JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech in WEB TECHNOLOGY

EFFECTIVE FROM ACADEMIC YEAR 2017- 18 ADMITTED BATCH

COURSE STRUCTURE AND SYLLABUS

**I Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| PC-1 | Advanced Algorithms | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-2 | Web Technologies and Services | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-3 | Computer Networking | 25 | 75 | 4 | 0 | 0 | 4 |
| PE-1 | 1. Web  Security<br>2. Database Internals<br>3. Web Mining<br>4. Semantic Web and Social Networks | 25 | 75 | 3 | 0 | 0 | 3 |
| PE-2 | 1. Multimedia and Rich Internet Applications<br>2. Object Oriented Modeling<br>3. Scripting Languages<br>4. Information Retrieval Systems | 25 | 75 | 3 | 0 | 0 | 3 |
| OE-1 | *Open Elective – 1 | 25 | 75 | 3 | 0 | 0 | 3 |
| Laboratory I | Web Programming and Networking Programming | 25 | 75 | 0 | 0 | 3 | 2 |
| Seminar I | Seminar-I | 100 | 0 | 0 | 0 | 3 | 2 |
| | **Total** | **275** | **525** | **21** | **0** | **6** | **25** |

**II Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| PC-4 | Web Services and Service Oriented Architecture | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-5 | Mobile  Application Development | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-6 | Internet Of Things | 25 | 75 | 4 | 0 | 0 | 4 |
| PE-3 | 1. Human Computer Interaction<br>2. Cyber Security<br>3. Software Architecture  and Design Patterns<br>4. Computer Forensics | 25 | 75 | 3 | 0 | 0 | 3 |
| PE4 | 1. Big Data Analytics<br>2. Cloud Computing<br>3. Distributed Systems<br>4. Distributed Computing | 25 | 75 | 3 | 0 | 0 | 3 |
| OE-2 | *Open Elective – 2 | 25 | 75 | 3 | 0 | 0 | 3 |
| Laboratory II | Mobile  Application Development Lab and IOT Lab | 25 | 75 | 0 | 0 | 3 | 2 |
| Seminar II | Seminar -II | 100 | 0 | 0 | 0 | 3 | 2 |
| | **Total** | **275** | **525** | **21** | **0** | **6** | **25** |

**III Semester**

| Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|
| Technical Paper Writing | 100 | 0 | 0 | 3 | 0 | 2 |
| Comprehensive Viva-Voce | 0 | 100 | 0 | 0 | 0 | 4 |
| Project work Review II | 100 | 0 | 0 | 0 | 22 | 8 |
| **Total** | **200** | **100** | **0** | **3** | **22** | **14** |

**IV Semester**

| Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|
| Project work Review III | 100 | 0 | 0 | 0 | 24 | 8 |
| Project Evaluation (Viva-Voce) | 0 | 100 | 0 | 0 | 0 | 16 |
| **Total** | **100** | **100** | **0** | **0** | **24** | **24** |

**\*Open Elective subjects must be chosen from the list of open electives offered by OTHER departments.**

**# For Project review I, please refer 7.10 in R17 Academic Regulations.**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**ADVANCED ALGORITHMS (PC – 1)**

**Course Objectives:**
- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field
- Various aspects of algorithm development
- Qualities of a good solution

**Unit - I : Introduction -** Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Strassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis.

**Unit - II: Review of Data Structures**- Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

**Unit - III:  Dynamic Programming -** Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms **-** Elements of the greedy strategy, Huffman codes, Amortized Analysis - Aggregate analysis, The accounting method, The potential method, Dynamic tables.

**Unit - IV: Graph Algorithms -** Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

**Unit - V: NP-Complete & Approximate Algorithms**-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems -  Clique problem, Vertex-cover problem, formula satisfiability, 3 CNF Satisfiabilty, The vertex-cover problem, The traveling-salesman problem, The subset-sum problem.

**TEXT BOOKS:**
1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third *Edition*, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

**REFERENCES:**
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication
2. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**WEB TECHNOLOGIES AND SERVICES (PC – 2)**

**Course Objective:**
The student who has knowledge of programming with java should be able to develop web based solutions using multi-tier architecture. S/he should have good understanding of different technologies on client and server side components as Follows:

- Client Side: HTML5, CSS3, Javascript, Ajax, JQuery and JSON
- Server Side: Servlets, JSP
- Database: MySQL with Hibernate and Connection Pooling
- Framework: Struts with validation framework, Internationalization (I18N)
- SOA: Service Oriented Architecture, Web services fundamentals, Axis framework for WS

**UNIT - I**
**Client Side Technologies:**
Overview of HTML - Common tags, XHTML, capabilities of HTML5, Cascading Style sheets, CSS3 enhancements, linking to HTML Pages, Classes in CSS,
Introduction to JavaScripts, variables, arrays, methods and string manipulation, BOM/DOM (Browser/Document Object Model), accessing elements by ID, Objects in JavaScript
Dynamic HTML with JavaScript and with CSS, form validation with JavaScript, Handling Timer Events
Simplifying scripting with JQuery, JASON for Information exchange.

**UNIT - II**
**Introduction to Java Servlets:** Introduction to Servlets: Lifecycle of a Servlet, Reading request and initialization parameters, Writing output to response, MIME types in response, Session Tracking: Using Cookies and Sessions, Steps involved in Deploying an application, Database Access with JDBC and Connection Pooling
Introduction to XML, XML Parsing with DOM and SAX Parsers in Java
Ajax - Ajax programming with JSP/Servlets, creating XML Http Object for various browsers, Sending request, processing response data and displaying it.
Introduction to Hibernate

**UNIT - III**
**Introduction to JSP:** JSP Application Development: Types of JSP Constructs (Directives, Declarations, Expressions, Code Snippets), Generating Dynamic Content, Exception Handling, Implicit JSP Objects, Conditional Processing, Sharing Data Between JSP pages, Sharing Session and Application Data, Using user defined classes with jsp:useBean tag, Accessing a Database from a JSP

**UNIT - IV**
**Introduction to Struts Framework:** Introduction to MVC architecture, Anatomy of a simple struts2 application, struts configuration file, Presentation layer with JSP, JSP bean, html and logic tag libraries, Struts Controller class, Using form data in Actions, Page Forwarding, validation frame work, Internationalization

**UNIT - V**
**Service Oriented Architecture and Web Services:** Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of a SOA

Introduction to Web Services– The definition of web services, basic operational model of web services, basic steps of implementing web services.

Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models, Describing Web Services –Web Services life cycle, anatomy of WSDL

Introduction to Axis– Installing axis web service framework, deploying a java web service on axis.

Web Services Interoperability **–** Creating java and .Net client applications for an Axis Web Service

(Note: The Reference Platform for the course will be open source products Apache Tomcat Application Server, MySQL database, Hibernate and Axis)

**TEXT BOOKS:**
1. Web Programming, building internet applications, Chris Bates 3$^{rd}$ edition, WILEY Dreamtech .
2. The complete Reference Java 7$^{th}$ Edition, Herbert Schildt., TMH.
3. Java Server Pages,Hans Bergsten, SPD, O'Reilly.
4. Professional Jakarta Struts - James Goodwill, Richard Hightower, Wrox Publishers.
5. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp – 2008.
6. Understanding SOA with Web Services, Eric Newcomer and  Greg Lomow, Pearson Edition – 2009
7. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier - 2009

**REFERENCE BOOKS**:
1. Programming the world wide web, 4$^{th}$ edition, R.W. Sebesta, Pearson
2. Core  Servlets and Java Server Pages Volume 1: core Technologies, Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson.
4. Jakarta Struts Cookbook, Bill Siggelkow, S P D O'Reilly.
5. Professional Java Server Programming, S. Allamaraju & others Apress (dreamtech).
6. Java Server Programming, Ivan Bayross and others, The X Team,SPD
7. Web Warrior Guide to Web Programming - Bai/Ekedaw-Cengage Learning.
8. Beginning Web Programming-Jon Duckett, WROX.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**COMPUTER NETWORKING (PC – 3)**

### UNIT-1

The internet architecture, Access Networks, The network Core, Peer-to-Peer Networks, Content Distribution Networks, Delay Tolerant Networks, Circuit Switching vs. Packet switching, Packet switching Delays and congestion, Client/Server and Peer-to-Peer Architectures, MAC and LLC, Virtual LAN, Asynchronous Transfer Mode (ATM)

### UNIT-2

Network Address Translator, Internet Control Message Protocol, SNMP, CIDR, IPv6, Routing Protocol Basics in advanced networks, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Switching Services, Spanning Tree Protocol (STP), Standard Network Management Protocol.

### UNIT-3

TCP and Mobile TCP, TCP Tahoe and TCP Reno, High speed TCP, Coexistence of UDP and TCP flows, HTTP and HTTPS, FTP and SFTP, Domain Name Service, TCP and UDP sockets

### UNIT-4

Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Delay Analysis, Connectivity and Availability, Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet.
Introduction, Wireless Links and Network Characteristics, CDMA, WiFi: 802.11, Wireless LANs, The 802.11 Architecture, The 802.11 MAC Protocol, The IEEE 802.11 Frame, Mobility in the Same IP Subnet, Advanced Features in 802.11, Personal Area Networks: Bluetooth and Zigbee, Cellular Internet Access, An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular Subscribers, On to 4G: LTE, Mobility Management: Principles, Addressing, Routing to a Mobile Node, Mobile IP ,Managing Mobility in Cellular Networks, Routing Calls to a Mobile User, Handoffs in GSM, Wireless and Mobility: Impact on Higher-Layer Protocols

### UNIT-5

Explaining IP Multicasting, VOIP, Unified Communication, Virtual Networking, Data center Networking, Introduction to Optical Networking, SONET /SDH Standard, Next generation cellular networks, Secure Socket Layer, IP Sec, TLS, Kerberos, Domain name system Protection.

**TEXT BOOKS:**
1. Computer Networking: A Top-Down Approach, 6/e, James F. Kurose and Keith W. Ross, Pearson Education, 2012.
2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A systems approach, Morgan Kaufman, 5th Edition, 2012
3. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill
4. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings,* Second Edition, Pearson Education.
5. Top-Down Network Design, *Priscilla Oppenheimer,* Second Edition, Pearson Education (CISCO Press)

**REFERENCE BOOKS:**

1. Advance Computer Network, By Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, Wiley India
2. CCNA Intro – Study Guide – Todd Lammle, Sybex
3. Computer Networks by Mayank Dave, Cengage.
4. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson,* Fifth Edition, Thomson.
5. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
6. An Engineering Approach to Computer Networking*, S.Keshav,* Pearson Education.
7. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet,* Pearson Education (CISCO Press)
8. Computer Communications Networks, Mir, Pearson Education.
9. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to computer networks and Cyber Security, CRC press, Taylor & Francis Group, 2014
10. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014
11. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M.Tech- I Year – I Semester (Web Technologies)**

**WEB SECURITY**
**(Professional Elective –I)**

**Course Objectives:**
- To learn web security objectives
- To learn about vulnerabilities in web hacking
- To learn about phishing, digital certificates, etc.

**UNIT - I :**
**The Web Security Landscape:** The Web Security Problem, Risk Analysis, and Best Practices;
**Cryptography and the Web:** Cryptography and Web Security, Working Cryptographic Systems and Protocols, What Cryptography Can't Do? , Legal Restrictions on Cryptography.

**UNIT - II:**
**The Web's War on Your Privacy:** Understanding Privacy, User-Provided Information, Log Files, Understanding Cookies, Web Bugs, Conclusion; **Privacy-Protecting Techniques:** Choosing a Good Service Provider, Picking a Great Password, Cleaning up after Yourself, Avoiding Spam and Junk Email, Identity Theft;
**Privacy-Protecting Technologies:** Blocking Ads and Crushing Cookies, Anonymous Browsing, Secure Email,
**Backups and Anti Theft:** Using Backups to Protect Your Data, Preventing theft.

**UNIT – III:**
**Physical security for Servers:** Planning for the Forgotten Threats, Protecting Computer Hardware, Protecting Your Data,
**Host Security for Servers:** Current Host Security Problems, Securing the Host Computer, minimizing Risk by Minimizing Services, Operating Securely, Secure Remote Access and Content Updating, firewalls and the Web,
**Securing Web Applications:** A Legacy of Extensibility and Risk, Rules to Code By, Security Using Fields, Hidden Fields and Cookies, Rules for Programming languages, Using PHP Securely, Writing Scripts That Run with Additional Privileges, Connecting to Databases.

**UNIT - IV:**
**Deploying SSL Server Certificates:** Planning for your SSL Server, Creating SSL Servers with FreeBSD, Installing an SSL Certificate on Microsoft IIS, Obtaining a Certificate from a Commercial CA, When Things Go Wrong;
**Securing Your Web Service:** Protecting Via Redundancy, Protecting Your DNS, Protecting Your Domain Registration.

**UNIT - V:**
**Controlling Access to Your Web Content:** Access Control Strategies, Controlling Access with Apache, Controlling Access with Microsoft IIS;
**Client-Side Digital Certificates:** Client Certificates, A Tour of the VeriSign Digital ID Center;
**Pornography, Filtering Software and Censorship:** Pornography Filtering, PICS, RSAC,
**Privacy Policies, Legislation, and P3P:** Policies that Protect Privacy and Privacy Policies, Children's Online Privacy Protection Act, P3P.

**TEXT BOOKS:**
1. Web Security, Privacy & Commerce: Simson Garfinkel, Gene Spafford, SPD O'reilly.

**REFERENCE BOOKS:**
1. Web Application Security: Bryan Sullivan, Vincent Liu, Mc Graw Hill.
2. Web Application Hacker's Handbook: Dafydd Stuttard, Marcus Pinto, 2nd Edition, Wiley India.
3. Hacking Exposed Web Applications 3: Joel Scambray, Vincent Liu, Caleb Sima, TMH.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**DATABASE INTERNALS**
**(Professional Elective –I)**

**Course Objectives:** By the end of the course, student will know:

- History and Structure of databases
- How to design a database
- How to convert the design into the appropriate tables
- Handling Keys appropriately
- Enforcing Integrity Constraints to keep the database consistent
- Normalizing the tables to eliminate redundancies
- Querying relational data
- and processing the queries
- Storage Optimizing Strategies for easy retrieval of data through index
- Triggers, Procedures and Cursors ,Transaction Management
- Distributed databases management system concepts and Implementation

**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, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL,Triggers

**UNIT - II**
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.

**UNIT - III**
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 Deadlocks, Specialized Locking Techniques – Concurrency Control without Locking.
Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

**UNIT - IV**

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, 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.

**UNIT - V**

**Distributed databases: I**ntroduction to distributed databases, Distributed DBMS architectures, Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery

**TEXT BOOKS:**

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3$^{rd}$ Edition, 2003.
2. Data base 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. Introduction to Database Systems, C.J. Date, Pearson Education.
2. Database Management System Oracle SQL and PL/SQL, P.K. Das Gupta, PHI.
3. Database System Concepts, Peter Rob, & Carlos Coronel, Cengage Learning, 2008.
4. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
5. Database-Principles, Programming and Performance, P. O'Neil & E. O'Neil, 2$^{nd}$ ed, ELSEVIER
6. Fundamentals of Relational Database Management Systems, S. Sumathi, S. Esakkirajan, Springer.
7. Introduction to Database Management, M.L. Gillenson and others, Wiley Student Edition.
8. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
9. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH.
10. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition.
11. Distributed Database Systems, Chhanda Ray, Pearson.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**WEB MINING**
**(Professional Elective –I)**

**Course Objectives:**
- To describe web mining and understand the need for web mining
- To differentiate between Web mining and data mining
- To understand the different application areas for web mining
- To understand the different methods to introduce structure to web-based data
- To describe Web mining, its objectives, and its benefits
- To understand the methods of Web usage mining

**UNIT - I**
Introduction to Web Data Mining and Data Mining Foundations, Introduction – World Wide Web (WWW), A Brief History of the Web and the Internet, Web Data Mining-Data Mining, Web Mining.
Data Mining Foundations – Association Rules and Sequential Patterns – Basic Concepts of Association Rules, Apriori Algorithm- Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports – Extended Model, Mining Algorithm, Rule Generation, Mining Class Association Rules, Basic Concepts of Sequential Patterns, Mining Sequential Patterns on GSP, Mining Sequential Patterns on PrefixSpan, Generating Rules from Sequential Patterns.

**UNIT - II**
**Supervised and Unsupervised Learning**
Supervised Learning - Basic Concepts, Decision Tree Induction – Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier Evaluation, Rule Induction – Sequential Covering, Rule Learning, Classification Based on Associations, Naïve Bayesian Classification , Naïve Bayesian Text Classification - Probabilistic Framework, Naïve Bayesian Model .
Unsupervised Learning – Basic Concepts , K-means Clustering – K-means Algorithm, Representation of Clusters, Hierarchical Clustering – Single link method, Complete link Method, Average link method, Strength and Weakness.

**UNIT - III**
**Information Retrieval and Web Search:**
Basic Concepts of Information Retrieval, Information Retrieval Methods - Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming.

**UNIT - IV**
**Link Analysis and Web Crawling:**
Link Analysis - Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery-Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities.
Web Crawling – A Basic Crawler Algorithm- Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stopword Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts.

**UNIT - V**

Opinion Mining and Web Usage Mining

Opinion Mining - Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros and Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam.

Web Usage Mining - Data Collection and Preprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns.

**TEXT BOOK:**
1. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data by Bing Liu (Springer Publications)

**REFERENCES BOOKS:**
1. Data Mining: Concepts and Techniques, Second Edition Jiawei Han, Micheline Kamber (Elsevier Publications)
2. Web Mining:: Applications and Techniques by Anthony Scime
3. Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Chakrabarti

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**SEMANTIC WEB AND SOCIAL NETWORKS**
**(Professional Elective-I)**

**Course Objectives:**
- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

**UNIT –I:**
Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

**UNIT -II:**
Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

**UNIT-III:**
Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

**UNIT-IV:**
Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

**UNIT-V:**
Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

**TEXT BOOKS:**
1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

**REFERENCE BOOKS:**
1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)

3. Information sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**MULTIMEDIA AND RICH INTERNET APPLICATIONS**
**(Professional Elective –II)**

**Course Objectives:**
This course aims to further develop students' competency in producing dynamic and creative graphic solutions for multimedia productions. It provides students with the basic concepts and techniques of interactive authoring. It also introduces students with the advanced scripting skills necessary for implementing highly interactive, rich internet applications using multimedia technologies and authoring tools. Students will develop aesthetic value and competencies in multimedia authoring. Artistic visual style and layout design are stressed, as well as the editing and integration of graphic images, animation, video, and audio files. The course allows students to master industry-wide software and technologies to create highly interactive, rich internet applications.

**UNIT - I**
**Introduction to Multimedia:** Internet and Multimedia communications, Multimedia Networks, Multimedia Applications, Multimedia Information representation- Digitization Principles, Text, Images, Audio and Video, Compression Methods-Basic Coding Methods – Run Length coding, Huffman coding, Arithmetic coding, Discrete Cosine Transform, Differential PCM, Motion Compensated Prediction, Video Compression – JPEG, H.261, MPEG-1 Video, MPEG 2 and 3 Video, H.263, Wavelet and Fractal Image Compression, Audio Compression.

**UNIT - II**
**Multimedia Applications in Networks:** Introduction, Application Level Framing, Audio/Video Conferencing-Session Directories, Audio/Video Conferencing, Adaptive Applications, Receiver Heterogeneity, Real Time Application with Resource   Reservation ,Video Server, Applications requiring reliable multicast – White Board , Network Text Editor for Shared Text Editing, Multi Talk, Multicast file transfer, Multimedia Applications on the World Wide Web – Multicast Web Page Sharing, Audio/Video Streams in the www,  Interactive Multiplayer Games.

**UNIT - III**
**Web 2.0:** What is web 2.0, Search, Content Networks, User Generated Content, Blogging, Social Networking, Social Media, Tagging, Social Marking, Rich Internet Applications, Web Services, Mashups, Location Based Services, XML, RSS, Atom, JSON, and VoIP, Web 2.0 Monetization and Business Models, Future of the Web.

**UNIT - IV**
**Rich Internet Applications (RIAs) with Adobe Flash and Flex**: Adobe Flash- Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, Publish your flash movie, Creating special effects with Flash, Creating a website splash screen, action script, web sources.
Adobe Flex 2- Introduction, Flex Platform Overview, Creating a Simple User Interface, Accessing XML data from your application, Interacting with Server Side Applications, Customizing your User Interface, Creating Charts and Graphs, Connection Independent RIAs on the desktop -Adobe Integrated Runtime (AIR), Flex 3 Beta.

**UNIT - V**
**Ajax- Enabled Rich Internet Application:**      Introduction, Traditional Web Applications Vs Ajax Applications, Rich Internet Application with Ajax, History of Ajax, Raw Ajax example using xml http request object, Using XML, Creating a full scale Ajax Enabled application, Dojo ToolKit.

**TEXT BOOKS:**
1. Multimedia Communications: Protocols and Applications, Franklin F Kuo, J.Joaquin Garcia, Wolf gang Effelsberg, Prentice Hall Publications.
2. Multimedia Communications: Applications, Networks, Protocols and Standards, Fred Halsall, Addison Wesley Publications.
3. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel and Harvey M Deitel, Deitel Developer Series, Pearson education.

**REFERENCE BOOKS:**
1. Professional Adobe Flex 2, Rich Tretola, Simon barber and Renaun Erickson, Wrox, Wiley India Edition.
2. Multimedia Information Networking, Nalin K Sharda, PHI Learning.
3. Multimedia Computing, Communications & Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education.
4. Multimedia Communication Systems: techniques, standards and networks, K.R.Rao, Bojkovic and Milovanovic, PHI Learning.
5. Programming Flex 3, C. Kazoun and J. Lott, SPD.
6. Dojo, J.E. Harmon, Pearson Education.
7. Adobe Flex 3: Training from the Source, Tapper & others, Pearson Education.
8. Principles of Multimedia, R.Parekh, TMH.
9. Mastering Dojo, R. Gill, C. Riecke and A. Russell, SPD.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**OBJECT ORIENTED MODELING**
**(Professional Elective –II)**

**Course Objectives:**

- Concisely define the following key terms: class, object, state, behavior, object class, class diagram, object diagram, operation, encapsulation, constructor operation, query operation, update operation, scope operation, association, association role, multiplicity, association class, abstract class, concrete class, class-scope attribute, abstract operation, method, polymorphism, overriding, multiple classification, aggregation, and composition.
- To describe the activities in the different phases of the object-oriented development life cycle.
- State the advantages of object-oriented modeling vis-à-vis structured approaches.
- Compare and contrast the object-oriented model with the E-R and EER models.
- Model a real-world application by using a UML class diagram.
- Provide a snapshot of the detailed state of a system at a point in time using a UML (Unified Modeling Language) object diagram.
- Recognize when to use generalization, aggregation, and composition relationships.
- Specify different types of business rules in a class diagram.

**UNIT - I**
**Introduction to UML**: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture.
**Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams.
**Class & Object Diagrams:** Terms, concepts, modeling techniques for Class & Object Diagrams.
**Collaboration Diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration diagrams, iterated messages, use of self in messages.
**Sequence Diagrams:** Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

**UNIT - II**
**Basic Behavioral Modeling:** Use cases, Use case Diagrams, Activity Diagrams.
**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.

**UNIT - III**
**The Unified process**: use case driven, architecture centric, iterative, and incremental
**The Four Ps:** people, project, product, and process
**Use case driven process:** why use case, capturing use cases, analysis, design, and implementation to realize the use cases, testing the use cases
**Architecture-centric process:** architecture in brief, why we need architecture, use cases and architecture, the steps to architecture, an architecture description.

**UNIT - IV**
**Iterative incremental process:** iterative incremental in brief, why iterative incremental development? The iterative approach is risk driven, the generic iteration.

**The Generic Iteration workflow:** phases are the first division workflow, planning proceeds doing, risks affect project planning, use case prioritization, resource needed, assess the iteration and phases

**Inception phase:** early in the inception phase, the archetypal inception iteration workflow, execute the core workflows, requirements to test.

### UNIT - V

**Elaboration Phase:** elaboration phase in brief, early in the elaboration phase, the architectural elaboration iteration workflow, execute the core workflows-Requirements to test.

**Construction phase:** early in the construction phase, the archetypal construction iteration workflow, execute the core workflow.

**Transition phase:** early in the transition phase, activities in transition phase

**Case Studies:** Automation of a Library, Software Simulator application (2-floor elevator simulator)

### TEXT BOOKS:
1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson 2<sup>nd</sup> Edition, Pearson Education.
2. UML 2 Toolkit by Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado WILEY-Dreamtech India Pvt. Ltd.
3. The Unified Software Development Process by Ivar Jacobson, Grady Booch, James Rumbaugh, Pearson Education

### REFERENCE BOOKS:
1. Fundamentals of Object Oriented Design in UML By Meilir Page-Jones, Pearson Education
2. Object Oriented Analysis & Design By Atul Kahate, The McGraw-Hill.
3. Practical Object-Oriented Design with UML By Mark Priestley, TATA Mc Graw Hill
4. Object Oriented Analysis & Design By Brett D McLaughlin, Gary Pollice and David West, O'reily.
5. Object-Oriented Analysis and Design using UML by Simon Bennet, Steve McRobb and Ray Farmer, 2<sup>nd</sup> Edition, TATA Mc Graw Hill.
6. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.
7. UML and C++, R.C. Lee, and W.M. Tepfenhart, PHI.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**SCRIPTING LANGUAGES**
**(Professional Elective –II)**

**Course Objectives:**
- To be able to introduce core programming basics and program design with functions using Python programming language.
- To understand the high-performance programs designed to strengthen the practical expertise.

**Unit - I:**
Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations (Operators. Type conversions, Expressions), More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
**Data types and Expressions: Strings**, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

**Unit - II:**
**Control Statements:** Definite Iteration, Formatting Text for Output, Selection, Conditional Iteration.
File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.
Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers,  The math Module, Storing Functions in Modules.

**Unit - III:**
**Strings and Text Files:** Accessing Characters and Substrings in a String, Strings and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption,  Lists, Introduction to Lists, List slicing, Finding Items in Lists with the  in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists,  Tuples Sequences, Tuples. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

**Unit - IV:**
**Design with Classes:** Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes.

**Unit - V**
**Graphical User Interfaces:** Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

**Simple Graphics and Image Processing:** Overview of Turtle Graphics, Two dimensional Shapes, Colors and RBG System, Image Processing.

**TEXT BOOKS:**
1. Kenneth A. Lambert, the Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

**REFERENCE BOOKS:**
1. Introduction to Computation and Programming Using Python.  , John V. Guttag, the MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3  The Pragmatic Bookshelf, 2nd edition (4 Oct. 2013)
4. Charles Dierach, Introduction to Computer Science using Python

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**INFORMATION RETRIEVAL SYSTEMS**
**(Professional Elective –II)**

**Course Objectives:** On completion of this course you should have gained a good understanding of the foundation concepts of information retrieval techniques and be able to apply these concepts into practice. Specifically, you should be able to:

- To use different information retrieval techniques in various application areas
- To apply IR principles to locate relevant information large collections of data
- To analyze performance of retrieval systems when dealing with unmanaged data sources
- To implement retrieval systems for web search tasks.

**UNIT - I**
Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

**UNIT - II**
Scoring, term weighting, and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion.

**UNIT - III**
XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

**UNIT - IV**
Support vector machines and machine learning on documents, Flat clustering, Hierarchical clustering, Matrix decompositions and latent semantic indexing.

**UNIT - V**
Web search basics. Web crawling and indexes, Link analysis.

**TEXT BOOK:**
1. Introduction to Information Retrieval , Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.

**REFERENCE BOOKS:**
1. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury, Springer.
2. Modern Information Retrieval, Ricardo Baeza-Yates, Pearson Education, 2007.
3. Information Retrieval: Algorithms and Heuristics, David A Grossman and Ophir Frieder, 2nd Edition, Springer, 2004.
4. Information Retrieval Data Structures and Algorithms, William B Frakes, Ricardo Baeza-Yates, Pearson Education, 1992.
5. Information Storage & Retieval, Robert Korfhage, John Wiley, & Sons.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- I Year – I Semester (Web Technologies)**

**PART-I**
**WEB PROGRAMMING LAB**

**Course Objectives:**
- To enable the student to program web applications using the following technologies
  HTML, Javascript , AJAX, PHP, Tomcat Server, Servlets, JSP

*Note:*
1. Use LAMP Stack (Linux, Apache, MySQL and PHP) for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform wherever applicable
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed

1. Install the following on the local machine
   - Apache Web Server (if not installed)
   - Tomcat Application Server locally
   - Install MySQL (if not installed)
   - Install PHP and configure it to work with Apache web server and MySQL (if not already configured)

2. Write an HTML page including javascript that takes a given set of integer numbers and shows them after sorting in descending order.

3. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

4. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

6. Create an XML document that contains 10 users information. Write a Java program, which takes User Id as input and returns the user details by taking the user information from the XML document using (a) DOM Parser and (b) SAX parser

   Implement the following web applications using (a) PHP, (b) Servlets and (c) JSP:

7. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.

8. Modify the above program to use an xml file instead of database.

9. Modify the above program to use AJAX to show the result on the same page below the submit button.

10. A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands.

11. Modify the above program such that it stores each query in a database and checks the database first for the result. If the query is already available in the DB, it returns the value that was previously computed (from DB) or it computes the result and returns it after storing the new query and result in DB.

12. A web application takes a name as input and on submit it shows a hello <name> page where <name> is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).

13. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

14. A web application for implementation:
    The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
    If name and password matches, serves a welcome page with user's full name.
    If name matches and password doesn't match, then serves "password mismatch" page
    If name is not found in the database, serves a registration page, where user's full name is asked and on submitting the full name, it stores, the login name, password and full name in the database (hint: use session for storing the submitted login name and password)

15. A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.

**REFERENCE BOOKS**:
1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
2. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. Java Script, D.Flanagan, O'Reilly, SPD.
5. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.

**Outcomes:**
- Use LAMP Stack for web applications
- Use Tomcat Server for Servlets and JSPs
- Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs
- Connect to Database and get results
- Parse XML files using Java (DOM and SAX parsers)

**PART-II**
**NETWORK PROGRAMMING LAB**

**Course Objectives:**
- To gain hands-on experiences in installing and administering computer systems and networks, in particular, the UNIX version.
- To implement networking and Internet protocols via programming and TCP/IP protocol architecture; user datagram protocol.
- TO implement shell script that accepts a list of files.

**LIST OF SAMPLE PROBLEMS/EXPERIMENTS:**
1. Write client and server programs (using C) for
   a. Interaction between server and client processes using Unix Domain Sockets.
   b. Interaction between server and client processes using Internet Domain Sockets.
2. Write a C program (sender.c )
   a. To create a message queue with read and write permissions.
   b. To write 3 messages to it with different priority numbers.
3. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in 63.a) and displays them.
4. Write C program that illustrates two processes communicating via shared memory.
5. Design TCP iterative Client and server application to reverse the given input sentence
6. Design TCP iterative Client and server application to reverse the given input sentence
7. Design TCP client and server application to transfer file
8. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
9. Design a TCP concurrent server to echo given set of sentences using poll functions
10. Design UDP Client and server application to reverse the given input sentence
11. Design UDP Client server to transfer a file
12. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
13. Design a RPC application to add and subtract a given pair of integers

**TEXT BOOKS:**
1. Advance Unix Programming Richard Stevens, Second Edition Pearson Education
2. Advance UNIX Programming, N.B. Venkateswarlu, BS Publication.
3. UNIX and Shell programming, B.A. Forouzan and R.F. Gilberg, Thomson.
4. UNIX and Shell Programming, M.G. Venkatesh Murthy, Pearson Education.
5. UNIX Shells by Example, 4th Edition, Elllie Quigley, Pearson Education