

# **VIDYA JYOTHI INSTITUTE OF TECHNOLOGY**

(An Autonomous Institution)

Aziznagar Gate, C.B. Post, Hyderabad - 500 075, Telangana.



## **ACADEMIC REGULATIONS AND SYLLABUS (R19)**

*for*

**M.Tech (CSE)**

(Applicable for the batches admitted from the Academic Year 2019-20 onwards)

**VIDYA JYOTHI INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**Course Structure & Syllabi of  
M.Tech(CSE) I & II Year**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**I Year I Semester**

Subject code	Category	Course Title	L	T	P	C
19D5CS1101	PC-1	Advanced Algorithms	4	0	0	4
19D5CS1102	PC-2	Computer Networking	4	0	0	4
19D5CS1103	PC-3	Software Engineering	4	0	0	4
19D5E11101 19D5E11102 19D5E11103 19D5E11104	PE-1	1. Network Security and Cryptography 2. Mobile Application Development 3. Graph Theory 4. Internet of Things	3	0	0	3
19D5E21101 19D5E21102 19D5E21103 19D5E21104	PE-2	1. Game Theory 2. Parallel and Distributed Algorithms 3. Software Architecture and Design Patterns 4. Embedded Systems	3	0	0	3
191EOE1101	OE-1	<b>*Open Elective – 1</b>	3	0	0	3
19D5LB1101	Laboratory I	Advanced Algorithms Lab	0	0	3	2
19D5SM1101	Seminar I	Seminar-I	0	0	3	2
<b>Total</b>			<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

**I Year II Semester**

Subject code	Category	Course Title	L	T	P	C
19D5CS1204	PC-4	Network Programming	4	0	0	4
19D5CS1205	PC-5	Distributed Systems and Cloud Computing	4	0	0	4
19D5CS1206	PC-6	Theory of Computation	4	0	0	4
19D5E31201 19D5E31202 19D5E31203 19D5E31204	PE-3	1. Data Warehousing and Data Mining 2. Storage Area Networks 3. Semantic Web and Social Networks 4. Cyber Security	3	0	0	3
19D5E41201 19D5E41202 19D5E41203 19D5E41204	PE4	1. Big Data Analytics 2. Soft Computing 3. Software Process and Project Management 4. Machine Learning	3	0	0	3
191EOE1201	OE-2	<b>*Open Elective – 2</b>	3	0	0	3
19D5LB1201	Laboratory II	Internet Technologies and Services Lab	0	0	3	2
19D5SM1201	Seminar II	Seminar –II	0	0	3	2
<b>Total</b>			<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

## II Year I semester

<b>Subject code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19D5CS2107	Technical Paper Writing	0	3	0	2
19D5CV2101	Comprehensive Viva-Voce	0	0	0	4
19D5PW2101	Project work Review I	0	0	22	8
	<b>Total</b>	<b>0</b>	<b>3</b>	<b>22</b>	<b>14</b>

## II Year II semester

<b>Subject code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19D5PW2202	Project work Review II	0	0	24	8
19D5PE2201	Project Evaluation (Viva-Voce)	0	0	0	16
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>24</b>

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

**ADVANCED ALGORITHMS (PC -1)****Course Objectives:**

1. The fundamental design, analysis, and implementation of basic data structures
2. Basic concepts in the specification and analysis of programs
3. Principles for good program design, especially the uses of data abstraction
4. Significance of algorithms in the computer field
5. Various aspects of algorithm development
6. Qualities of a good solution

**UNIT-1: 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 Satisfiability, 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.

**Reference Books:**

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++, 3<sup>rd</sup> edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2<sup>nd</sup> edition, PHI.

**COMPUTER NETWORKING (PC -2)****UNIT-I**

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-II**

NetworkAddressTranslator,InternetControlMessageProtocol,SNMP,CIDR,IPv6,RoutingProtocol Basics in advanced networks, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP),SwitchingServices,SpanningTreeProtocol(STP),StandardNetworkManagementProtocol.

**UNIT-III**

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-IV**

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 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-LayerProtocols

**UNIT-V**

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. HighSpeedNetworksandInternets–PerformanceandQualityofService,*WilliamStallings*, 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, WileyIndia
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, PrenticeHall.
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, 5<sup>th</sup> Edition, 2014
11. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996

**SOFTWARE ENGINEERING (PC - 3)****Course Objectives:**

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects
2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams.

**Course Outcomes:**

1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD)
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**UNIT-1:**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths.

**A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.

**UNIT-2:**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**System models:** Context models, behavioral models, data models, object models, structured methods.

**UNIT-3:**

**Design Engineering:** Design process and design quality, design concepts, the design model. **Creating an architectural design:** software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT-4:**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

**Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

## **UNIT-5:**

**Metrics for Process and Products:** Software measurement, metrics for software quality.

**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

**Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

### **Text Books:**

1. Software Engineering, A practitioner's Approach - Roger S. Pressman, 6<sup>th</sup> edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7<sup>th</sup> edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

### **Reference Books:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Education.

**NETWORK SECURITY AND CRYPTOGRAPHY**  
(Professional Elective- 1)

**Course Objectives:**

1. Understand the basic categories of threats to computers and networks
2. Understand various cryptographic algorithms
3. Describe public-key cryptosystem
4. Describe the enhancements made to IPv4 by IPSec
5. Understand Intrusions and intrusion detection
6. Discuss the fundamental ideas of public-key cryptography
7. Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message
8. Discuss Web security and Firewalls

**Course Outcomes:**

1. Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues
2. Ability to identify information system requirements for both of them such as client and server
3. Ability to understand the current legal issues towards information security

**UNIT – 1**

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security  
**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT – 2**

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT – 3**

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

**UNIT – 4**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

## **UNIT – 5**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### **TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 3<sup>rd</sup> Edition

### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: W.M. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, Cengage Learning
6. Network Security and Cryptography: Bernard Menezes, Cengage Learning

**MOBILE APPLICATION DEVELOPMENT  
(Professional Elective- 1)**

**Course Objectives:**

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To demonstrate their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

**UNIT - I**

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**UNIT - II**

**Android User Interface:** Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing, and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**UNIT - III**

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

**UNIT - IV**

**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**UNIT - V**

**Advanced Topics:** Alarms – Creating and using alarms

Using Internet Resources – Connecting to internet resource, using download manager

Location Based Services – Finding Current Location and showing location on the Map, updating location

**TEXT BOOKS:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCE BOOK:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

**GRAPH THEORY**  
**(Professional Elective- 1)**

**UNIT - I**

**Introduction**-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

**UNIT - II**

**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

**UNIT - III**

**Trees**- Definitions and characterizations, Number of trees, Cayley's formula, Kircho-matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

**UNIT - IV**

**Independent sets coverings and matchings** – Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, König's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**UNIT - V**

**Vertex Colorings**- Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**TEXTBOOKS:**

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1<sup>st</sup> edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications <https://www.iro.umontreal.ca/~hahn/IFT3545/GTWA.pdf>

**REFERENCES:**

**Lecture Videos:** <http://nptel.ac.in/courses/111106050/13>

**INTERNET OF THINGS  
(Professional Elective- 1)**

**Course Objectives:**

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web based services on IoT devices

**UNIT - I**

**Introduction to Internet of Things** – Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs  
IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates  
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

**UNIT - II**

**IoT and M2M** – Software defined networks, network function virtualization, difference between SDN and NFV for IoT  
Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER

**UNIT - III**

**Introduction to Python** - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**UNIT - IV**

**IoT Physical Devices and Endpoints** - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**UNIT - V**

**IoT Physical Servers and Cloud Offerings** – Introduction to Cloud Storage models and communication APIs.  
Webserver – Web server for IoT, Cloud for IoT, Python web application framework  
Designing a RESTful web API

**TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN:9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN:9789350239759

**GAME THEORY**  
**(Professional Elective- 2)**

**UNIT - 1**

**Introduction:** Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation

Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

**UNIT - 2**

**Mixed, Correlated, and Evolutionary Equilibrium** -Mixed Strategy Nash Equilibrium Interpretations of Mixed Strategy Nash Equilibrium Correlated Equilibrium Evolutionary Equilibrium Rationalizability and Iterated Elimination of Dominated Actions-Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions

**UNIT - 3**

**Knowledge and Equilibrium**-A Model of Knowledge Common Knowledge, Can People Agree to Disagree?, Knowledge and Solution Concepts, The Electronic Mail Game

**UNIT - 4**

**Extensive Games with Perfect Information**-Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy , TwoNotableFiniteHorizonGames, IteratedElimination of WeaklyDominatedStrategies Bargaining Games -Bargaining and Game Theory , A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions

**UNIT - 5**

**Repeated Games**- The Basic Idea Infinitely Repeated Games vs.\ Finitely Repeated Games Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely RepeatedGame

**TEXT BOOKS:**

1. M. J. Osborne and A. Rubinstein, A course in Game Theory, MITPress
2. Roger Myerson, Game Theory, Harvard UniversityPress
3. D. Fudenberg and J. Tirole, Game Theory, MITPress

**REFERENCE BOOKS:**

1. J. von Neumann and O. Morgenstern, Theory of Games and Economic Behavior, New York: John Wiley andSons.
2. R.D. Luce and H. Raiffa, Games and Decisions, New York: John Wiley andSons.,
3. G. Owen, Game Theory, (Second Edition), New York: AcademicPress,

**PARALLEL AND DISTRIBUTED ALGORITHMS  
(Professional Elective- 2)**

**Course Objectives:**

1. To learn parallel and distributed algorithms development techniques for shared memory and message passing models
2. To study the main classes of parallel algorithms
3. To study the complexity and correctness models for parallel algorithms

**UNIT - 1**

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

**UNIT - 2**

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

**UNIT - 3**

Pipelining- Techniques computing platform, pipeline programs examples

**UNIT - 4**

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallel sharing data parallel programming languages and constructs, open MP

**UNIT - 5**

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**TEXT BOOK:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2<sup>nd</sup> Edition.

**REFERENCE BOOK:**

1. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS**  
(Professional Elective- 2)

**Course Objectives:**

After completing this course, the student should be able to:

1. To understand the concept of patterns and the Catalog
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation, and consistency
3. To understand the variety of implemented bad practices related to the Business and Integration tiers
4. To highlight the evolution of patterns
5. To how to add functionality to designs while minimizing complexity
6. To understand what design patterns really are, and are not
7. To learn about specific design patterns
8. To learn how to use design patterns to keep code quality high without overdesign

**UNIT - 1****Envisioning Architecture**

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

**Creating an Architecture**

Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

**UNIT - 2****Analyzing Architectures**

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

**Moving from one system to many**

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

**UNIT -3****Patterns**

Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

**Creational and Structural patterns**

Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

**UNIT -4****Behavioral patterns**

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

**UNIT - 5****Case Studies**

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development,

**TEXT BOOKS:**

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education,2003.
2. Design Patterns, Erich Gamma, Pearson Education,1995.

**REFERENCE BOOKS:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley,2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education,2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY,2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education,2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education,2003.
7. Design Patterns in C#, Steven John metsker, Pearson education,2004.
8. Pattern Oriented Software Architecture, F. Buschmann & others, John Wiley & Sons.

**EMBEDDED SYSTEMS**  
**(Professional Elective- 2)**

**Course Objectives:**

1. To explain various embedded system applications and design requirements
2. To construct embedded system hardware
3. To develop software programs to control embedded system
4. To generate product specification for embedded system

**UNIT - 1**

**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems

**UNIT - 2**

**8051 and Advanced Processor Architecture:** 8051 Architecture, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts, Introduction to Advanced Architectures, Real World Interfacing, Processor and Memory organization - **Devices and Communication Buses for Devices Network:** Serial and parallel Devices & ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems, Wireless and Mobile System protocols

**UNIT - 3**

**Embedded Programming Concepts:** Software programming in Assembly language and High Level Language, Data types, Structures, Modifiers, Loops and Pointers, Macros and Functions, object oriented Programming, Embedded Programming in C++ & JAVA

**UNIT - 4**

**Real – Time Operating Systems:** OS Services, Process and Memory Management, Real – Time Operating Systems, Basic Design Using an RTOS, Task Scheduling Models, Interrupt Latency, Response of Task as Performance Metrics - **RTOS Programming:** Basic functions and Types of RTOSes, RTOS VxWorks, Windows CE

**UNIT - 5**

**Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-Design - **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine, Simulators, Laboratory Tools

**TEXT BOOK:**

1. Embedded Systems, Raj Kamal, Second Edition TMH.

**REFERENCE BOOKS:**

1. Embedded/Real-Time Systems, Dr. K.V.K.K. Prasad, dream Techpress
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
3. The 8051 Microcontroller, Third Edition, Kenneth J Ayala, Thomson.
4. An Embedded Software Primer, David E. Simon, Pearson Education.
5. Micro Controllers, Ajay V Deshmukhi, TMH.
6. Microcontrollers, Raj kamal, Pearson Education.
7. Introduction to Embedded Systems, Shibu K.V, TMH.

**ADVANCED ALGORITHMS LAB****Course Objectives:**

1. The fundamental design, analysis, and implementation of basic datastructures
2. Basic concepts in the specification and analysis of programs
3. Principles for good program design, especially the uses of dataabstraction

**Sample Problems on Data structures:**

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
  - a) Linearsearch
  - b) Binarysearch
2. Write Java programs to implement the following using arrays and linkedlists
  - a) ListADT
3. Write Java programs to implement the following using anarray.
  - a) StackADT
  - b) QueueADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using anarray.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome ornot.
7. Write Java programs to implement the following using a singly linkedlist.
  - a) StackADT
  - b) QueueADT
8. Write Java programs to implement the dequeue (double ended queue) ADTusing
  - a) Array
  - b) Singlylinkedlist
  - c) Doubly linkedlist.
9. Write a Java program to implement priority queueADT.
10. Write a Java program to perform the followingoperations:
  - a) Construct a binary search tree ofelements.
  - b) Search for a key element in the above binary searchtree.
  - c) Delete an element from the above binary searchtree.
11. Write a Java program to implement all the functions of a dictionary (ADT) usingHashing.
12. Write a Java program to implement Dijkstra’s algorithm for Single source shortestpath problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary treein
  - a) Preorder
  - b) Inorder
  - c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.

15. Write Java programs for implementing the following sorting methods:
- a) Bubblesort                      d) Mergesort      g) Binary treesort
  - b) Insertionsort                      e) Heapsort
  - c) Quicksort                      f) Radixsort
16. Write a Java program to perform the following operations:
- a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

**REFERENCE BOOKS:**

1. Data Structures and Algorithms in java, 3<sup>rd</sup> edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard, 2<sup>nd</sup> edition, Schaum's Outlines, TMH.
3. Data Structures and algorithms in Java, 2<sup>nd</sup> Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2<sup>nd</sup> Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P. H. Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work, W. J. Collins, Mc GrawHill.
8. Java: the complete reference, 7<sup>th</sup> edition, Herbert Schildt, TMH.
9. Java for Programmers, P. J. Deitel and H. M. Deitel, Pearson education / Java: How to Program P. J. Deitel and H. M. Deitel , 8<sup>th</sup> edition, PHI.
10. Java Programming, D.S. Malik, Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

## NETWORK PROGRAMMING (PC – 4)

### Course Objectives:

1. To understand to Linux utilities
2. To understand file handling, signals
3. To understand IPC, network programming in Java
4. To understand processes to communicate with each other across a Computer Network.

### UNIT – I

**Linux Utilities-** File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.

**Bourne again shell (bash)-** Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

**Review of C programming concepts-** arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

### UNIT - II

**Files-** File Concept, File types, File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink.

**File and Directory management** – Directory contents, Scanning Directories- Directory file APIs.

**Process-** Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

### UNIT - III

**Signals-** Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

**Interprocess Communication** - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.

**Message Queues-** Kernel support for messages, UNIX system V APIs for messages, client/server example.

**Semaphores-** Kernel support for semaphores, UNIX system V APIs for semaphores.

### UNIT – IV

**Shared Memory-** Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.

**Network IPC** - Introduction to Unix Sockets, IPC over a network, Client-Server model, Address formats (Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server

**Programs-** Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

## **UNIT-V**

**Network Programming in Java**-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

### **TEXT BOOKS:**

1. Unix System Programming using C++, T.Chan, PHI.(UnitsII,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(UnitI)
3. AnIntroductiontoNetworkProgrammingwithJava,JanGraba,Springer,rp2010.(UnitV)
4. Unix Network Programming ,W.R. Stevens, PHI.(UnitsII,III,IV)
5. Java Network Programming,3<sup>rd</sup> edition, E.R. Harold, SPD, O'Reilly.(UnitV)

### **REFERENCE BOOKS:**

1. Linux System Programming, Robert Love, O'Reilly,SPD.
2. AdvancedProgrammingintheUNIXenvironment,2<sup>nd</sup>Edition,W.R.Stevens,Pearson Education.
3. UNIXforprogrammersandusers,3<sup>rd</sup>Edition,GrahamGlass, KingAbles,Pearson Education.
4. Beginning Linux Programming, 4<sup>th</sup> Edition, N.Matthew, R.Stones, Wrox, Wiley IndiaEdition.
5. UnixNetworkProgrammingTheSocketsNetworkingAPI,Vol.-I,W.R.Stevens,BillFenner, A.M.Rudoff, PearsonEducation.
6. Unix Internals, U.Vahalia, PearsonEducation.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3<sup>rd</sup> edition, PearsonEducation.
8. C Programming Language, Kernighan and Ritchie,PHI

### DISTRIBUTED SYSTEMS AND CLOUD COMPUTING (PC – 5)

**Course Objectives:**

1. To explain the evolving computer model called cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. To describe the security aspects included.

**Course Outcomes:**

1. Ability to understand the virtualization and cloud computing concepts.

**UNIT- I**

**Systems Modeling, Clustering and Virtualization:** Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Datacenters.

**UNIT- II**

**Foundations:** Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

**UNIT- III**

**Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS):** Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

**UNIT- IV**

**Monitoring, Management and Applications:** An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

**UNIT - V**

**Governance and Case Studies:** Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

**TEXT BOOKS:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

**REFERENCE BOOKS:**

1. Cloud Computing : A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, 2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.

3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F.Ransome, CRC Press,rp2012.
4. CloudApplicationArchitectures:BuildingApplicationsandInfrastructureintheCloud,George Reese, O'Reilly, SPD,rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD,rp2011.

## THEORY OF COMPUTATION (PC – 6)

### Course Outcomes

1. Able to understand the concept of abstract machines and their power to recognize the languages.
2. Able to employ finite state machines for modeling and solving computing problems.
3. Able to design context free grammars for formal languages.
4. Able to distinguish between decidability and undecidability.
5. Able to gain proficiency with mathematical tools and formal methods.

### **UNIT - I:**

**Regular Languages** – Finite Automata, Formal definition of finite automaton, Examples of finite automata, Formal definition of computation, Designing finite automata, The regular operations, Non determinism, formal definition of nondeterministic finite automaton, equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions, formal definition of a regular expression, equivalence with finite automata, Nonregular languages, The pumping lemma for regular languages.

### **UNIT - II:**

**Context-Free languages**, Context-free grammars, formal definition of a Context-free grammar, Examples of context-free grammars, Designing context-free grammars, Ambiguity, Chomsky normal form, Pushdown Automata, Examples of pushdown Automata, Equivalence with context-free grammars, Non-context-free languages, The pumping lemma for context-free languages.

### **UNIT - III:**

**The Church-Turing Thesis** - Turing machines, Formal definition of turing machine, Examples of turing machines, Variants of turing machines, Multitape turing machines, Nondeterministic turing machine, Enumerators, Equivalence with other models, The definition of algorithm, Hilbert's problem, Terminology of describing turing machines.

### **UNIT - IV:**

**Decidability** – Decidable languages, Decidable problems concerning regular languages, Decidable problems concerning context-free languages, The halting problem, The diagonalization method, The halting method is undecidable, A turing –unrecognizable language, **Reducibility** – Undecidable problems for language theory, Reductions via computations histories, A simple undecidable problem, Mapping reducibility, computable functions, Formal definition of mapping reducibility.

### **UNIT - V:**

**Time Complexity** – Measuring complexity, Big – O and small-o notation, Analyzing algorithms, Complexity relationships among models, The class P, Polynomial time, examples of problems in P, The class NP, Examples of problems in NP, The P versus NP question, NP-Completeness, polynomial time reducibility, Definition of NP-Completeness, The Cook-Levin Theorem, Additional NP-Complete problems, The vertex cover problem, The Hamiltonian path problem, The subset sum problem.

### **TEXT BOOK:**

1. Introduction to the theory of computation, Micheal Sipser, Third Edition, Cengage Learning.

**REFERENCE BOOKS:**

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to Formal Languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.
5. Theory of Computer Science – Automata Languages and Computation, Mishra and Chandrashekar, 2nd edition, PHI.

### DATA WAREHOUSING AND DATA MINING (PE – III)

#### Course Objectives:

1. To develop the abilities of critical analysis to data mining systems and applications.
2. To implement practical and theoretical understanding of the technologies for data mining
3. To understand the strengths and limitations of various data mining models;

#### UNIT- I

**Data mining Overview and Advanced Pattern Mining:** Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis, outlier analysis, advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

#### UNIT- II

**Advance Classification:** Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzzy set approach.

#### UNIT- III

**Advance Clustering:** Density - based methods – DBSCAN, OPTICS, DENCLUE, Grid-Based methods – STING, CLIQUE, and Exception – maximization algorithm, clustering High- Dimensional Data, Clustering Graph and Network Data.

#### UNIT- IV

**Web and Text Mining:** Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

#### UNIT- V

**Temporal and Spatial Data Mining:** Introduction, Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

#### TEXT BOOKS:

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian pei, Morgan Kaufmann.
2. Data Mining Techniques – Arun K Pujari, Universities Press.

#### REFERENCE BOOKS:

1. Introduction to Data Mining – Pang-Ning Tan, Vipin kumar, Michael Steinbach, Pearson.
2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.

### STORAGE AREA NETWORKS (PE - III)

#### Course Objectives:

1. To understand Storage Area Networks characteristics and components.
2. To become familiar with the SAN vendors and their products
3. To learn Fibre Channel protocols and how SAN components use them to communicate with each other
4. To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches Thoroughly learn Cisco SAN-OS features.
5. To understand the use of all SAN-OS commands. Practice variations of SAN OS features

#### UNIT - I:

**Introduction to Storage Technology** Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

#### UNIT - II:

**Storage Systems Architecture** Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system.

#### UNIT - III:

**Introduction to Networked Storage** Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments.

#### UNIT - IV:

**Information Availability & Monitoring & Managing Data Center** List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.

Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center

#### UNIT - V:

**Securing Storage and Storage Virtualization** Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes

**Case Studies**

The technologies described in the course are reinforced with EMC examples of actual solutions. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

**TEXT BOOK:**

1. EMC Corporation, Information Storage and Management, Wiley.

**REFERENCE BOOKS:**

1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill ,Osborne,2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited,2002.

### SEMANTIC WEB AND SOCIAL NETWORKS (PE – III)

#### Course Objectives:

1. To learn WebIntelligence
2. To learn Knowledge Representation for the SemanticWeb
3. To learn OntologyEngineering
4. To learn Semantic Web Applications, Services andTechnology
5. To learn Social Network Analysis and semanticweb

#### **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:**

**OntologyEngineering:**OntologyEngineering,ConstructingOntology,OntologyDevelopmentTools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and InferenceEngines.

#### **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

WhatisocialNetworksanalysis,developmentofthesocialnetworksanalysis,ElectronicSourcesfor Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social networkfeatures.

#### **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 & FrancisGroup)
3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, SpringerPublications.
4. Programming the Semantic Web, T. Segaran, C.Evans, J. Taylor, O’Reilly,SPD.

**CYBER SECURITY (PE - III)****Course Objectives:**

1. To learn about cyber crimes and how they are planned
2. To learn the vulnerabilities of mobile and wireless devices
3. To learn about the crimes in mobile and wireless devices

**UNIT - I**

**Introduction to Cybercrime:** Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**Cyber offenses: How criminals Plan Them:** Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT- II**

**Cybercrime: Mobile and Wireless Devices:** Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT - III****Cybercrimes and Cyber security: the Legal Perspectives**

Introduction, Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

**UNIT - IV****Understanding Computer Forensics**

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques  
Forensics Auditing

**UNIT - V****Cyber Security: Organizational Implications**

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**TEXT BOOKS:**

1. **Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives**, Nina Godbole and Sunil Belapure, WileyINDIA.
2. **Introduction to Cyber Security**, Chwan-Hwa (John) Wu, J. David Irwin. CRC Press T&F Group.

**REFERENCE BOOK:**

1. **Cyber Security Essentials**, James Graham, Richard Howard and Ryan Otson, CRC Press.

## BIG DATA ANALYTICS (PE – IV)

### Course Objectives:

1. To understand about bigdata
2. To learn the analytics of BigData
3. To Understand the MapReducefundamentals

### UNIT - I

**BigDataAnalytics:** Whatisbigdata,HistoryofDataManagement;StructuringBigData;Elementsof Big Data; Big Data Analytics;Distributed and Parallel Computing for Big Data.

Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools;

### UNIT - II

**Understanding Analytics and Big Data:** Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

### UNIT - III

**Understanding MapReduce Fundamentals and HBase :** The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations- Programming with HBase; Installation, Combining HBase and HDFS;

### UNIT - IV

**BigDataTechnologyLandscapeandHadoop:**NoSQL,Hadoop;RDBMSversusHadoop;Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFC (Hadoop Distributed File System), HDFC Daemons, read,write, Replica ProcessingofDatawithHadoop;ManagingResourcesandApplicationswithHadoopYARN.

## **UNIT - V**

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools;

### **TEXT BOOKS:**

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black Book™, DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e, BY Albright|Winston

### **REFERENCE BOOKS:**

1. Rajiv Sabherwal, Irma Becerra-Fernandez, "Business Intelligence—Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, "Business Intelligence Roadmap", Addison-Wesley IT Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

## SOFT COMPUTING (PE – IV)

### Course Objectives:

1. To give students knowledge of soft computing theories fundamentals, i.e. Fundamentals of artificial and neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

### **UNIT- I**

**AI Problems and Search:** AI problems, Techniques, Problem Spaces and Search, Heuristic Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation- Using Predicate Logic and Rules.

### **UNIT- II**

**Artificial Neural Networks:** Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

### **UNIT- III**

**Unsupervised Learning Network-** Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

### **UNIT- IV**

Introduction to Classical Sets ( crisp Sets)and Fuzzy Sets- operations and Fuzzy sets. Classical Relations -and Fuzzy Relations- Cardinality, Operations, Properties and composition, Tolerance and equivalence relations.

Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

### **UNIT- V**

Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems, Genetic Algorithm- Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Technique.

### **TEXT BOOKS:**

1. Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley India, 2007
2. Soft Computing and Intelligent System Design- Fakhreddine OKarray, Clarence D Silva, Pearson Edition, 2004.

### **REFERENCE BOOKS:**

1. Artificial Intelligence and Soft Computing- Behavioural and Cognitive Modeling of the Human Brain- Amit Konar, CRC press, Taylor and Francis Group.
2. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, 2008.
3. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education.
4. A first course in Fuzzy Logic- Hung T Nguyen and Elbert A Walker, CRC Press Taylor and Francis Group.

## SOFTWARE PROCESS AND PROJECT MANAGEMENT (PE – IV)

### Course Objectives:

1. Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
2. Compare and differentiate organization structures and project structures.
3. Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

### UNIT - I

#### **Software Process Maturity**

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

#### **Process Reference Models**

Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

### UNIT - II

#### **Software Project Management Renaissance**

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

#### **Life-Cycle Phases and Process artifacts**

Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures

### UNIT - III

#### **Workflows and Checkpoints of process**

Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.

#### **Process Planning**

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

### UNIT - IV

#### **Project Organizations**

Line-of- business organizations, project organizations, evolution of organizations, process automation.

#### **Project Control and process instrumentation**

The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

### UNIT - V

#### **CCPDS-R Case Study and Future Software Project Management Practices**

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

**TEXT BOOKS:**

1. Managing the Software Process, *Watts S. Humphrey*, Pearson Education.
2. Software Project Management, *Walker Royce*, Pearson Education.

**REFERENCE BOOKS:**

1. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
2. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
3. Process Improvement essentials, James R. Persse, O'Reilly, 2006
4. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
5. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
6. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
7. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2<sup>nd</sup> edition, Wiley India, 2004.
8. The Art of Project Management, Scott Berkun, SPD, O'Reilly, 2011.
9. Applied Software Project Management, Andrew Stellman & Jennifer Greene, SPD, O'Reilly, rp2011.
10. Agile Project Management, Jim Highsmith, Pearson education, 2004.

**MACHINE LEARNING (PE – IV)****Course Objectives:**

1. To be able to formulate machine learning problems corresponding to different applications.
2. To understand a range of machine learning algorithms along with their strengths and weaknesses.
3. To understand the basic theory underlying machine learning.
4. To be able to apply machine learning algorithms to solve problems of moderate complexity.
5. To be able to read current research papers and understand the issues raised by current research.

**UNIT - I**

**Introduction** - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning.

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

**UNIT - II**

**Decision Tree learning** – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**Artificial Neural Networks** – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition  
Advanced topics in artificial neural networks.

**Evaluation Hypotheses** – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

**UNIT - III**

**Bayesian learning** – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm. **Computational learning theory** – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

**Genetic Algorithms** – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

**UNIT - IV**

**Learning Sets of Rules** – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution.

**Analytical Learning** - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

## **UNIT - V**

**Combining Inductive and Analytical Learning** – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators.

**Reinforcement Learning** – Introduction, the Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming.

### **TEXT BOOKS:**

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC)

### **REFERENCE BOOKS:**

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
4. Machine Learning by Peter Flach ,Cambridge.

### INTERNET TECHNOLOGIES AND SERVICES LAB

#### Course Objectives:

1. Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields
2. Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute
3. Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address
4. Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log
5. Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms
6. Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements
7. Demonstrate techniques for improving the accessibility of an HTML document

#### List of Sample Problems:

##### **i) Internet Technologies**

1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: [www.amazon.com](http://www.amazon.com) the website should consist the following pages.  
Home page, Registration and user Login  
User Profile Page, Books catalog Shopping  
Cart, Payment By credit card Order  
Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
4. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using Servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate ShoppingCart.
5. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.
6. Implement the “Hello World!” program using JSP Struts Framework.

##### **ii) Additional Assignment Problems**

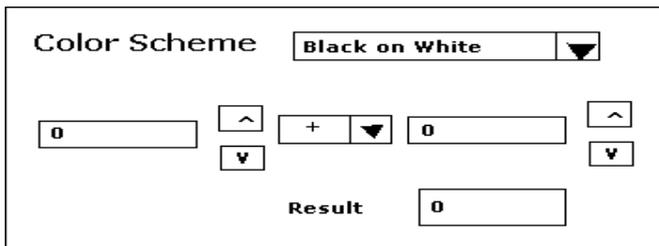
- a. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.
- b. Write a java swing application that takes a text file name as input and counts the characters, words

and lines in the file. Words are separated with white space characters and lines are separated with new line character.

- c. Write a simple calculator servlet that takes two numbers and an operator (+, -, /, \* and %) from an HTML page and returns the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL.
- d. Write an HTML page that contains 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).
- e. Write a servlet 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.
- f. Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, \* and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:

<b>Value1</b>	<b>Operator</b>	<b>Value2</b>	<b>=</b>	<b>Result</b>
<input type="text" value=""/>	<input type="text" value="+"/> <input type="text" value="▼"/>	<input type="text" value=""/>	<input "="" type="text" value="="/>	<input type="text" value=""/>

- g. Write a Java program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and \* (selectable). Once any change

takes place, the result must be automatically computed by the program.

- h. Write a Java Application that will read an XML file that contains personal information (Name, Mobile Number, age and place). It reads the information using SAX parser. After reading the information, it shows two input Text Fields in a window, one for tag name and the other for value. Once these two values are given, it should list all the records in the XML file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD"? An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.

<b>Field</b>	<input type="text" value="mobile"/>	
<b>Value</b>	<input type="text" value="9449449449"/>	<input type="button" value="OK"/>
<b>Result</b>	<input type="text" value="abc, 22, Hyd"/> <input type="text" value="def, 23, Delhi"/> <input type="text" value="xxx, 44, Chennai"/>	

Consider the following 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 users full name, present user name (used to login) and password are collected. Implement this application in:

1. PureJSP
2. PureServlets
3. StrutsFramework

Implement a simple arithmetic calculator with +, -, /, \*, % and = operations using Struts Framework  
The number of times the calculator is used should be displayed at the bottom (use session variable).

### iii) Internet Technologies and Services Lab - Additional Problems

<p>Create a web service in Java that takes two city names from the user and returns the distance between these two from data available from a table in MySQL.</p> <p>Write a java and a C# client which use the above service</p>
<p>Write a Java program that takes a file as input and encrypts it using DES encryption. The program should check if the file exists and its size is not zero.</p>
<p>Write a Java program that generates a key pair and encrypts a given file using RSA algorithm.</p>
<p>Write a Java program that finds digest value of a given string.</p>
<p>Consider the following xml file for encryption</p> <pre>&lt;?xml version="1.0"&gt;&lt;transaction&gt;&lt;from&gt;12345&lt;/from&gt;&lt;to&gt;54321&lt;/to&gt;&lt;amount&gt;10000&lt;/amount&gt; &lt;secretcode&gt;abc123&lt;/secretcode&gt;&lt;checksum&gt;&lt;/checksum&gt;&lt;/transaction&gt;</pre> <p>Replace &lt;from&gt; and &lt;to&gt; values with the RSA encrypted values represented with base64 encoding assuming that the public key is available in a file in local directory "pubkey.dat". Encrypt &lt;secretcode&gt; with AES algorithm with a password 'secret'. The checksum of all the field values concatenated with a delimiter character '+' will be inserted in the checksum and the xml file is written to encrypted.xml file.</p>
<p>Assume that a file 'config.xml', which has the following information:</p> <pre>&lt;users&gt; &lt;user&gt;&lt;name&gt;abc&lt;/name&gt;&lt;pwd&gt;pwd123&lt;/pwd&gt;&lt;role&gt;admin&lt;/role&gt;&lt;md5&gt;xxx&lt;/md5&gt;&lt;/user&gt; &lt;user&gt;&lt;name&gt;def&lt;/name&gt;&lt;pwd&gt;pwd123&lt;/pwd&gt;&lt;role&gt;guest&lt;/role&gt;&lt;md5&gt;xxx&lt;/md5&gt;&lt;/user&gt; &lt;/users&gt;</pre> <p>Replace name and role with DES encrypted values and pwd with RSA encrypted values (represent the values with base64 encoding). The public key is available in "public.key" file in current directory. Replace xxx with respective MD5 values of all the fields for each user. Write the resulting file back to config.xml.</p>
<p>Write an HTML page that gives 3 multiple choice (a,b,c and d) questions from a set of 5 preloaded questions randomly. After each question is answered change the color of the question to either green or blue using CSS. Finally on clicking OK button that is provided, the score should be displayed as a pop-up window. Use Java Script for dynamic content.</p>

<p>Write an HTML page that has 3 countries on the left side ("USA", "UK" and "INDIA") and on the right side of each country, there is a pull-down menu that contains the following entries: ("Select Answer", "New Delhi", "Washington" and "London"). The user will match the Countries with their respective capitals by selecting an item from the menu. The user chooses all the three answers (whether right or wrong). Then colors of the countries should be changed either to green or to red depending on the answer. Use CSS for changing color.</p>
<p>Write an HTML Page that can be used for registering the candidates for an entrance test. The fields are: name, age, qualifying examination (diploma or 10+2), stream in qualifying examination. If qualifying examination is "diploma", the stream can be "Electrical", "Mechanical" or "Civil". If the qualifying examination is 10+2, the stream can be "MPC" or "BPC". Validate the name to accept only characters and spaces.</p>
<p>Write an HTML page that has two selection menus. The first menu contains the states ("AP", "TN" and "KN") and depending on the selection the second menu should show the following items: "Hyderabad", "Vijayawada", "Kurnool" for AP, "Chennai", "Salem", "Madurai" for TN and "Bangalore", "Bellary", "Mysore" for KN.</p>
<p>Write an HTML page that has phone buttons 0 to 9 and a text box that shows the dialed number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If the number is not a valid international number (+ followed by country code and 10 digit phone number) the color of the display should be red and it should turn to green when the number is valid. Consider only "+91, +1 and +44 as valid country codes. Use CSS for defining colors.</p>
<p>Write an HTML page that has a text box for phone number or Name. If a number is entered in the box the name should be displayed next to the number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If a name is entered in the text box, it should show the number next to the name. If the corresponding value is not found, show it in red and show it in green otherwise. Use CSS for colors. Store at least 5 names and numbers in the script for testing.</p>
<p>A library consists of 10 titles and each title has a given number of books initially. A student can take or return a book by entering his/her HTNo as user ID and a given password. If there are at least two books, the book is issued and the balance is modified accordingly.</p> <ol style="list-style-type: none"> <li>Use RDBMS and implement it with JSP.</li> <li>Use XML File for data and Implement it with JSP</li> <li>Use RDBMS and implement it with Servlets</li> <li>Use XML File for data and Implement it with Servlets</li> </ol>
<p>A Bus Reservation System contains the details of a bus seat plan for 40 seats in 2x2 per row arrangement, where the seats are numbered from 1 to 40 from first row to last row. The customer can visit the website and can reserve a ticket of his choice if available by entering his details (Name, Address, Gender and Age). The customer can cancel the ticket by entering the seat number and his name as entered for reservation.</p> <ol style="list-style-type: none"> <li>Use RDBMS and implement it with JSP.</li> <li>Use XML File for data and Implement it with JSP</li> <li>Use RDBMS and implement it with Servlets</li> <li>Use XML File for data and Implement it with Servlets.</li> </ol>
<p>Implement a simple messaging system with the following details: When a student logs in with his/her HTNO and a given password, they should get all the messages posted to him/her giving the ID of sender and the actual message. Each message may be separated with a ruler. There should be a provision for the user to send a message to any number of users by giving the IDs separated with commas in the "To" text box.</p> <ol style="list-style-type: none"> <li>Use RDBMS and implement it with JSP.</li> <li>Use XML File for data and Implement it with JSP</li> <li>Use RDBMS and implement it with Servlets</li> <li>Use XML File for data and Implement it with Servlets.</li> </ol>
<p>There is an image of 600x100 size which can be logically divided into 12 button areas with labels (0-9, +, =). Write a javascript calculator program that uses this image as input virtual keyboard and three text areas for two input numbers and result of sum of these numbers. Add a CSS that can be used to change the colors of text and background of text areas and the page. The input numbers can be up to 4 digits each.</p>
<p>Develop a web application that takes username and password as input and compares them with those available in an xml user database. If they match, it should display the welcome page that contains the user's full</p>

name and last used date and time retrieved from a client cookie. On logout it stores new time to the cookie and displays a goodbye page. If authentication fails, it should store the attempt number to the client cookie and displays an error page. Add necessary CSS that takes care of the font, color of foreground and background.

A web application has the following specifications:

The first page (Login page) should have a login screen where the user gives the login name and password. Both fields must be validated on client side for a minimum length of 4 characters, names should be lower case a-z characters only and passwords should contain at least one digit. On submitting these values, the servers should validate them with a MySQL database and if failed, show the login page along with a message saying “Login Name or Password Mismatch” in Red color below the main heading and above the form. If successful, show a welcome page with the user's full name (taken from database) and a link to Logout. On logout, a good bye page is displayed with the total time of usage (Logout time – login time). Specify the Schema details of table and web.xml file contents. Implement it using (a) JSP Pages (b) Servlets (c) Struts

Design a struts based web portal for an international conference with following specifications:

The welcome page should give the details of the conference and a link to login. If login fails, direct them back for re-login and also provide a link for registration. On successful registration/login, the user will be directed to a page where he can see the status (accepted/rejected) of their already submitted papers followed by a form for submitting a doc file to the conference. Provide a logout button on all pages including the homepage, once the user logs in. Implement validation framework to check that the user name is in the form of CCDDCC and password is in the form of (CCSDDD) (C for character, S for special character (one of @, #, \$, %, ^, & and !), and D for digit). Database should be accessed through Connection Pool for MySQL for user information. Provide scope for internationalization in future. Assume any missing information and mention it first.

# **VIDYA JYOTHI INSTITUTE OF TECHNOLOGY**

(An Autonomous Institution)

Aziznagar Gate, C.B. Post, Hyderabad - 500 075, Telangana.



## **Academic Syllabus (R15)**

*for*

**M.Tech (CSE)**

(Applicable for the batches admitted from the Academic Year 2015-16 onwards)

**VIDYA JYOTHI INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**M.TECH. (COMPUTER SCIENCE AND ENGINEERING)  
COURSE STRUCTURE**

**I Year – I Semester**

Subject Code	Category	Course Title	L	P	C
15D5CS1101	<b>Core Course I</b>	Data Structures and Algorithms	4	--	4
15D5CS1102	Core Course II	Database Internals	4	--	4
15D5CS1103	Core Course III	Distributed Systems	4	--	4
15D5E11101	Core Elective I	<b>Network Security</b>	4	--	4
15D5E11102		Android Application Development			
15D5E11103		Cloud Computing			
15D5E11104		Internet of Things			
15D5E21101	Core Elective II	Machine Learning	4	--	4
15D5E21102		Parallel and Distributed Algorithms			
15D5E21103		<b>3. Software Architecture and Design Patterns</b>			
15D5E21104		Embedded Systems			
15D5OE1101	Open Elective I	Android Application Development	4	--	4
15D5OE1102		Big Data Analytics			
15D5OE1103		Bio Informatics			
15D5OE1104		Bio Metrics			
15D5OE1105		<b>Linux Programming</b>			
15D5OE1106		<b>Intellectual Property Rights</b>			
15D5LB1101	Laboratory I	Data Structures and Algorithms Lab	--	4	2
15D5SM1101	Seminar I	Seminar	--	4	2
<b>Total Credits</b>			<b>24</b>	<b>8</b>	<b>28</b>

**I Year – II Semester**

Subject Code	Category	Course Title	L	P	C
15D5CS1204	Core Course IV	Network Programming	4	--	4
15D5CS1205	Core Course V	Information Retrieval Systems	4	--	4
15D5CS1206	Core Course VI	Internet Technologies and Services	4	--	4
15D5E31201	Core Elective III	<b>Core E8lective– 3</b>	4	--	4
15D5E31202		1. Data Mining			
15D5E31203		2. <b>Storage Area Networks</b>			
15D5E31204		3. Semantic Web and Social Networks			
15D5E41201	Core Elective IV	<b>Core Elective– 4</b>	4	--	4
15D5E41202		1. Big Data Analytics			
15D5E41203		2. Soft Computing			
15D5E41204		<b>3. Software Process and Project Management</b>			
15D5OE1201	Open Elective II	<b>E – COMMERCE</b>	4	--	4
15D5LB1201	Laboratory II	Internet Technologies and Services Lab	--	4	2
15D5SM1201	Seminar II	Seminar	--	4	2
<b>Total Credits</b>			<b>8</b>	<b>28</b>	

**II Year - I  
Semester**

<b>Subject Code</b>	<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>P</b>	<b>C</b>
15D5CV2101	Comprehensive Viva-Voce		--	--	4
15D5PW2101	Project work Review I		--	24	12
<b>Total Credits</b>			--	24	<b>16</b>

**II Year - II Semester**

<b>Subject Code</b>	<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>P</b>	<b>C</b>
15D5PW2202	Project work Review II		--	8	4
15D5PE2201	Project Evaluation (Viva-Voce)		--	16	12
<b>Total Credits</b>			--	<b>24</b>	<b>16</b>

### Open Electives

1. Basic Computer Programming skills are required for all open electives. Additionally, knowledge on the specified area mentioned in prerequisites is required for opting the open elective
2. Note: A student can register for any open elective subject provided that he has not already registered for the same subject

S.NO	Open Electives	Prerequisites
1.	"R" Programming	Maths, Statistics
2.	Android Application Development	Java
3.	Algorithmics	----
4.	Big Data Analytics	Data Bases , Maths
5.	Bioinformatics	Data Structures
6.	Biometrics	----
7.	Cyber Security	Internet Technologies
8.	Computer Forensics	Maths, Data Structures
9.	Distributed Systems Security	Information Security
10.	E-Commerce	Internet Technologies
11.	Embedded Systems	Digital logic
12.	Information Security	Maths
13.	Intellectual Property Rights	---
14.	Internet of Things	Java
15.	Java Programming	---
16.	Linux Programming	---
17.	Mobile Computing	Java
18.	Mobile Application Security	Mobile Application Development
19.	OpenStack cloud computing	Linux Programming
20.	Operations Research	Maths, Data Structures
21.	Principles of Information Security	-----
22.	Scripting Languages	---
23.	Social Media Intelligence	---
24.	Software Engineering	---
25.	Storage Area Networks	Computer Networks
26.	Web Usability	-----

## M. Tech-CSE – I Year – I Sem

### DATA STRUCTURES AND ALGORITHMS

#### 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

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

#### UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

#### UNIT III

Searching-Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.

Sorting -Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

#### UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.

Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

#### UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees -Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.

Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

#### TEXT BOOKS:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3<sup>rd</sup> edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

#### REFERENCE BOOKS:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8<sup>th</sup> editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3<sup>rd</sup> edition, Wiley India Edition.
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.

## M. Tech-CSE – I Year – I Sem

### DATABASE INTERNALS

#### Objectives:

By the end of the course, you 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:** Introduction 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<sup>rd</sup> 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<sup>nd</sup> 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.

**Objectives:**

- Understand the need for distributed systems and their applications.
- Understand the concepts of remote procedure calls, remote file systems, distributed agreement, clock synchronization, and security.

**UNIT I**

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models-Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication.

Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

**UNIT II**

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems.

Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

**UNIT III**

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore, Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

**UNIT IV**

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

**UNIT V**

Security-Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 Wi-Fi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

**TEXT BOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman& Hall/CRC, Taylor & Francis Group, 2010.

**REFERENCE BOOKS:**

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, TMH.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

**NETWORK SECURITY**  
(CORE ELECTIVE-I)

**Objectives:**

- Understand the basic categories of threats to computers and networks
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

**UNIT – I**

**Attacks on Computers and Computer Security:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography: Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT – II**

**Symmetric key Ciphers:** Block Cipher principles & Algorithms(DES, AES,Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution **Asymmetric key Ciphers:** Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman,ECC), Key Distribution

**UNIT – III**

**Message Authentication Algorithms and Hash Functions:** Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm **Authentication Applications:** Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication

**UNIT – IV**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management

**UNIT – V**

**Web Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction **Intruders, Virus and Firewalls:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls **Case Studies on Cryptography and security:** Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

**TEXT BOOKS:**

1. Cryptography and Network Security : William Stallings, Pearson Education,5<sup>th</sup> Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 2<sup>nd</sup> Edition.
3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

**REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2<sup>nd</sup> Edition
3. Information Security, Principles and Practice : Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Principles of Information security by Michael E Whitman and Herbert J.Mattord.

## M. Tech-CSE – I Year – I Sem

### ANDROID APPLICATION DEVELOPMENT (CORE ELECTIVE-I)

#### Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To demonstrate their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

#### Unit I:

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools  
Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes  
Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

#### Unit II:

**Android User Interface:** Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts  
User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers  
Event Handling – Handling clicks or changes of various UI components  
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

#### Unit III

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS  
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity  
Notifications – Creating and Displaying notifications, Displaying Toasts

#### Unit IV

**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference  
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

#### Unit V

**Advanced Topics:** Alarms – Creating and using alarms  
Using Internet Resources – Connecting to internet resource, using download manager  
Location Based Services – Finding Current Location and showing location on the Map, updating location

#### TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

#### REFERENCE:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

## M. Tech-CSE – I Year – I Sem

### CLOUD COMPUTING (CORE ELECTIVE-I)

#### Objectives:

- To learn the new computing model which enables shared resources on demand over the network.
- To learn about the pay-per-use scenarios.
- To learn about the new kind of service models and deployment models.
- To learn about the virtualization technology.
- To learn the python programming or various services and models.
- To develop cloud applications in Python

#### UNIT-I

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Mapreduce.

#### UNIT –II

Cloud Platforms for Industry, Healthcare and education, Cloud Platforms in the Industry, cloud applications. Virtualization, cloud virtualization technology, deep dive: cloud virtualization, Migrating in to cloud computing, Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems,

#### UNIT-III

Cloud computing Applications: Industry, Health, Education, Scientific Applications, Business and Consumer Applications, Understanding Scientific Applications for Cloud Environments, Impact of Cloud computing on the role of corporate IT. Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

#### UNIT-IV

Python Basics, Python for cloud, cloud application development in python, Cloud Application Development in Python. Programming Google App Engine with Python: A first real cloud Application, Managing Data in the cloud, Google app engine Services for Login Authentication, Optimizing UI and Logic, Making the UI Pretty: Templates and CSS, Getting Interactive. Map Reduce Programming Model and Implementations.

#### UNIT-V

Cloud management, Organizational Readiness and change management in the cloud age ,Cloud Security ,Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services

#### TEXT BOOKS:

2. Cloud Computing: Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley
3. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.
4. Cloud Computing: Arshdeep Bahga, Vijay Madiseti, 2014, University Press.
5. Cloud computing: Dr Kumar Saurab Wiley India 2011.

#### REFERENCES;

1. Code in the Cloud: Mark C.Chu-Carroll 2011, SPD.( Second part of IV UNIT)
2. Essentials of cloud computing : K Chandrasekharan CRC Press.
3. Cloud Computing: John W. Rittinghouse, James Ransome, CRC Press.
4. Virtualization Security: Dave shackleford 2013. SYBEX a wiley Brand.
5. Cloud computing and Software Services: Ahson , Ilyas.2011.
6. Cloud Computing Bible: Sosinsky 2012. Wiley India .
7. Cloud Computing: Dan C. Marinescu-2013, Morgan Kaufmann.
8. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
- 9 . Fundamentals of Python Kenneth A.Lambert | B.L.Juneja

**INTERNET OF THINGS  
(CORE ELECTIVE-I)**

**Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

**Unit I**

Introduction to Internet of Things –Definition and Characteristics of IoT,  
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs  
IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,  
Communication protocols, Embedded Systems, IoT Levels and Templates  
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

**Unit II**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT  
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

**Unit III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling  
Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**Unit IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)  
Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**Unit V**

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs  
Webserver – Web server for IoT, Cloud for IoT, Python web application framework  
Designing a RESTful web API

**TEXT BOOK:**

Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547

Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

**MACHINE LEARNING  
(CORE ELECTIVE-II)**

**Objectives:**

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

**UNIT I**

**INTRODUCTION** - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning

**Concept learning and the general to specific ordering** – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

**UNIT II**

**Decision Tree learning** – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

**Artificial Neural Networks** – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition  
Advanced topics in artificial neural networks

**Evaluation Hypotheses** – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

**UNIT III**

**Bayesian learning** – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

**Computational learning theory** – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

**Genetic Algorithms** – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

**UNIT IV**

**Learning Sets of Rules** – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

**Analytical Learning** - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

**UNIT V**

**Combining Inductive and Analytical Learning** – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

**Reinforcement Learning** – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

**TEXT BOOKS:**

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

**REFERENCE BOOKS:**

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995
4. Machine Learning by Peter Flach , Cambridge.

**M. Tech-CSE – I Year – I Sem**

**PARALLEL AND DISTRIBUTED ALGORITHMS  
(CORE ELECTIVE –II)**

**Objectives:**

- To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
- To study the main classes of parallel algorithms.
- To study the complexity and correctness models for parallel algorithms.

**UNIT-I**

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

**UNIT-II**

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

**UNIT-III**

Pipelining- Techniques computing platform, pipeline programs examples

**UNIT-IV**

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallel sharing data parallel programming languages and constructs, open MP

**UNIT-V**

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**TEXT BOOK:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2<sup>nd</sup> Edition.

**REFERENCE BOOK:**

1. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

## M. Tech-CSE – I Year – I Sem

### SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (CORE ELECTIVE –II)

#### Objectives:

After completing this course, the student should be able to:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.
- To highlight the evolution of patterns.
- To how to add functionality to designs while minimizing complexity
- To understand what design patterns really are, and are not
- To learn about specific design patterns.
- To learn how to use design patterns to keep code quality high without overdesign.

#### UNIT I

##### Envisioning Architecture

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

##### Creating an Architecture

Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

#### UNIT II

##### Analyzing Architectures

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

##### Moving from one system to many

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

#### UNIT III

##### Patterns

Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

##### Creational and Structural patterns

Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

#### UNIT IV

##### Behavioral patterns

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

#### UNIT V

##### Case Studies

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development,

#### TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

#### REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

## EMBEDDED SYSTEMS (CORE ELECTIVE-II)

### Objectives:

- To explain various embedded system applications and design requirements.
- To construct embedded system hardware.
- To develop software programs to control embedded system.
- To generate product specification for embedded system.

### UNIT I

**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems

### UNIT II

**8051 and Advanced Processor Architecture:** 8051 Architecture, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts, Introduction to Advanced Architectures, Real World Interfacing, Processor and Memory organization - **Devices and Communication Buses for Devices Network:** Serial and parallel Devices & ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems, Wireless and Mobile System protocols

### UNIT III

**Embedded Programming Concepts:** Software programming in Assembly language and High Level Language, Data types, Structures, Modifiers, Loops and Pointers, Macros and Functions, object oriented Programming, Embedded Programming in C++ & JAVA

### UNIT IV

**Real – Time Operating Systems:** OS Services, Process and Memory Management, Real – Time Operating Systems, Basic Design Using an RTOS, Task Scheduling Models, Interrupt Latency, Response of Task as Performance Metrics - **RTOS Programming:** Basic functions and Types of RTOSES, RTOS VxWorks, Windows CE

### UNIT V

**Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-Design - **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine, Simulators, Laboratory Tools

### TEXT BOOK:

1. Embedded Systems, Raj Kamal, Second Edition TMH.

### REFERENCE BOOKS:

1. Embedded/Real-Time Systems, Dr.K.V.K.K.Prasad, dreamTech press
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
3. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.
4. An Embedded Software Primer, David E. Simon, Pearson Education.
5. Micro Controllers, Ajay V Deshmukhi, TMH.
6. Microcontrollers, Raj kamal, Pearson Education.
7. Introduction to Embedded Systems,Shibu K.V, TMH.

## DATA STRUCTURES AND ALGORITHMS LAB

### 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.

### Sample Problems on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
  - a) Linear search
  - b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
  - a) List ADT
3. Write Java programs to implement the following using an array.
  - a) Stack ADT
  - b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
  - a) Stack ADT
  - b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
  - a) Array
  - b) Singly linked list
  - c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
  - a) Construct a binary search tree of elements.
  - b) Search for a key element in the above binary search tree.
  - c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
  - a) Preorder
  - b) Inorder
  - c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
  - a) Bubble sort
  - b) Insertion sort
  - c) Quick sort
  - d) Merge sort
  - e) Heap sort
  - f) Radix sort
  - g) Binary tree sort
16. Write a Java program to perform the following operations:
  - a) Insertion into a B-tree
  - b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

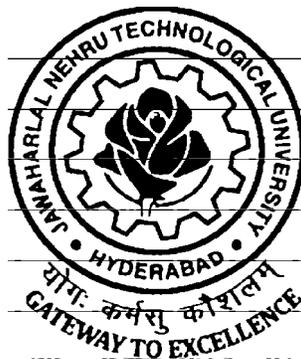
### REFERENCE BOOKS:

1. Data Structures and Algorithms in java, 3<sup>rd</sup> edition, A.Drozdek, Cengage Learning.
  2. Data Structures with Java, J.R.Hubbard, 2<sup>nd</sup> edition, Schaum's Outlines, TMH.
  3. Data Structures and algorithms in Java, 2<sup>nd</sup> Edition, R.Lafore, Pearson Education.
  4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
  5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
  6. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
  7. Data Structures and java collections frame work, W.J.Collins, Mc Graw Hill.
  8. Java: the complete reference, 7<sup>th</sup> editon, Herbert Schildt, TMH.
  9. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel , 8<sup>th</sup> edition, PHI.
  10. Java Programming, D.S.Malik, Cengage Learning.
  11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.
- ( Note: Use packages like java.io, java.util, etc)**

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**M.TECH  
COMPUTER SCIENCE**

(Applicable for the batches admitted from 2013-14)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
KUKATPALLY, HYDERABAD – 500 085.**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

**M.TECH - COMPUTER SCIENCE**  
**COURSE STRUCTURE AND SYLLABUS**

**I Year I Semester**

Code	Group	Subject	L	P	Credits
		Advanced Data Structures and Algorithms	3	-	3
		Computer System Design	3	-	3
		Advanced Operating Systems	3	-	3
		Software Process and Project Management	3	-	3
	Elective -I	Distributed Systems Natural Language Processing Pattern Recognition	3	-	3
	Elective -II	Machine Learning Parallel and Distributed Algorithms Software Architecture and Design Patterns	3	-	3
	Lab	Advanced Data Structures and Algorithms Lab	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

**I Year II Semester**

Code	Group	Subject	L	P	Credits
		Advanced Network Programming	3	-	3
		Advanced Databases	3	-	3
		Web Services and Service Oriented Architecture	3	-	3
		Wireless Networks and Mobile Computing	3	-	3
	Elective -III	Advanced Data Mining Storage Area Networks Database Security	3	-	3
	Elective -IV	Semantic Web and Social Networks Cloud Computing Information Retrieval Systems	3	-	3
	Lab	Web Services Lab	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

**II Year - I Semester**

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	-	3	2
		Project work	-	-	18
		Total Credits	-	3	22

**II Year - II Semester**

Code	Group	Subject	L	P	Credits
		Project work and Seminar	-	-	22
		Total Credits	-	-	22

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – I Sem. (Computer Science)****ADVANCED DATA STRUCTURES AND ALGORITHMS****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**

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

**UNIT II**

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

**UNIT III**

Searching–Linear and binary search methods, Hashing–Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.

Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

**UNIT IV**

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.

Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-DFS and BFS, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

**UNIT V**

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees –Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.

Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

**TEXT BOOKS:**

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3<sup>rd</sup> edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

**REFERENCE BOOKS:**

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8<sup>th</sup> editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3<sup>rd</sup> edition, Wiley India Edition.
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – I Sem. (Computer Science)

## COMPUTER SYSTEM DESIGN

**Objectives:**

- To apply the fundamentals of Computer Systems Design and IT in devising IT solutions.
- To design, simulate, and analyze digital hardware.
- To Interface between basic hardware and software computing systems.
- To Simulate and evaluate different computing architectures.

**UNIT I**

**Computer structure** – hardware, software, system software, Von-Neumann architecture – case study. IA-32 Pentium: registers and addressing, instructions, assembly language, program flow control, logic and shift/rotate instructions, multiply, divide MMX, SIMD instructions, I/O operations, subroutines.

Input/output organization, interrupts, DMA, Buses, Interface circuits, I/O interfaces, device drivers in windows, interrupt handlers.

**UNIT II**

**Processing Unit:** Execution of a complete instruction, multiple bus organization, hardwired control, micro programmed control.

**Pipelining:** data hazards, instruction hazards, influence on instruction sets, data path & control consideration, and RISC architecture introduction.

**UNIT – III**

**Memory:** types and hierarchy, model level organization, cache memory, performance considerations, mapping, virtual memory, swapping, paging, segmentation, replacement policies.

**UNIT – IV**

**Processes and Threads:** processes, threads, inter process communication, classical IPC problems, Deadlocks.

**UNIT – V**

**File system:** Files, directories, Implementation, Unix file system.

**Security:** Threats, intruders, accident data loss, basics of cryptography, user authentication.

**TEXT BOOKS:**

1. Computer Organization – Car Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Modern Operating Systems, Andrew S Tanenbaum 2<sup>nd</sup> edition Pearson/PHI.

**REFERENCE BOOKS:**

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson /PHI.
2. Morris Mano- Computer System Architecture –3<sup>rd</sup> Edition-Pearson Education.
3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7<sup>th</sup> Edition, John Wiley.
4. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/ PHI.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – I Sem. (Computer Science)****ADVANCED OPERATING SYSTEMS****Objectives:**

- To understand main components of Real time Operating system and their working.
- To study the operations performed by OS as a resource manager.
- To understand the scheduling policies of DOS.
- To implement the working principles of OS.
- To study different OS and compare their features.

**UNIT I:**

**Real-time operating systems:** Design issues, principles and case study.

**UNIT II:**

**Distributed operating system:** Design issues, features and principles of working, case study.

**UNIT III:**

**Network operating system:** Design issues, working principles and characteristic features, case study.

**UNIT IV:**

**Kernel development:** Issues and development principles, case study.

**UNIT V:**

Protection, privacy, access control and security issues, solutions.

**TEXT BOOKS:**

1. A. Silberschatz - Applied Operating System Concepts, Wiley, 2000.
2. Lubemir F Bic and Alan C. Shaw - Operating System Principles, Pearson Education, 2003.

**REFERENCE BOOKS:**

1. Operating Systems : Internal and Design Principles - Stallings, 6<sup>th</sup> ed., PE.
2. Modern Operating Systems, Andrew S Tanenbaum 3<sup>rd</sup> ed., PE.
3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7<sup>th</sup> ed., John Wiley.
4. UNIX User Guide – Ritchie & Yates.
5. UNIX Network Programming - W.Richard Stevens ,1998, PHI.
6. The UNIX Programming Environment – Kernighan & Pike, PE.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – I Sem. (Computer Science)

## SOFTWARE PROCESS AND PROJECT MANAGEMENT

**Objectives:**

- Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
- Compare and differentiate organization structures and project structures.
- Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

**UNIT I**

**Software Process Maturity** :Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

**Process Reference Models** : Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

**UNIT II**

**Software Project Management Renaissance** : Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

**Life-Cycle Phases and Process artifacts** : Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

**UNIT III**

**Workflows and Checkpoints of process** : Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.

**Process Planning**: Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

**UNIT IV**

**Project Organizations**: Line-of- business organizations, project organizations, evolution of organizations, process automation.

**Project Control and process instrumentation** : The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

**UNIT V**

**CCPDS-R Case Study and Future Software Project Management Practices** : Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

**TEXT BOOKS:**

1. Managing the Software Process, Watts S. Humphrey, Pearson Education, 1999.
2. Software Project Management, Walker Royce, Pearson Education, 1998.

**REFERENCE BOOKS:**

1. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
2. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000.
3. Process Improvement essentials, James R. Persse, O'Reilly, 2006.

3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007.
6. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, 2<sup>nd</sup> edition, Wiley India, 2004.
7. The Art of Project Management, Scott Berkun, SPD, O'Reilly, 2011.
8. Applied Software Project Management, Andrew Stellman & Jennifer Greene, SPD, O'Reilly, 2011.
9. Agile Project Management, Jim Highsmith, Pearson education, 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – I Sem. (Computer Science)****DISTRIBUTED SYSTEMS****(ELECTIVE-I)**

## Objectives:

- To explain what a distributed system is, why you would design a system as a distributed system, and what the desired properties of such systems are;
- To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles and evaluate the effectiveness and shortcomings of their solutions;
- To recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems;
- To design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognize when this is not possible, and explain why;
- To build distributed system software using basic OS mechanisms as well as higher-level middleware and languages.

**UNIT I**

Characterization of Distributed Systems- Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication.

Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

**UNIT II**

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems.

Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

**UNIT III**

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore.

Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

**UNIT IV**

Transactions and Concurrency control - Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls. Distributed Transactions - Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency

control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

**UNIT V**

Security - Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 WiFi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

**TEXT BOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

**REFERENCE BOOKS:**

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani & Mukesh Singhal, Cambridge, 2010.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Computer Science)

NATURAL LANGUAGE PROCESSING  
(ELECTIVE-I)**Objectives:**

- To acquire basic understanding of linguistic concepts and natural language complexity, variability.
- To acquire basic understanding of machine learning techniques as applied to language.
- To implement N-grams Models.

**UNIT I**

**Introduction and Overview** : What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. **Regular Expressions** Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools. **Programming in Python** : An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit) **String Edit Distance and Alignment** Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance examples of use in spelling correction and machine translation.

**UNIT II**

**Context Free Grammars** Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing and the problems with each. The desirability of combining evidence from both directions. **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser, Designing a little grammar, and parsing with it on some test data. **Probability**: Introduction to probability theory, Joint and conditional probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language. **Information Theory**: The “Shannon game”, motivated by language! Entropy, cross-entropy, information gain. Its application to some language phenomena.

**UNIT III**

**Language modeling and Naive Bayes** : Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

**UNIT IV**

**Probabilistic Context Free Grammars** : Weighted context free grammars. Weighted CYK. Pruning and beam search.

**Parsing with PCFGs** : A tree bank and what it takes to create one. The probabilistic version of CYK. How do humans parse? Experiments with eye-tracking. Modern parsers.

**Maximum Entropy Classifiers** : The maximum entropy principle and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation and other language tasks.

**UNIT V**

**Maximum Entropy Markov Models & Conditional Random Fields** : Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state

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machines. State-of-the-art models for NLP.

**Lexical Semantics** : Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial's.

**Information Extraction & Reference Resolution**: Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

**TEXT BOOKS:**

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall.
2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press.
3. "Natural Language Understanding". James Allen. The Benajmins/Cummings Publishing Company.

**REFERENCES BOOKS:**

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E: Statistical Language Learning. The MIT Press.
3. Jelinek, F: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – I Sem. (Computer Science)

PATTERN RECOGNITION  
(ELECTIVE – I)**Objectives:**

- To implement pattern recognition and machine learning theories
- To design and implement certain important pattern recognition techniques
- To apply the pattern recognition theories to applications of interest
- To implement the entropy minimization, clustering transformation and feature ordering

**UNIT I**

**Introduction** - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model

**Decision and Distance Functions** - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

**UNIT II**

**Probability** - Probability of events: Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples. **Statistical Decision Making** - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

**UNIT III**

**Non Parametric Decision Making** - Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques.

**Clustering and Partitioning** - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

**UNIT IV**

**Pattern Preprocessing and Feature Selection**- Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

**UNIT V**

**Syntactic Pattern Recognition & Application of Pattern Recognition** -Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS SCAN, Finger prints, etc.

**TEXT BOOKS:**

1. Gose. Johnsonbaugh. Jost. " Pattern recognition and Image Analysis", PHI.
2. Tou. Rafael. Gonzalez. "Pattern Recognition Principle", Pearson Education.

**REFERENCE BOOKS:**

1. Richard Duda, Hart, David Stork, "Pattern Classification", John Wiley.
2. Digital Image Processing, M.Anji Reddy, Y.Hari Shankar, BS Publications.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – I Sem. (Computer Science)

**MACHINE LEARNING  
(ELECTIVE –II)****Objectives:**

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

**UNIT I**

**Introduction** - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning.

**Concept learning and the general to specific ordering** – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

**UNIT II**

**Decision Tree learning** – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**Artificial Neural Networks** – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

**Evaluation Hypotheses** – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

**UNIT III**

**Bayesian learning** – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm.

**Computational learning theory** – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

**Genetic Algorithms** – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms.

**UNIT IV**

**Learning Sets of Rules** – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction,

Inverting Resolution.

**Analytical Learning** - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge.

#### **UNIT V**

**Combining Inductive and Analytical Learning** – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators.

**Reinforcement Learning** – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming.

#### **TEXT BOOKS:**

1. Machine Learning – Tom M. Mitchell - MGH.
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC).

#### **REFERENCE BOOKS:**

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001.
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – I Sem. (Computer Science)****PARALLEL AND DISTRIBUTED ALGORITHMS****(ELECTIVE –II)****Objectives:**

- To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
- To study the main classes of parallel algorithms.
- To study the complexity and correctness models for parallel algorithms.

**UNIT-I**

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing.

**UNIT-II**

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples.

**UNIT-III**

Pipelining- Techniques computing platform, pipeline programs examples.

**UNIT-IV**

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallel sharing data parallel programming languages and constructs, open MP.

**UNIT-V**

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**TEXT BOOK:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2<sup>nd</sup> Edition.

**REFERENCE BOOK:**

1. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Computer Science)

**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS  
(ELECTIVE –II)****Objectives:**

After completing this course, the student should be able to:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.
- To highlight the evolution of patterns.
- To how to add functionality to designs while minimizing complexity.
- To understand what design patterns really are, and are not.
- To learn about specific design patterns.
- To learn how to use design patterns to keep code quality high without overdesign.

**UNIT I**

**Envisioning Architecture** : The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

**Creating an Architecture** : Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

**UNIT II**

**Analyzing Architectures** : Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

**Moving from one system to many** : Software Product Lines, Building systems from off the shelf components, Software architecture in future.

**UNIT III**

**Patterns** : Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

**Creational and Structural patterns** : Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

**UNIT IV**

**Behavioral patterns** : Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

**UNIT V**

**Case Studies** : A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

**TEXT BOOKS:**

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

**REFERENCE BOOKS:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001.
3. Software Design, David Budgen, second edition, Pearson education, 2003.
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006.
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – I Sem. (Computer Science)

## ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

**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.

**Sample Problems on Data structures:**

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
  - a) Linear search
  - b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
  - a) List ADT
3. Write Java programs to implement the following using an array.
  - a) Stack ADT
  - b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
  - a) Stack ADT
  - b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
  - a) Array
  - b) Singly linked list
  - c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
  - a) Construct a binary search tree of elements.
  - b) Search for a key element in the above binary search tree.
  - c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
  - a) Preorder
  - b) Inorder
  - c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
  - a) Bubble sort
  - b) Insertion sort
  - c) Quick sort
  - d) Merge sort
  - e) Heap sort
  - f) Radix sort
  - g) Binary tree sort

16. Write a Java program to perform the following operations:  
a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

**REFERENCE BOOKS:**

1. Data Structures and Algorithms in java, 3<sup>rd</sup> edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard, 2<sup>nd</sup> edition, Schaum's Outlines, TMH.
3. Data Structures and algorithms in Java, 2<sup>nd</sup> Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work, W.J.Collins, Mc Graw Hill.
8. Java: the complete reference, 7<sup>th</sup> editon, Herbert Schildt, TMH.
9. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel , 8<sup>th</sup> edition, PHI.
10. Java Programming, D.S.Malik, Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

**( Note: Use packages like java.io, java.util, etc)**

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – II Sem. (Computer Science)****ADVANCED NETWORK PROGRAMMING****Objectives:**

Computer network programming involves writing computer programs that enable processes to communicate with each other across a computer network.

**Network programming is client–server programming**

Interprocess communication, even if it is bidirectional, cannot be implemented in a perfectly symmetric way: to establish a communication channel between two processes, one process must take the initiative, while the other is waiting for it. Therefore, network programming unavoidably assumes a client–server model: The process initiating the communication is a client, and the process waiting for the communication to be initiated is a server. The client and server processes together form a distributed system. In a peer-to-peer communication, the program can act both as a client and a server.

**UNIT – I**

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.

Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

**UNIT - II**

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink.

File and Directory management – Directory contents, Scanning Directories- Directory file APIs.

Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

**UNIT - III**

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.

Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example.

Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

**UNIT – IV**

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.

Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

**UNIT-V**

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

**TEXT BOOKS:**

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV).
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I).
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V).
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV).
5. Java Network Programming,3<sup>rd</sup> edition, E.R. Harold, SPD, O'Reilly.(Unit V).

**REFERENCE BOOKS:**

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2<sup>nd</sup> Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3<sup>rd</sup> Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4<sup>th</sup> Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3<sup>rd</sup> edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – II Sem. (Computer Science)

## ADVANCED DATABASES

**Objectives:**

By the end of the course, you 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.
- Optimizing and processing the queries.
- Storage 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:** Introduction 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<sup>rd</sup> 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<sup>nd</sup> 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.
12. Distributed Database Management Systems, S.K.Rahimi and F.S.Haug, Wiley.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – II Sem. (Computer Science)****WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE****Objectives:**

- To Understand Web Services and implementation model for SOA.
- To Understand the SOA, its Principles and Benefits.
- To Understand XML concepts.
- To Understand paradigms needed for testing Web Services.
- To explore different Test Strategies for SOA-based applications.
- To implement functional testing, compliance testing and load testing of Web Services.
- To Identify bug-finding ideas in testing Web Services.

**UNIT-I**

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

**UNIT -II**

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

**UNIT III**

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

**UNIT – IV**

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

**UNIT - V**

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

**TEXT BOOKS:**

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

**REFERENCE BOOKS:**

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2<sup>nd</sup> Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann Publishers, 2005.
5. J2EE Wer Services, Richard Monson-Haefel, Pearson Education.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – II Sem. (Computer Science)

## WIRELESS NETWORKS AND MOBILE COMPUTING

**Objectives:**

The main objective of this course is to provide the students with the competences required for understanding and using the communications component of an universal communications environment. Students will be provided, in particular, with the knowledge required to understand.

- emerging communications networks,
- their computational demands,
- the classes of distributed services and applications enabled by these networks, and
- the computational means required to create the new networks and the new applications.

**UNIT I**

**Wireless Networks:** Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards. **Mobile Computing:** Mobile communication, Mobile computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Mobility Management.

**UNIT II**

**Wireless LAN:** Infra red Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11: System Architecture, Protocol Architecture, 802.11b, 802.11a, Newer Developments, HIPERLAN 1, HIPERLAN 2, Bluetooth : User Scenarios, Architecture.

**UNIT III**

**Global System for Mobile Communications (GSM):** Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security. **GPRS:** GPRS System Architecture, **UMTS:** UMTS System Architecture. **LTE:** Long Term Evolution.

**UNIT IV**

**Mobile Network Layer:** Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP).

**UNIT V**

**Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

**TEXT BOOKS:**

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al "Wireless and Mobile Networks: Concepts and Protocols", Wiley India.
3. Raj Kamal, "Mobile Computing", OXFORD UNIVERSITY PRESS.

**REFERENCE BOOKS:**

1. Asoke K Talukder, et al, "Mobile Computing", Tata McGraw Hill, 2008.
2. Matthew S.Gast, "802.11 Wireless Networks", SPD O'REILLY.
3. Ivan Stojmenovic, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2007.
4. Kumkum Garg, "Mobile Computing", Pearson.
5. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Computer Science)

**ADVANCED DATA MINING  
(ELECTIVE –III)****Objectives:**

- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies for data mining.
- To understand the strengths and limitations of various data mining models.

**UNIT-I**

**Data mining Overview and Advanced Pattern Mining:** Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis, outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

**UNIT-II**

**Advance Classification:** Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughset approach, fuzzy set approach.

**UNIT-III**

**Advance Clustering :** Density - based methods – DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High- Dimensional Data; Clustering Graph and Network Data.

**UNIT-IV**

**Web and Text Mining:** Introduction, web mining, web content mining, web structure mining, web usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

**UNIT-V**

**Temporal and Spatial Data Mining :** Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

**TEXT BOOKS:**

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian pei, Morgan Kaufmann.
2. Data Mining Techniques – Arun K Pujari, Universities Press.

**REFERENCE BOOKS:**

1. Introduction to Data Mining – Pang-Ning Tan, Vipin kumar, Michael Steinbach, Pearson.
2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – II Sem. (Computer Science)

**STORAGE AREA NETWORKS  
(ELECTIVE-III)**

## Objectives:

- To understand Storage Area Networks characteristics and components.
- To become familiar with the SAN vendors and their products.
- To learn Fibre Channel protocols and how SAN components use them to communicate with each other.
- To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches Thoroughly learn Cisco SAN-OS features.
- To understand the use of all SAN-OS commands. Practice variations of SANOS features.

**UNIT I:**

**Introduction to Storage Technology:** Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

**UNIT II:**

**Storage Systems Architecture:** Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system.

**UNIT III:**

**Introduction to Networked Storage:** Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments.

**UNIT IV:**

**Information Availability & Monitoring & Managing Datacenter:** List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.

Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.

**UNIT V:**

**Securing Storage and Storage Virtualization:** Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes

**Case Studies:** The technologies described in the course are reinforced with EMC examples of actual solutions. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

**TEXT BOOK:**

1. EMC Corporation, Information Storage and Management, Wiley.

**REFERENCE BOOKS:**

1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Computer Science)

**DATABASE SECURITY  
(ELECTIVE-III)****Objectives:**

- To learn the security of databases.
- To learn the design techniques of database security.
- To learn the secure software design.

**UNIT I****Introduction:** Introduction to Databases Security, Problems in Databases Security, Controls, Conclusions.**Security Models -1:** Introduction Access Matrix Model, Take-Grant Model, Acten Model, PN Model, Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases.**UNIT II****Security Models -2:** Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model. The Lattice Model for the Flow Control conclusion.**Security Mechanisms :** Introduction, User Identification/Authentication Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security, Functionalities in Some Operating Systems, Trusted Computer System Evaluation Criteria.**UNIT III****Security Software Design:** Introduction, A Methodological Approach to Security Software Design, Secure Operating System Design, Secure DBMS Design, Security Packages, Database Security Design.**UNIT IV****Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions, Types of Attacks, Inference Controls evaluation Criteria for Control Comparison, .Introduction, IDES System, RETISS System, ASES System Discovery.**UNIT V****Models For The Protection Of New Generation Database Systems -1:** Introduction, A Model for the Protection of Frame Based Systems, A Model for the Protection of Object-Oriented Systems, SORION Model for the Protection of Object-Oriented Databases.**Models For The Protection Of New Generation Database Systems -2:** A Model for the Protection of New Generation Database Systems: the Orion Model, Jajodia and Kogan's Model, A Model for the Protection of Active Databases Conclusions.**TEXT BOOKS:**

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
2. Database Security, Castano, Second edition, Pearson Education.

**REFERENCE BOOK:**

1. Database security by alfred basta, melissa zgola, CENGAGE learning.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech – I Year – II Sem. (Computer Science)

SEMANTIC WEB AND SOCIAL NETWORKS  
(ELECTIVE –IV)**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 – II Sem. (Computer Science)

**CLOUD COMPUTING  
(ELECTIVE-IV)**

**Prerequisite:** Computer Networks and Operating Systems.

**Course Description:**

Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner. This course provides an insight into what is cloud computing and the various services cloud is capable.

**UNIT I**

**Systems Modeling, Clustering and Virtualization:** Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

**UNIT II**

**Foundations:** Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

**UNIT III**

**Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS):** Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing.

Aneka, Comet Cloud, T-Systems, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

**UNIT IV**

**Monitoring, Management and Applications:** An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

**UNIT V**

**Governance and Case Studies:** Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

**TEXT BOOKS:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.

**REFERENCE BOOKS:**

1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.

3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – II Sem. (Computer Science)****INFORMATION RETRIEVAL SYSTEMS  
(ELECTIVE –IV)****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 & Retrieval, Robert Korfhage, John Wiley & Sons.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M. Tech – I Year – II Sem. (Computer Science)****WEB SERVICES LAB****Objectives:**

- To implement the technologies like WSDL, UDDI.
- To learn how to implement and deploy web service client and server.

**List of Programs:**

1. Write a program to implement WSDL Service (Hello Service . WSDL File).
2. Write a program the service provider can be implement a single get price(), static bind() and get product operation.
3. Write a program to implement the operation can receive request and will return a response in two ways.
  - a) One-Way operation
  - b) Request - Response
4. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius (using HTTP Post Protocol).
5. Write a program to implement business UDDI Registry entry.
6. Write a program to implement
  - a) Web based service consumer
  - b) Windows application based web service consumer.