. Database Management Systems, Raghu Ramakrishna, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Database System Concepts, A.Silberschatz, H.F. Korth, S. Sudarshan, McGraw hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition. Ramez Elmasri, Shamkant B.Navathe, Pearson Education, 2008.

**REFERENCE BOOKS:**

1. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.



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**OPERATING SYSTEMS**

**UNIT-I**

**Overview of Operating System**

Introduction, Computer System Organization, Computer System Architecture, Operating Systems Services, Systems Calls and Types, Evolution of Operating Systems.

**UNIT-II**

**Process Management**

Process, Process States , Process Control Block ,Process Scheduling, Operations On Processes, Threads Concepts, Process Scheduling Concepts, CPU Scheduling Algorithms, Multiple Processor Scheduling.

**UNIT-III**

**Synchronization**

Importance of Synchronization, The Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples

**Principles of Deadlock** – Deadlock System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Detection And Avoidance, Recovery Form Deadlock.

**UNIT-IV**

**Memory Management Strategies & Virtual Memory Management**

Concepts, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

**Secondary-Storage Structures & I/O Systems**

Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, Disk Management, RAID Structure, I/O Hardware, Application Interface, Kernel I/O Subsystem.

**UNIT-V**

**File System Interface And Implementation**

The Concept of a File, Access Methods, Directory Structure, File System Structure, File System Implementation, File Sharing, Protection, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

**Protection And Security:** Principles of Protection, Security Problem, System and Network Threats, Denial Lock Service, Importance of Cryptography.

**TEXT BOOKS:**

1. Operating System Principles,7/E,Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, WILEY INDIA publications.
2. Operating Systems, 6/e, William Stallings, PHI/Pearson.

**REFERENCE BOOKS:**

1. Operating Systems, 2/e, Dhamdhre.



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**DATA WAREHOUSING AND DATA MINING**

**UNIT 1: DATA WAREHOUSING:**

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.

**UNIT II: BUSINESS ANALYSIS:**

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

**UNIT III: DATA MINING:**

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

**UNIT IV: ASSOCIATION RULE MINING AND CLASSIFICATION:**

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

**UNIT V: CLUSTERING AND TRENDS IN DATA MINING:**

Cluster Analysis – Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods – Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

**TEXT BOOKS:**

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
  2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
- AULibrary.com

**REFERENCES:**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.



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3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T. Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.



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**CS LAB 1**

**Data Structures Programs:**

1. To implement Stacks & Queues using Arrays & Linked Lists.
2. To implement Stack ADT, Queue ADT using arrays & Linked Lists.
3. To implement Dequeue using Double Linked List & Arrays.
4. To perform various Recursive & Non-recursive operations on Binary Search Tree.
5. To implement BFS & DFS for a graph.
6. To implement Merge & Heap sort of given elements.
7. To perform various operations on AVL trees.
8. To implement Krushkal's algorithm to generate a min-cost spanning tree.
9. To implement Prim's algorithm to generate min-cost spanning tree.
10. To implement functions of Dictionary using Hashing.

**Operating system programs:**

1. Program to implement FCFS(First Come First Serve)scheduling Algorithms.
2. Program to implement SJF(Shortest Job First)Scheduling Algorithm.
3. Program to implement Priority Scheduling algorithm.
4. Program to implement Round Robin Scheduling algorithm.
5. Program to implement FIFO(First In First Out) Page Replacement Algorithm.
6. Program to implement LRU(least Recently used)Page Replacement Algorithm.
7. Program to implement LFU(Least Frequently used)Page Replacement Algorithm.
8. Write a program to implement how Disk Scheduling is done in operating system.
9. Draw the appropriate C.P.U performance graphs for SJF Scheduling Algorithm.



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**CYBER SECURITY**

**UNIT I:**

**Introduction:**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

**UNIT II:**

**Conventional Encryption:**

Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT III:**

**Number Theory:** Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms.

**Public key:** Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**UNIT IV:**

**IP Security:** IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**Transport Level Security:** Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

**Email Privacy:** Pretty Good Privacy (PGP) and S/MIME.

**UNIT V:**

**Intrusion Detection:** Intruders, Intrusion Detection systems, Password Management.

**Malicious Software:** Viruses and related threats & Countermeasures.

**Fire walls:** Firewall Design principles, Trusted Systems.

**TEXT BOOKS:**

1. Network Security & Cryptography: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

**REFERENCE BOOKS:**

1. Network Security & Cryptography, Bernard Menezes, Cengage, 2010.



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**BIG DATA ANALYTICS**

**UNIT-I**

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.

**UNIT-II**

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

**UNIT-III**

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

**UNIT-IV**

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

**UNIT-V**

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

**TEXT BOOKS:**

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss.

**REFERENCE BOOKS:**

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne.



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**SOFTWARE LINKS:**

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>





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**WEB TECHNOLOGIES**

**UNIT-I:**

**Java script :** The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

**UNIT-II:**

**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches, **AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.

**UNIT-III:**

**PHP Programming: Introducing PHP:** Creating PHP script, Running PHP script.

**Working with variables and constants:** Using variables, Using constants, Data types, Operators.

**Controlling program flow:** Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

**UNIT-IV:**

**PERL:** Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashes and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.

**UNIT-V:**

**RUBY:** Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails.

**TEXT BOOKS:**

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford.
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrell, Gosselin, Zak, Karparhi, MacIntyre, Morrissey, Cengage.

**REFERENCE BOOKS:**

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. <http://www.upriss.org.uk/perl/PerlCourse.html>



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**MACHINE LEARNING**  
**(Elective – 1)**

**UNIT -I: The ingredients of machine learning, Tasks:** the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning.

**Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation.

**UNIT- II: Beyond binary classification:** Handling more than two classes, Regression, Unsupervised and descriptive learning.

**Concept learning:** The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts.

**UNIT- III: Tree models:** Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction.

**Rule models:** Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning.

**UNIT -IV: Linear models:** The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.

**Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

**UNIT- V: Probabilistic models:** The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables.

**Features:** Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting.

**TEXT BOOKS:**

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

**REFERENCE BOOKS:**

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.



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**COMPILER DESIGN**  
**(Elective – 1)**

**UNIT – I**

Introduction Language Processing, Structure of a compiler the evaluation of Programming language, The Science of building a Compiler application of Compiler Technology. Programming Language Basics. Lexical Analysis:- The role of lexical analysis buffering, specification of tokens. Recognitions of tokens the lexical analyzer generator lexical.

**UNIT –II**

Syntax Analysis -: The Role of a parser, Context free Grammars Writing A grammar, top down passing bottom up parsing Introduction to Lr Parser.

**UNIT –III**

More Powerful LR parser (LR1, LALR) Using Armigers Grammars Equal Recovery in Lr parser Syntax Directed Transactions Definition, Evolution order of SDTS Application of SDTS. Syntax Directed Translation Schemes.

**UNIT – IV**

Intermediated Code: Generation Variants of Syntax trees 3 Address code, Types and Deceleration, Translation of Expressions, Type Checking. Canted Flow Back patching.

**UNIT – V**

Runtime Environments, Stack allocation of space, access to Non Local date on the stack Heap Management code generation – Issues in design of code generation the target Language Address in the target code Basic blocks and Flow graphs. A Simple Code generation.

**TEXT BOOKS:**

1. Compilers, Principles Techniques and Tools. Alfred V Aho, Monical S. Lam, Ravi Sethi Jeffery D. Ullman, 2nd edition, pearson, 2007.
2. Compiler Design K.Muneeswaran, OXFORD.
3. Principles of compiler design, 2nd edition, Nandhini Prasad, Elsebier.

**REFERENCE BOOKS:**

1. Compiler Construction, Principles and practice, Kenneth C Louden, CENGAGE.
2. Implementations of Compiler, A New approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER.



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**ADVANCED UNIX PROGRAMMING**  
**(Elective -1)**

**UNIT-I**

Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

**UNIT-II**

The File system –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type- The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

**UNIT-III**

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

**UNIT-IV**

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

**UNIT-V**

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The \$? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command- Debugging Scripts-The Script Command-The Eval Command-The Exec Command. The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command- The Kill Command-Job Control.

**TEXT BOOKS:**

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

**REFERENCE BOOKS:**

1. Unix and shell programming by B.M. Harwani, OXFORD university press.



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**IMAGE PROCESSING**  
**(Elective -2)**

**UNIT I:**

**Introduction:** Applications of Computer Graphics and Image Processing, Fundamentals on Pixel concepts, effect of Aliasing and Jaggles, Advantages of high resolution systems.

**DDA line algorithms:** Bresenhams line and circle derivations and algorithms.

**UNIT II:**

**2-D Transformations:** Translations, Scaling, rotation, reflection and shear transformations, Homogeneous coordinates, **Composite Transformations-** Reflection about an arbitrary line; Windowing and clipping, viewing transformations, Cohen- Sutherland clipping algorithm.

**UNIT III:**

**Digital Image Properties:** Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, Color perceived by humans, Color Spaces, Palette Images, color Constancy.

**Color Images:** Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Fri-chen, Canny Edge detection.

**UNIT IV:**

**Mathematical Morphology:** Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation.

**UNIT V:**

**SEGMENTATION:** Threshold detection methods, Optimal Thresholding, Edge based Segmentation- Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Mergingm Region Splitting, Splitting and Merging, Watershed Segmentation.

**Image Data Compression:** Image data Properties, Discrete Image Transformations in data compression, Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predicative Compression methods, Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG- MPEG Image Compression methods.

**TEXT BOOKS:**

1. Computer Graphics C Version, Donald Hearn, M Paulli Baker , Pearson ( Unit I and Unit II)
2. Image Processing, Analysis and Machine Vision, Millan Sonka, Vaclov Halvoc, Roger Boyle, Cengage Learning, 3ed, ( Unit III, Unit IV, Unit V and Unit VI)

**REFERENCES:**

1. Computer & Machine Vision, Theory , Algorithms , Practicles, E R Davies, Elsevier, 4ed.
2. Digital Image Processing with MATLAB and LABVIEW, Vipul Singh, Elsevier.



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**MOBILE COMPUTING**  
**(Elective -2)**

**UNIT- I**

**Introduction:** Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

**UNIT –II**

**(Wireless) Medium Access Control (MAC):** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

**UNIT –III**

**Mobile Network Layer:** IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, HCP.

**UNIT –IV**

**Mobile Transport Layer:** Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

**Database Issues:** Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

**UNIT- V**

**Data Dissemination and Synchronization :** Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

**Mobile Ad hoc Networks (MANETs) :** Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery.

**Protocols and Platforms for Mobile Computing:** WAP, Bluetooth, XML, J2ME, Java Card, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

**TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772.

**REFERENCE BOOKS:**

1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, “Mobile Computing, Technology Applications and Service Creation” Second Edition, Mc Graw Hill.
2. UWE Hansmann, Lothar Merk, Martin S. Nocklous, Thomas Stober, “Principles of Mobile Computing,” Second Edition, Springer.



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**OBJECT ORIENTED ANALYSIS AND DESIGN**  
**(Elective – 2)**

**UNIT-I:**

**Introduction:** The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

**UNIT-II:**

**Classes and Objects:** Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

**UNIT-III:**

**Introduction to UML:** Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

**UNIT-IV:**

**Basic Behavioral Modeling:** Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

**UNIT-V:**

**Advanced Behavioral Modeling:** Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams.

**TEXT BOOKS:**

1. “Object- Oriented Analysis And Design with Applications”, Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.
2. “The Unified Modeling Language User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

**REFERENCE BOOKS:**

1. “Object-oriented analysis and design using UML”, Mahesh P. Matha, PHI.
2. “Head first object-oriented analysis and design”, Brett D. McLaughlin, Gary Pollice, Dave West, O’Reilly.



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**ARTIFICIAL INTELLIGENCE**  
**(Elective – 3)**

**UNIT-I:**

**Introduction to artificial intelligence:** Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI.

**UNIT-II:**

**Problem solving: state-space search and control strategies :** Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening  $a^*$ , constraint satisfaction.

**Problem reduction and game playing:** Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games.

**UNIT-III:**

**Logic concepts:** Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

**UNIT-IV:**

**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web.

**UNIT-V:**

**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

**TEXT BOOKS:**

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA.
3. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH.
4. Introduction to Artificial Intelligence, Patterson, PHI.

**REFERNCE BOOKS:**

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Luger, 5th ed, PEA.
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer.
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier.





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**CLOUD COMPUTING**  
(Elective -3)

**UNIT I:**

**Introduction:** Network centric computing, Network centric content, peer-to-peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems:** introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

**UNIT II:**

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing. **Cloud Computing:** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

**UNIT III:**

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades. **Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

**UNIT IV:**

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2) **Cloud Security:** Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

**UNIT V:**

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1) **Google:** Google App Engine, Google Web Toolkit (Text Book 2) **Micro Soft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

**TEXT BOOKS:**

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH.



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**REFERNCE BOOK:**

1. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH.



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**SOFTWARE ENGINEERING**  
**(Elective – 3)**

**UNIT-I:**

**Software and Software Engineering:** The Nature of Software, The Unique Nature of Web Apps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

**Process Models:** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

**UNIT-II:**

**Requirements Analysis and Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

**Software Design:** Overview of the Design Process, How to Characterise of a Design?, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design.

**UNIT – III:**

**Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

**User Interface Design:** Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

**UNIT – IV:**

**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black- Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing.

**UNIT – V:**

**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

**Computer Aided Software Engineering:** Case and its Scope, Case Environment, Case Support in Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment.

**TEXT BOOKS:**

1. Software Engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition McGraw Hill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education.

**REFERENCE BOOKS:**

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.



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2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering 1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.



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**CS LAB-2**

1. a) Study of Unix/Linux general purpose utility command list  
man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
- b) Study of vi editor.
- c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
- d) Study of Unix/Linux file system (tree structure).
- e) Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program that makes a copy of a file using standard I/O, and system calls
3. Write a C program to emulate the UNIX ls -l command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe.  
Ex: - ls -l | sort
5. Write a C program that illustrates two processes communicating using shared memory
6. Write a C program to simulate producer and consumer problem using semaphores
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.
9. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.
10. Write a Ruby program that uses iterator to find out the length of a string.
11. Write simple Ruby programs that uses arrays in Ruby.
12. Write programs which uses associative arrays concept of Ruby.
13. User Authentication: Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
  1. Create a Cookie and add these four user id's and passwords to this Cookie.
  2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.  
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ".Use init-parameters to do this.
14. Example PHP program for registering users of a website and login.