

# **ACADEMIC REGULATIONS & COURSE STRUCTURE**

**For**

**INFORMATION TECHNOLOGY**  
*(Applicable for batches admitted from 2016-2017)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

## I Semester

| S.No.                | SUBJECT                             | L  | P  | C         |
|----------------------|-------------------------------------|----|----|-----------|
| 1                    | ADVANCED DATA STRUCTURES            | 4  | -- | 3         |
| 2                    | ADVANCED GRAPH THEORY               | 4  | -- | 3         |
| 3                    | PARALLEL ALGORITHMS                 | 4  | -- | 3         |
| 4                    | DATA MINING AND KNOWLEDGE DISCOVERY | 4  | -- | 3         |
| 5                    | ADVANCED COMPUTER NETWORKS          | 4  | -- | 3         |
| 6                    | WEB TECHNOLOGIES                    | 4  | -- | 3         |
| 7                    | IT LAB 1                            | -- | 3  | 2         |
| <b>Total Credits</b> |                                     |    |    | <b>20</b> |

## II Semester

| S.No.                | SUBJECT   | L  | P  | C         |
|----------------------|---|----|----|-----------|
| 1                    | ADVANCED UNIX PROGRAMMING   | 4  | -- | 3         |
| 2                    | CYBER SECURITY  | 4  | -- | 3         |
| 3                    | BIG DATA ANALYTICS  | 4  | -- | 3         |
| 4                    | CLOUD COMPUTING   | 4  | -- | 3         |
| 5                    | <b>Elective – 1</b><br>1. ADHOC & SENSOR NETWORKS<br>2. SEMANTIC WEBSERVICES<br>3. PRINCIPLES OF PROGRAMMING LANGUAGES<br>4. INTERNET OF THINGS                 | 4  | -- | 3         |
| 6                    | <b>Elective - 2</b><br>1. MACHINE LEARNING<br>2. INFORMATION RETRIEVAL SYSTEM<br>3. IMAGE PROCESSING & PATTERN RECOGNITION<br>4. SOFTWARE TESTING METHODOLOGIES | 4  | -- | 3         |
| 7                    | IT LAB 2  | -- | 3  | 2         |
| <b>Total Credits</b> |   |    |    | <b>20</b> |

## III Semester

| S. No.               | Subject                 | L  | P  | Credits   |
|----------------------|-------------------------|----|----|-----------|
| 1                    | Comprehensive Viva-Voce | -- | -- | 2         |
| 2                    | Seminar – I             | -- | -- | 2         |
| 3                    | Project Work Part - I   | -- | -- | 16        |
| <b>Total Credits</b> |                         |    |    | <b>20</b> |

## IV Semester

| S. No.               | Subject                | L  | P  | Credits   |
|----------------------|------------------------|----|----|-----------|
| 1                    | Seminar – II           | -- | -- | 2         |
| 2                    | Project Work Part - II | -- | -- | 18        |
| <b>Total Credits</b> |                        |    |    | <b>20</b> |

---

**ADVANCED DATA STRUCTURES****UNIT I:**

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

**UNIT II:**

Searching-Linear and Binary Search Methods.

Sorting-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort.

Trees- Binary trees, Properties, Representation and Traversals (DFT,BFT),Expression Trees(Infix,prefix,postfix).

Graphs-Basic Concepts , Storage Structures and Traversals.

**UNIT III:**

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

**UNIT IV:**

Priority queues- Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion, Deletion .

Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

**UNIT V:**

Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations-, Insertion, Deletion and Searching.

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

**TEXT BOOKS:**

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

**REFERENCES BOOKS:**

1. Data Structures And Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures And Algorithms, 3/e, Adam Drozdek, Cenage.

## **ADVANCED GRAPH THEORY**

### **UNIT I:**

Basic Concepts: Graphs and digraphs, incidence and adjacency matrices, isomorphism, the automorphism group;

Trees: Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem,

### **UNIT II:**

Connectivity: Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger's theorem;

Paths and Cycles: Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, circumference, the Chinese Postman Problem, the Traveling Salesman problem, diameter and maximum degree

### **UNIT III:**

Matchings: Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching (in both bipartite and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f-factor theorem;

Extremal problems: Independent sets and covering numbers, Turan's theorem, Ramsey theorems;

### **UNIT IV:**

Colorings: Brooks theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number, Vizing's theorem;

Graphs on surfaces: Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2-cell embeddings, graphs on other surfaces;

### **UNIT V:**

Directed graphs: Tournaments, directed paths and cycles, connectivity and strongly connected digraphs

Networks and flows: Flow cuts, max flow min cut theorem

Selected topics: Dominating sets, the reconstruction problem

### **TEXT BOOKS:**

1. Douglas B. West, Introduction to Graph Theory, Prentice Hall of India.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science. Prentice-Hall.

### **REFERENCE BOOKS:**

1. Frank Harary, Graph Theory, Narosa.
2. R. Ahuja, T. Magnanti, and J. Orlin, Network Flows: Theory, Algorithms, and Applications, Prentice-Hall.

## PARALLEL ALGORITHMS

### UNIT I: Introduction:

Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law.

### UNIT II: Scheduling:

Organizational features of Processor Arrays, Multi processors and multi-computers. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm Coffman-graham scheduling algorithm for parallel processors.

### UNIT III: Algorithms:

Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms. Matrix Multiplication algorithms on SIMD and MIMD models. Fast Fourier Transform algorithms. Implementation on Hyper cube architectures. Solving linear system of equations, parallelizing aspects of sequential methods back substitution and Tri diagonal.

### UNIT IV: Sorting:

Parallel sorting methods, Odd-even transposition Sorting on processor arrays, Biontic ,merge sort on shuffle -exchange ID , Array processor,2D-Mesh processor and Hypercube Processor Array. Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations. Ellis algorithm and Manber and Ladner's Algorithms for dictionary operations.

### UNIT V: Searching

Parallel algorithms for Graph searching, All Pairs shortest paths and minimum cost spanning tree. Parallelization aspects of combinatorial search algorithms with Focus on Branch and Bound Methods and Alpha-beta Search methods.

### TEXT BOOKS:

1. Parallel computing theory and practice, Michel J.Quinn
2. Programming Parallel Algorithms, Guy E. Blelloch, Communications of the ACM

---

**DATA MINING AND KNOWLEDGE DISCOVERY****Unit 1:**

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi dimensional data analysis.

**Unit 2:** Classification: Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

**Unit 3:** Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical , Continuous attributes, Concept hierarchy, Sequential , Sub graph patterns

**Unit 4:** Clustering: Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm

**Unit 5:** Web data mining: Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, Search Engines :Characteristics, Functionality, Architecture, Ranking of WebPages, Enterprise search

**TEXT BOOKS:**

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipinkumar, Addison-Wesley.
2. Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.

**REFERENCE BOOKS:**

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008.
2. Fundamentals of data warehouses, 2/e ,Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
3. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.
4. Data Mining , Concepts and Techniques, 2/e, Jiawei Han, MichelineKamber, Elsevier, 2006.

## ADVANCED COMPUTER NETWORKS

### Unit-I:

**Network layer:** Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets.

**Routing Algorithm** –shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, Broadcast routing, Multicasting routing, routing for mobiles Hosts, routing in Adhoc networks-

**congestion control algorithms**-Load shedding, Congestion control in Data gram Subnet.

### Unit-II:

**IPV4 Address** address space, notations, classful addressing, classless addressing network addressing translation(NAT) , **IPV6 Address** structure address space, **Internetworking** need for network layer internet as a data gram, internet as connection less network.

**IPV4** datagram, Fragmentation, checksum, options.

**IPV6** Advantages, packet format, extension Headers, Transition form IPV4 to IPV6

### Unit-III:

**Process to process delivery:** client/server paradigm, multiplexing and demultiplexing, connectionless versus connection oriented services, reliable versus reliable.

**UDP:** well known ports for UDP, user data gram, check sum, UDP operation, and uses of UDP

**TCP:** TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.

**SCTP:** SCTP services SCTP features, packet format, An SCTP association, flow control, error control.

**Congestion control:** open loop congestion control, closed loop congestion control, Congestion control in TCP, frame relay,

**QUALITY OF SERVICE:** flow characteristics, flow classes **TECHNIQUES TO IMPROVE**

**QOS:** scheduling, traffic shaping, resource reservation, admission control.

### Unit -IV:

**Multimedia:** introduction digital a audio , Audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, video on demand, the Mbone-the multicast back bone

### Unit -V: Emerging trends Computer Networks:

**Mobile Ad hoc networks:** applications of Ad hoc networks, challenges and issues in MANETS,MAC layers issues, routing protocols in MANET, transport layer issues, Ad Hoc networks security.

**Wireless sensors networks:** WSN functioning, operation system support in sensor devices, WSN Characteristics, sensor network operation, sensor Architecture: cluster management;

**Wireless mesh networks** WMN design, Issues in WMNs;

**TEXT BOOKS:**

1. Data communications and networking 4<sup>th</sup> edition Behrouz A Fourzan, TMH
2. Computer networks 4<sup>th</sup> edition Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE

**REFERENCE BOOKS:**

1. Computer networks, A system Approach, 5<sup>th</sup> ed, Larry L Peterson and Bruce S Davie, Elsevier



**WEB TECHNOLOGIES****UNIT-I:**

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

**UNIT-II:**

**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

**AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.

**UNIT-III:**

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

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

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

**UNIT-IV:**

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

**UNIT-V:**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**IT LAB 1**

- 1) Write a c program to implement one to one chat application using sockets?
- 2) Write a c program to implement redundancy check using CRC?
- 3) Write a java program to implement simulation of sliding window protocol?
- 4) Write a java program to get the MAC or Physical address of the system using Address Resolution Protocol?
- 5) By using Data mining tool Demonstration of preprocessing on dataset student.arff?
- 6) By using Data mining tool Demonstration of classification rule process on dataset employee.arff using j48 algorithm
- 7) By using Data mining tool Demonstration of Association rule process on dataset test.arff using apriori algorithm?
- 8) By using Data mining tool Demonstration of classification rule process on dataset employee.arff using naïve baye's algorithm?
- 9) By using Data mining tool Demonstration of clustering rule process on dataset iris.arff using simple k-means algorithms.
- 10) To perform various Recursive & Non-Recursive operations on Binary Search Tree
- 11) To implement BFS & DFS for a Graph
- 12) To implement Merge & Heap Sort of given elements
- 13) To perform various operations on AVL trees
- 14) To implement Krushkal's algorithm to generate a min-cost spanning tree
- 15) To implement Prim's algorithm to generate a min-cost spanning tree
- 16) To implement functions of Dictionary using Hashing

## **ADVANCED UNIX PROGRAMMING**

### **UNIT-I**

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

### **UNIT-II**

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

### **UNIT-III**

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

### **UNIT-IV**

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

### **UNIT-V**

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

### **TEXT BOOKS:**

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

### **REFERENCE BOOKS:**

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

## CYBER SECURITY

### UNIT I:

#### Introduction:

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

### UNIT II :

#### Conventional Encryption:

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

### UNIT III :

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

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

### UNIT IV:

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

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

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

### UNIT V :

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

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

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

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

## **BIG DATA ANALYTICS**

### **UNIT-I**

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

### **UNIT-II**

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

### **UNIT-III**

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

### **UNIT-IV**

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

### **UNIT-V**

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

### **TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**SOFTWARE LINKS:**

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

## CLOUD COMPUTING

### UNIT I:

**Introduction:** Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing

**Parallel and Distributed Systems:** introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

### UNIT II:

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing

**Cloud Computing :** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

### UNIT III:

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades

**Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling

### UNIT IV:

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, Big Table, Megastore ( text book 1), Amazon Simple Storage Service(S3) (Text book 2)

**Cloud Security:** Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

### UNIT V:

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1)

**Google:** Google App Engine, Google Web Toolkit (Text Book 2)

**Microsoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

**TEXT BOOKS:**

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

**REFERNCE BOOK:**

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



## ADHOC & SENSOR NETWORKS (Elective -1)

### UNIT I: Introduction to Ad Hoc Wireless Networks

Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols

### UNIT II: Routing Protocols for Ad Hoc Wireless Networks

Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

### UNIT III: Security protocols for Ad hoc Wireless Networks

Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

### UNIT IV: Basics of Wireless Sensors and Applications

The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

### UNIT V: Security in WSNs

Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems-TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow style language: Tiny GALs, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

### TEXT BOOKS:

4. Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
5. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Cordeiro Dharma P.Agrawal*, World Scientific Publications / Cambridge University Press, March 2006
6. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

### REFERENCE BOOKS:

5. Wireless Sensor Networks: An Information Processing Approach, *Feng Zhao, Leonidas Guibas*, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
6. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
7. Ad hoc Networking, *Charles E.Perkins*, Pearson Education, 2001
8. Wireless Ad hoc Networking, *Shih-Lin Wu, Yu-Chee Tseng*, Auerbach Publications, Taylor & Francis Group, 2007

---

## **SEMANTIC WEBSERVICES** **(Elective -1)**

### **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 interscience, 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, Rudi Studer, Paul 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.

# PRINCIPLES OF PROGRAMMING LANGUAGES

## (Elective -1)

### UNIT I:

**Syntax and semantics:** Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

### UNIT II:

**Data, data types, and basic statements:** Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

### UNIT III:

**Subprograms and implementations:** Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

### UNIT IV:

**Object- orientation, concurrency, and event handling:** Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling

### UNIT V:

**Functional programming languages:** Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, – Programming with ML,

**Logic programming languages:** Introduction to logic and logic programming, – Programming with Prolog, multi - paradigm languages

### TEXT BOOKS:

1. Robert W. Sebesta, “Concepts of Programming Languages”, Tenth Edition, Addison Wesley, 2012.
2. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

### REFERENCE BOOKS:

1. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Prentice Hall, 1998.
3. Richard A. O’Keefe, “The craft of Prolog”, MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003.

# INTERNET OF THINGS

## UNIT I:

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices  
Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

## UNIT II:

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

## UNIT III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

## UNIT IV:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

## UNIT V:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World.

## TEXTBOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

## REFERNCE BOOKS:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , Oreilly.

---

## **MACHINE LEARNING** **(Elective -2)**

**UNIT -I: The ingredients of machine learning, Tasks:** the problems that can be solved with machine learning, **Models:** the output of machine learning, **Features,** the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation

**UNIT- II: Beyond binary classification:** Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning:** The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

**UNIT- III: Tree models:** Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:** Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

**UNIT -IV: Linear models:** The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods. **Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

**UNIT- V: Probabilistic models:** The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables. **Features:** Kinds of feature, Feature transformations, Feature construction and selection. **Model ensembles:** Bagging and random forests, Boosting

### **TEXT BOOKS:**

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

### **REFERENCE BOOKS:**

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

---

## **INFORMATION RETRIEVAL SYSTEM** (Elective -2)

### **Unit I : Introduction to Information storage and retrieval systems:**

Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation  
**Introduction to Data structures and algorithms related to Information Retrieval:** Basic Concepts, Data structures, Algorithms.

### **Unit II: Inverted Files and Signature Files:**

Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques.  
Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

### **Unit III: New Indices for Text, Lexical Analysis and Stop lists:**

**PAT Trees and PAT Arrays:** Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stop lists.

### **Unit IV: Stemming Algorithms and Thesaurus Construction:**

Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files.  
Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

### **Unit V: String Searching Algorithms:**

Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

### **TEXT BOOKS**

1. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA,2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

# IMAGE PROCESSING & PATTERN RECOGNITION

## (Elective -2)

### UNIT I:

**Pattern Recognition:** machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

**Bayesian Decision Theory:** Introduction, continuous features-two categories classifications, minimum error rate classification-zero-one loss function, classifiers, discriminate functions, and decision surfaces.

### UNIT II:

**Normal density:** Univariate and multivariate density, discriminate functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.

**Component analyses:** Principal component analysis, non-linear component analysis, Low dimensional representations, and multi dimensional scaling.

### UNIT III:

**Digitized Image and its properties:** Basic concepts, Image Functions, the dirac distribution and convolution, the Fourier transform, Images as a Stochastic process, Images as linear systems.

**Image Digitization:** Sampling, Quantization, Colour Images.

**Digital Image Properties:** Metric and topological properties of Digital Images, Histograms, Visual perception of the Image, Image quality, Noise in Images.

### UNIT IV:

**Data Structures for Image Analysis:** Levels of Image Data representation, traditional Image Data Structures- Matrices, Chains, Topological Data Structures, Relational Structures.

### UNIT V:

**Image Pre-processing:** Pixel brightness transformation – Position dependent brightness correction, Gray scale transformation. Geometric Transformations -- Pixel co-ordinate transformation, Brightness interpolation. Local Pre-processing – Image smoothing, Edge-detectors, Zero crossings of the second derivatives, scale in Image processing, canny edge detection, parametric edge models, edges in multi spectral images, other local pre-processing operators, adaptive neighborhood pre-processing.

**Text Books:**

1. Image Processing, Analysis and Machine Vision – Milan Sonka, Vaclav Hlavac, Roger Boyle,  
Second Edition – Vikas Publishing House.
2. pattern classification ,Richard o.Duda, peter E.Hart, David G.Stroke, Wiley student  
edition,2<sup>nd</sup>  
edition.
3. Digital Image processing , Rafeal C.Gonzalez,Richard E.Woods, 2<sup>nd</sup> edition, Pearson  
Education/PHI.

**Reference:**

1. Digital Image Processing And Analysis – Chanda & Majumder



# SOFTWARE TESTING METHODOLOGIES

(Elective -2)

## UNIT-I:

**Introduction:** Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

**Flow graphs and Path testing:** Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

## UNIT-II:

**Transaction Flow Testing:** Transaction Flows, Transaction Flow Testing Techniques.

**Dataflow testing:** Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

## UNIT-III:

**Domain Testing:** Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

**Paths, Path products and Regular expressions:** Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

## UNIT-IV:

**Logic Based Testing:** Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

**State, State Graphs and Transition Testing:** State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

**Graph Matrices and Application:-**Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

## UNIT – V:

**Software Testing Tools:** Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

## TEXT BOOKS:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

## REFERENCE BOOKS:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3<sup>rd</sup> edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.

**IT LAB 2**

1. Write a Program to count the number of words and lines supplied at standard input using UNIX shell programming?
2. Write a shell script to find the factorial of a number entered through keyboard?
3. Write a shell script to find the gross salary given that if the basic salary is less than 1500 then HRA =10% of basic salary and DA=90% if the basic salary is greater than or equal to 1500 then HRA=500 and DA=98% of basic salary. The employee's basic salary is the input through keyboard?
4. Write a shell script to display following information using case statement?
  - a. List users
  - b. Show date
  - c. Display file
  - d. Change working directory
  - e. Return to original directory
  - f. Quit
5. Write a c program to implement one to one chat application using sockets?
6. Write a c program to implement redundancy check using CRC?
7. Write a java program to implement simulation of sliding window protocol?
8. Write a java program to get the MAC or Physical address of the system using Address Resolution Protocol?
9. Write a java program to implement Play Fair Cipher to encrypt and decrypt a given message?
10. Write a java program to demonstrate public-key based asymmetric algorithms for encryption-based security of information?
11. Write a java program that implement secured Internet Protocol (IP) communications by using Internet Protocol Security (IPSec)?
12. Write a java program to implement RSA algorithm?

# **ACADEMIC REGULATIONS & COURSE STRUCTURE**

**For**

**NEURAL NETWORKS**

*(Applicable for batches admitted from 2016-2017)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

## I Semester

| S.No.                | SUBJECT                     | L  | P  | C         |
|----------------------|-----------------------------|----|----|-----------|
| 1                    | ARTIFICIAL INTELLIGENCE     | 4  | -- | 3         |
| 2                    | DATA WAREHOUSING AND MINING | 4  | -- | 3         |
| 3                    | WEB TECHNOLOGIES            | 4  | -- | 3         |
| 4                    | NATURAL LANGUAGE PROCESSING | 4  | -- | 3         |
| 5                    | CYBER SECURTY               | 4  | -- | 3         |
| 6                    | COMPUTATIONAL INTELLIGENCE  | 4  | -- | 3         |
| 7                    | NN LAB 1                    | -- | 3  | 2         |
| <b>Total Credits</b> |                             |    |    | <b>20</b> |

## II Semester

| S.No.                | SUBJECT  | L  | P  | C         |
|----------------------|--|----|----|-----------|
| 1                    | MACHINE LEARNING   | 4  | -- | 3         |
| 2                    | ARTIFICIAL NEURAL NETWORKS   | 4  | -- | 3         |
| 3                    | BIG DATA ANALYTICS   | 4  | -- | 3         |
| 4                    | ADVANCED ALGORITHMS  | 4  | -- | 3         |
| 5                    | <b>Elective – 1</b><br>1. OBJECT ORIENTED ANALYSIS AND DESIGN<br>2. SOFT COMPUTING<br>3. COGNITIVE SYSTEMS<br>4. EXPERT SYSTEMS                          | 4  | -- | 3         |
| 6                    | <b>Elective - 2</b><br>1. COMPUTER VISION AND IMAGE PROCESSING<br>2. CLOUD COMPUTING<br>3. DECISION SUPPORT SYSTEMS<br>4. INFORMATION STORAGE MANAGEMENT | 4  | -- | 3         |
| 7                    | NN LAB 2   | -- | 3  | 2         |
| <b>Total Credits</b> |  |    |    | <b>20</b> |

## III Semester

| S. No.               | Subject                 | L  | P  | Credits   |
|----------------------|-------------------------|----|----|-----------|
| 1                    | Comprehensive Viva-Voce | -- | -- | 2         |
| 2                    | Seminar – I             | -- | -- | 2         |
| 3                    | Project Work Part - I   | -- | -- | 16        |
| <b>Total Credits</b> |                         |    |    | <b>20</b> |

## IV Semester

| S. No.               | Subject                | L  | P  | Credits   |
|----------------------|------------------------|----|----|-----------|
| 1                    | Seminar – II           | -- | -- | 2         |
| 2                    | Project Work Part - II | -- | -- | 18        |
| <b>Total Credits</b> |                        |    |    | <b>20</b> |

## ARTIFICIAL INTELLIGENCE

### UNIT-I:

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

### UNIT-II:

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

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

### UNIT-III:

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

### UNIT-IV:

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

### UNIT-V:

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

### TEXT BOOKS:

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

### REFERNCE BOOKS:

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

## DATA WAREHOUSING AND DATA MINING

### UNIT 1: DATA WAREHOUSING

Data warehousing Components –Building a Data warehouse -- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

### UNIT II: BUSINESS ANALYSIS

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

### UNIT III: DATA MINING

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

### UNIT IV :ASSOCIATION RULE MINING AND CLASSIFICATION

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

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

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

### TEXT BOOKS:

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

## **REFERENCES:**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.

## WEB TECHNOLOGIES

### UNIT-I:

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

### UNIT-II:

**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

**AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.

### UNIT-III:

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

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

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

### UNIT-IV:

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

### UNIT-V:

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

### Text Books:

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

### Reference Books:

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



## NATURAL LANGUAGE PROCESSING

### UNIT- I

**Introduction:** NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

### UNIT- II

**N-gram Language Models:** The role of language models, Simple Ngram models. Estimating parameters and smoothing. Evaluating language models.

**Part of Speech Tagging and Sequence Labeling :** Lexical syntax. Hidden Markov Models. Maximum Entropy Models. Conditional Random Fields

### UNIT- III

**Syntactic parsing:** Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

### UNIT- IV

**Semantic Analysis:** Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.

### UNIT- V

**Information Extraction (IE) and Machine Translation (MT):** Named entity recognition and relation extraction. IE using sequence labeling. Basic issues in MT. Statistical translation, word alignment, phrasebased translation, and synchronous grammars. Dialogues: Turns and utterances, grounding, dialogue acts and structures Natural Language Generation: Introduction to language generation, architecture, discourse planning (text schemata, rhetorical relations).

### TEXT BOOK

1. D. Jurafsky & J. H. Martin – “Speech and Language Processing – An introduction to Languageprocessing, Computational Linguistics, and Speech Recognition”, Pearson Education

### REFERENCES

1. Allen, James. 1995. – “Natural Language Understanding”. Benjamin/ Cummings, 2ed.
2. Bharathi, A., Vineet Chaitanya and Rajeev Sangal. 1995. Natural Language Processing- “A Pananian Perspective”. Prentice Hill India, Eastern Economy Edition.
3. Eugene Charniak: “Statistical Language Learning”, MIT Press, 1993.
4. Manning, Christopher and Heinrich Schutze. 1999. “Foundations of Statistical Natural Language Processing”. MIT Press.

## CYBER SECURITY

### UNIT - I:

#### Introduction:

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

### UNIT - II :

#### Conventional Encryption:

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

### UNIT - III:

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

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

### UNIT - IV:

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

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

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

### UNIT - V:

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

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

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

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

**COMPUTATIONAL INTELLIGENCE****UNIT -I**

Introduction-Computational intelligences-agents,-example application domains-Representation and reasoning systems-Data log,-syntax and semantics-variables,-queries-recursion- Learning Issues, decision-tree, neural networks learning

**UNIT -II**

Proofs-soundness- completeness- top-down and bottom-up reasoning,- function symbols- Searching graphics, generic search engine- blind search strategies,-heuristic search,-A\* search

**UNIT- III**

Pruning the search space-search direction-iterative deepening-dynamic programming-constraint satisfaction-consistency algorithms-hill climbing- randomized algorithms.

**UNIT -IV**

Knowledge representation issues- defining a solution- choosing a representation-semantic networks-frames-primitive and derived relations- Equality- inequality- unique names assumption,-complete knowledge assumption - negation as failure.

**UNIT- V**

STRIPS representation-situation calculus-forward planning-resolution and planning- Knowledge based systems - implementations- base language and meta language

**TEXT BOOK:**

1. Computational Intelligence: a logical approach by Poole, Mackworth and Goebel, 1998, Oxford University Press

**REFERENCES:**

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press, 2004.

### NN LAB 1

#### **Data Ware housing and Mining Lab:**

- 1) By using Data mining tool Demonstration of pre-processing on dataset student.arff?
- 2) By using Data mining tool Demonstration of classification rule process on dataset employee.arff using j48 algorithm
- 3) By using Data mining tool Demonstration of Association rule process on dataset test.arff using apriori algorithm?
- 4) By using Data mining tool Demonstration of classification rule process on dataset employee.arff using naïve baye's algorithm?
- 5) By using Data mining tool Demonstration of clustering rule process on dataset iris.arff using simple k-means algorithms.

#### **Web Technologies Lab list:**

1. Write Ruby program reads a number and calculates the factorial value of it and prints the Same.
2. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.
3. Write a Ruby program that uses iterator to find out the length of a string.
4. Write Ruby program which uses Math module to find area of a triangle.
5. Write Ruby program which uses tk module to display a window
6. Define complex class in Ruby and do write methods to carry operations on complex objects.
7. Write perl program takes set names along the command line and prints whether they are regular files or special files
8. An example perl program to connect to a MySQL database table and executing simple commands.
9. Example PHP program for cotactus page.

## MACHINE LEARNING

**UNIT -I: The ingredients of machine learning, Tasks:** the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation

**UNIT- II: Beyond binary classification:** Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning:** The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

**UNIT- III: Tree models:** Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:** Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

**UNIT -IV: Linear models:** The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods. **Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

**UNIT- V: Probabilistic models:** The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables. **Features:** Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

---

**ARTIFICIAL NEURAL NETWORKS****UNIT-I: Introduction and ANN Structure.**

Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

**UNIT-II**

Mathematical Foundations and Learning mechanisms. Re-visiting vector and matrix algebra. State-space concepts. Concepts of optimization. Error-correction learning. Memory-based learning. Hebbian learning. Competitive learning.

**UNIT-III**

Single layer perceptrons. Structure and learning of perceptrons. Pattern classifier - introduction and Bayes' classifiers. Perceptron as a pattern classifier. Perceptron convergence. Limitations of a perceptrons.

**UNIT-IV: Feed forward ANN.**

Structures of Multi-layer feed forward networks. Back propagation algorithm. Back propagation - training and convergence. Functional approximation with back propagation. Practical and design issues of back propagation learning.

**UNIT-V: Radial Basis Function Networks.**

Pattern separability and interpolation. Regularization Theory. Regularization and RBF networks. RBF network design and training. Approximation properties of RBF.

**TEXT BOOKS:**

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

**REFERENCE BOOKS:**

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

## **BIG DATA ANALYTICS**

### **UNIT-I**

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

### **UNIT-II**

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

### **UNIT-III**

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

### **UNIT-IV**

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

### **UNIT-V**

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

### **TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**SOFTWARE LINKS:**

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



---

**ADVANCED ALGORITHMS****UNIT-I**

**Design Paradigms: Overview:** Overview of Divide and Conquer, Greedy and Dynamic Programming strategies. Basic search and traversal techniques for graphs, Backtracking, Branch and Bound, Max Flow Problem

**UNIT-II**

**String Matching:** Introduction to string-matching problem, Naïve algorithm, Rabin Karp, Knuth Morris Pratt, Boyer-Moore algorithms and complexity analysis.

**Theory of NP- Hard and NP-Complete Problems. :** P, NP and NPC complete complexity classes; A few NP-Completeness proofs; Other complexity classes.

**UNIT-III**

**Approximation Algorithms :** Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

**UNIT-IV**

**Parallel Algorithms:** Introduction, Models, speedup and efficiency, Some basic techniques, Examples from graph theory, sorting, Parallel sorting networks. Parallel algorithms and their parallel time and processors complexity.

**UNIT-V**

**Probabilistic Algorithms & Randomized Algorithms :** Numerical probabilistic algorithms, Las Vegas and Monte Carlo algorithms, Game theoretic techniques, Applications on graph problems

**TEXT BOOKS:**

1. Introduction to Algorithms : T.H. Cormen, C.E.Leiserson and R.L. Rivest
2. Fundamentals of Algorithmics : G.Brassard and P.Bratley
3. Approximation Algorithms: Vijay V.Vazirani
4. Randomized Algorithms: R. Motwani and P.Raghavan

**REFERENCE BOOK:**

1. Algorithmic :The spirit of computing: D.Harel

**OBJECT ORIENTED ANALYSIS AND DESIGN**  
**(Elective-I)****UNIT I:**

**Introduction to UML:** The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, genericity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture.

**UNIT II:**

**Basic structural Modeling:** Classes, relationships, common mechanisms, diagrams, Advanced structural modeling: advanced relationships, interfaces, types & roles, packages, instances.

**Class & object diagrams:** Terms, concepts, examples, modeling techniques, class & Object diagrams.

**UNIT III:**

**Collaboration diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration diagrams, iterated messages, use of self in messages.

**Sequence diagrams:** Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

**UNIT IV:**

**Behavioral Modeling:** Interactions, use cases, use case diagrams, activity diagrams.

**Advanced Behavioral Modeling:** Events and signals, state machines, processes & threads, time and space, state chart diagrams.

**UNIT V: Architectural Modeling:** Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

**TEXT BOOKS:**

1. The Unified Modeling Language User Guide, Grady Booch, Rumbaugh, Ivar Jacobson, PEA
2. Fundamentals of Object Oriented Design in UML, Meilir Page-Jones, Addison Wesley

**REFERENCE BOOKS:**

1. Head First Object Oriented Analysis & Design, Mclaughlin,SPD OReilly,2006
2. Object oriented Analysis& Design Using UML, Mahesh ,PHI
3. The Unified Modeling Language Reference Manual, 2/e, Rumbaugh, Grady Booch,etc., PEA
4. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson

## **SOFT COMPUTING** **(Elective -1)**

### **UNIT- I**

**FUZZY SET THEORY:** Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Surgeon Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

### **UNIT- II**

**OPTIMIZATION:** Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, Random Search – Downhill Simplex Search.

### **UNIT -III**

**ARTIFICIAL INTELLIGENCE:** Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification  
State Space Search: Strategies Implementation of Graph Search Search based on Recursion Patent-directed Search Production System and Learning.

### **UNIT -IV**

**NEURO FUZZY MODELING:** Adaptive Neuro-Fuzzy Inference Systems, Architecture – Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

### **UNIT- V**

**APPLICATIONS OF COMPUTATIONAL INTELLIGENCE:** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.

### **TEXT BOOKS:**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press, 2006.

### **REFERENCES:**

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.

## **COGNITIVE SYSTEMS**

**(Elective -1)**

### **UNIT I:**

Introduction to Knowledge Based Artificial Intelligence (KBAI) and Cognitive Systems. Where Knowledge-Based AI fits into AI as whole, Cognitive systems: what are they? Cognitive Science and Cognition, AI and cognition: how are they connected?

### **UNIT II:**

Fundamentals: Semantic Networks, Generate & Test, Means-Ends Analysis, Problem Reduction, Production Systems

### **UNIT III:**

Kinematics of Robot Manipulator: Introduction, General Mathematical Preliminaries on Vectors & Matrices, Direct Kinematics problem, Geometry Based Direct kinematics problem, Co-ordinate and vector transformation using matrices, Rotation matrix, Inverse Transformations, Problems, Composite Rotation matrix, Homogenous Transformations, Robotic Manipulator Joint Co-Ordinate System, Euler Angle & Euler Transformations, Roll-Pitch-Yaw(RPY) Transformation H Representation & Displacement Matrices for Standard Configurations, Jacobian Transformation in Robotic Manipulation. (SLE: Geometrical Approach to Inverse Kinematics.)

### **UNIT IV:**

Visuospatial Reasoning Constraint Propagation, Visuospatial Reasoning Unit 8: Design & Creativity Configuration, Diagnosis, Design, Creativity Met cognition Learning by Correcting Mistakes, Meta-Reasoning, AI Ethics Module II (Cognitive Systems) Introduction: Automation and Robotics, Historical Development, Definitions, Basic Structure of Robots, Robot Anatomy, Complete Classification of Robots, Fundamentals about Robot Technology, Factors related to use Robot Performance, Basic Robot Configurations and their Relative Merits and Demerits, the Wrist & Gripper Subassemblies. Concepts about Basic Control System, Control Loops of Robotic Systems, Different Types of Controllers Proportional, Integral, Differential, PID controllers. (SLE: Types of Drive Systems and their Relative Merits)

### **UNIT V:**

Robot Sensing & Vision: Various Sensors and their Classification, Use of Sensors and Sensor Based System in Robotics, Machine Vision System, Description, Sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Robotic Assembly Sensors and Intelligent Sensors.

## **TEXT BOOKS**

1. Chris Forsythe et al. , Cognitive Systems: Human Cognitive Models in Systems Design, Kindle Edition
2. G. F. Markus. The Algebraic Mind - Integrating Connectionism & Cognitive Science , MIT Press.
3. Fu, Lee and Gonzalez, Robotics, control vision and intelligence. McGraw Hill . 4. John J. Craig, Introduction to Robotics, Addison Wesley

## **REFERENCES:**

1. Henrik Christensen, Cognitive Systems (Cognitive Systems Monographs), Springer
2. Yoram Koren, Robotics for Engineers, McGraw Hill International, 1st edition, 1985.
3. Groover, Weiss, Nagel, Industrial Robotics, McGraw Hill International, 2nd edition, 2012. 4. Robotic Engineering -An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st edition, 2009

# **EXPERT SYSTEMS**

## **(Elective -1)**

### **UNIT- I:**

Introduction What is AI? The Foundations of AI, What is an AI Technique?-Tic-Tac-Toe. Problems, Problem Spaces and Search Defining the problem as a state space search, Production systems, Problem characteristics, production system characteristics, Issues in the design of search programs.

### **UNIT -II:**

Heuristic Search Techniques Generate-and-test, Hill climbing, Simulated Annealing, Best-First search, A\* algorithm, AO\* algorithm, Constraint satisfaction, Means-Ends Analysis.

### **UNIT -III:**

First-Order Logic Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic, Representing Change in the world, Deducing hidden properties of the world. Interface in First-Order Logic Inference rules involving Quantifiers, An Example proof, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution, Completeness of Resolution.

### **UNIT-IV:**

Slot-and-Filler Structures Semantic Nets, Frames, Conceptual Dependency. Game Playing Overview, The Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

### **UNIT-V:**

Natural Language Processing Introduction, Syntactic processing, Semantic analysis. Expert Systems Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

### **TEXT BOOKS:**

1. Rich, Elaine and Knight, Kevin, Artificial Intelligence, Tata McGraw-Hill publications, 2nd Edition, 2006
2. Russell, Stuart and Norvig, Peter, Artificial Intelligence A Modern Approach, Pearson Education

### **REFERENCE BOOKS:**

1. Eugene Charniak and Drew McDermott, Introduction to Artificial Intelligence, Addison Wesley, Pearson Education, 2005
2. George F Luger, Artificial Intelligence Structures and Strategies for Complex Problem Solving, Pearson Education Ltd., 2nd Edition, 2002. 3. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall of India, 2001.

**COMPUTER VISION AND IMAGE PROCESSING**  
(Elective -2)

**UNIT -I**

**Image Formation Models :** Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems

**UNIT- II**

**Image Processing and Feature Extraction:** Image representations (continuous and discrete), Edge detection

**UNIT- III**

**Motion Estimation:** Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion

**UNIT- IV**

**Shape Representation and Segmentation:** Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, and Multiresolution analysis

**UNIT- V**

**Object recognition:** Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition

**TEXT BOOKS:**

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
2. Robot Vision, by B. K. P. Horn, McGraw-Hill.

**REFERENCE BOOKS:**

1. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.

# CLOUD COMPUTING

(Elective – 2)

## UNIT I:

**Introduction:** Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing

**Parallel and Distributed Systems:** introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

## UNIT II:

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing

**Cloud Computing :** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

## UNIT III:

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades

**Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling

## UNIT IV:

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, Big Table, Megastore ( text book 1), Amazon Simple Storage Service(S3) (Text book 2)

**Cloud Security:** Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

## UNIT V:

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1)

**Google:** Google App Engine, Google Web Toolkit (Text Book 2)

**Microsoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

## TEXT BOOKS:

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

## REFERNCE BOOK:

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



## **DECISION SUPPORT SYSTEMS**

### **(Elective -2)**

#### **UNIT -I**

Basic Concepts: Decision making systems, Modeling and support, Basics and definition Systems models, Modeling process, Decision making, Intelligence phase, Design phase Choice phase, Evaluation, Implementation phase, Alternative decision making models, Decision support systems, Decision makers, Case applications.

#### **UNIT- II**

Decision Support System Development: Decision support system development, Basics, Life cycle, Methodologies, Prototype, Technology levels and tools, Development platforms, Tool selection, Developing DSS, Enterprise systems, Concepts and definition, Evolution of information systems, Information needs, Characteristics and capabilities, Comparing and integrating EIS and DSS, EIS data access, Data warehouse, OLAP, Multidimensional analysis, Presentation and the Web, Including soft information enterprise on systems, Organizational DSS, Supply and value chains, Decision support, Supply chain problems and solutions, Computerized systems. MRP, ERP, SCM, Frontline decision support systems.

#### **UNIT -III**

Knowledge Management: Organizational learning and memory , Knowledge management, Development Methods, Technologies and tools, Success , Knowledge management and artificial intelligence, Electronic Document Management, Knowledge Acquisition and Validation, Knowledge Engineering – Scope, Acquisition Methods, Interviews, Tracking Methods, Observation and other Methods, Grid Analysis, Machine Learning, Rule Induction, Case-Based Reasoning, Neural Computing, Intelligent Agents, Selection of an appropriate Knowledge Acquisition Methods, Multiple Experts, Validation and Verification of the Knowledge Base-Analysis, Coding, Documenting, and Diagramming, Numeric and Documented.

#### **UNIT -IV**

Knowledge Acquisition, Knowledge Acquisition and the Internet/ Intranets, Knowledge Representation Basics, Representation in Logic and other Schemas, Semantic Networks, Production Rules, Frames, Multiple Knowledge Representation, Experimental Knowledge Representations, Representing Uncertainty.

#### **UNIT- V**

Intelligent System Development: Inference Techniques, Reasoning in Artificial Intelligence, Inference with Rules, Inference Tree, Inference with Frames, Model Based and Case Based Reasoning, Explanation and Meta Knowledge, Inference with Uncertainty, Representing Uncertainty, Probabilities and Related Approaches, Theory of Certainty, Approximate Reasoning using Fuzzy Logic Intelligent Systems Development, Prototyping, Project Initialization, System Analysis and Design, Software Classification, Building Expert Systems with Tools, Shells and Environments, Software Selection, Hardware, Rapid Prototyping and a Demonstration Prototype, System Development, Implementation, Post Implementation.

**TEXT BOOKS:**

1. Decision Support Systems and Intelligent Systems, Sixth Edition, Efrain Turban and Jay E. Aronson, Pearson Education, 2001.

**REFERENCES:**

1. Knowledge Management Enabling business Growth, Ganesh Natarajan and Sandhya Shekhar, Tata McGraw Hill, 2002.
2. Decision Support System, George M. Marakas, Prentice Hall, India, 2003.
3. Decision Support and Data Warehouse Systems, Efrem A. Mallach, Tata McGraw,Hill, 2002.

# **INFORMATION STORAGE MANAGEMENT**

**(Elective -2)**

## **UNIT-I**

**INTRODUCTION TO STORAGE TECHNOLOGY:** Concepts of storage networking -Business applications defined for Storage - Sources of Data and states of data creation - Data center requirements and evolution - Managing complexity - Storage infrastructure – Evolution of storage - Information lifecycle management.

## **UNIT-II**

**STORAGE SYSTEMS ARCHITECTURE:** Storage architectures - Peripheral connectivity- Components and concepts- Magnetic disk storage- Disk systems –Disk arrays- RAID storage arrays- Magnetic tape storage- Physical vs Logical disk organization - Caching properties and algorithms - connectivity options - Differences in bus and network architectures.

## **UNIT-III**

**INTRODUCTION TO NETWORK STORAGE:** Putting storage on the Network- The NAS Hardware- Software architecture- Network connectivity- NAS as a Storage system- NAS connectivity options- Connectivity protocols- Management principles- Storage Area Networks: Architecture- Hardware devices- Host bus adaptors- Connectivity - Content Addressable Storage (CAS) : Elements- Connectivity options- Standards and Management principles – Hybrid storage solutions overview.

## **UNIT-IV**

**INTRODUCTION TO INFORMATION AVAILABILITY:** Business continuity and disaster recovery basics: Local business continuity techniques- Remote business continuity techniques - Storage design and implementations of Business continuity plan- Managing availability- Disaster recovery principles & techniques.

## **UNIT-V**

**MANAGING STORAGE VIRTUALIZATION:** Managing Availability: Availability metrics – serviceability - capacity planning – Management tools: overview - information security virtualization – different virtualization technologies

## **TEXT BOOKS:**

1. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill Publishing Company, New Delhi, 2003.
2. Gerald J Kowalski and Mark T Mayburk,” Information storage and Retrieval Systems”, Springer International Edition, New Delhi, 2006.

## **REFERENCE BOOKS:**

1. Ulf Troppens, Rainer Erkens and Wolfgang Müller “Storage Networks Explained” Wiley & Sons, USA, 2004.
2. Marc Farley Osborne, “Building Storage Networks”, Tata McGraw Hill Publishing Company, New Delhi, 2000.

**NN LAB 2****Big Data Analytics lab:**

1. (i) Perform setting up and Installing Hadoop in its three operating modes:  
Standalone, Pseudo distributed, Fully distributed  
(ii) Use web based tools to monitor your Hadoop setup.

2. Implement the following file management tasks in Hadoop:

- Adding files and directories
- Retrieving files
- Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities

3. Run a basic Word Count MapReduce program to understand MapReduce Paradigm.
4. Write a mapreduce program that mines weather data.  
Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
6. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

**OOAD lab:**

1. create a UML diagram of ATM APPLICATION.
2. create a UML diagram of LIBRARY MANAGEMENT SYSTEM.
3. create a UML diagram of ONLINE BOOK SHOP
4. create a UML diagram of RAILWAY RESERVATION SYSTEM
5. create a UML diagram for BANKING SYSTEM

# **ACADEMIC REGULATIONS & COURSE STRUCTURE**

**For**

**SOFTWARE ENGINEERING**  
*(Applicable for batches admitted from 2016-2017)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

**I Semester**

| S.No.                | SUBJECT                                 | L  | P  | C         |
|----------------------|---|----|----|-----------|
| 1                    | SOFTWARE REQUIREMENTS AND ESTIMATION    | 4  | -- | 3         |
| 2                    | SOFTWARE METRICS AND REUSE              | 4  | -- | 3         |
| 3                    | SOFTWARE PROJECT AND PROCESS MANAGEMENT | 4  | -- | 3         |
| 4                    | WEB TECHNOLOGIES                        | 4  | -- | 3         |
| 5                    | BIG DATA ANALYTICS                      | 4  | -- | 3         |
| 6                    | SCRIPTING LANGUAGES                     | 4  | -- | 3         |
| 7                    | SE LAB 1                                | -- | 3  | 2         |
| <b>Total Credits</b> |   |    |    | <b>20</b> |

**II Semester**

| S.NO                 | SUBJECT  | L  | P  | C         |
|----------------------|--|----|----|-----------|
| 1                    | SOFTWARE ARCHITECTURE AND DESIGN PATTERNS  | 4  | -- | 3         |
| 2                    | SOFTWARE QUALITY ASSURANCE AND TESTING   | 4  | -- | 3         |
| 3                    | CYBER SECURITY   | 4  | -- | 3         |
| 4                    | SERVICE ORIENTED ARCHITECTURES   | 4  | -- | 3         |
| 5                    | <b>Elective – 1</b><br>1. SECURE SOFTWARE ENGINEERING<br>2. SYSTEMS ENGINEERING<br>3. ERP & SUPPLY CHAIN MANAGEMENT<br>4. E-COMMERCE | 4  | -- | 3         |
| 6                    | <b>Elective - 2</b><br>1. USER INTERFACE DESIGN<br>2. CLOUD COMPUTING<br>3. SOFTWARE DEFINED NETWORKS<br>4. INTERNET OF THINGS       | 4  | -- | 3         |
| 7                    | SE LAB 2   | -- | 3  | 2         |
| <b>Total Credits</b> |  |    |    | <b>20</b> |

**III Semester**

| S. No.               | Subject                 | L  | P  | Credits   |
|----------------------|-------------------------|----|----|-----------|
| 1                    | Comprehensive Viva-Voce | -- | -- | 2         |
| 2                    | Seminar – I             | -- | -- | 2         |
| 3                    | Project Work – Part - I | -- | -- | 16        |
| <b>Total Credits</b> |                         |    |    | <b>20</b> |

**IV Semester**

| S. No.               | Subject                | L  | P  | Credits   |
|----------------------|------------------------|----|----|-----------|
| 1                    | Seminar – II           | -- | -- | 2         |
| 2                    | Project Work Part - II | -- | -- | 18        |
| <b>Total Credits</b> |                        |    |    | <b>20</b> |

---

---

## SOFTWARE REQUIREMENTS AND ESTIMATION

### UNIT I:

#### **Software Requirements: What and Why**

Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management

### UNIT II:

**Software Requirements Engineering** : Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality **Software Requirements Modeling**: Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames

### UNIT III:

**Software Requirements Management** : Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain

**Requirements Management Tools**: Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation

### UNIT IV:

**Software Estimation**: Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation.

**Size Estimation**: Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures,

### UNIT V:

**Effort, Schedule and Cost Estimation**: What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation

**Software Estimation Tools**: Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools

### TEXT BOOKS:

1. Software Requirements and Estimation by Rajesh Naik and Swapna Kishore, Tata Mc Graw Hill

### REFERENCES:

1. Software Requirements by Karl E. Weigers, Microsoft Press.
2. Managing Software Requirements, Dean Leffingwell & Don Widrig, Pearson Education, 2003.
3. Mastering the requirements process, second edition, Suzanne Robertson & James Robertson, Pearson Education, 2006.

## SOFTWARE METRICS AND REUSE

### UNIT- I

**Introduction to software quality:** Quality: Popular Views & Professional Views, Software Quality, Total quality management Fundamentals of Measurement Theory: Definition, Operational Definition and Measurement, Level of Measurement, Some Basic Measures, Reliability and Validity, Measurement Errors, Be Careful with Correlation, Criteria for Causality.

**Software Quality Metrics Overview:** Product Quality Metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metrics Programs, Collecting Software Engineering Data.

### UNIT- II

**Applying the Seven Basic Quality Tools in Software Development:** Ishikawa's Seven Basic Tools, Checklist, Pareto Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause-and-Effect Diagram, Relations Diagram.

**Defect Removal Effectiveness:** A closer look at Defect Removal Effectiveness, Defect Removal Effectiveness and Quality Planning, Cost Effectiveness of Phase Defect Removal

### UNIT- III

**In-Process Metrics for Software Testing:** In-Process metrics for Software Testing, In-Process metrics and Quality Management, Possible Metrics for Acceptance Testing to evaluate Vendor Developed Software, How do you know Your Product is Good Enough to Ship?

**Complexity Metrics and Models:** Lines of Code, Halstead's Software Science, Cyclomatic Complexity, Syntactic Constructs, Structure Metrics, An Example of Module Design Metrics in Practice

### UNIT- IV

**Metrics and Lessons learned for Object-oriented projects:** Object - oriented Concepts and Constructs, Design and Complexity metrics, productivity metrics, Quality and quality management metrics, Lessons learned for OO projects.

**Using Function Point Metrics to Measure Software Process Improvement:** Software Process Improvement Sequences, Process Improvement Economics, Measuring Process Improvements at Activity Levels.

### UNIT V:

**Reuse:** Introduction, benefits of reuse, reuse landscape, design patterns, generator based reuse, application frame work for reuse, applications of system reuse, COTS product reuse



**TEXT BOOKS:**

1. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Second Edition, Pearson Education Asia, 2003
2. Software Engineering, Sommerville, 7ed, Pearson

**REFERENCES:**

1. Software Engineering Measurement, John C. Munson Auerbach Publication, 2003
2. Estimating Software– intensive systems: projects, products and processes, Richards D. Stutzke, Addison – Wesley 2005
3. Software Metrics: A guide to planning, analysis and application, C. Ravindranath Pandian, Auerbach Publication, 2003
4. Practical Implementation of Software Metrics, Paul Goodman, Mc.Graw Hill, 1993

## SOFTWARE PROJECT AND PROCESS MANAGEMENT

### 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.

### UNIT III:

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. Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

### UNIT IV:

Process Planning and Project Organizations Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning, line-of- business organizations, project organizations, evolution of organizations, process automation.

### UNIT V :

Project Control and process instrumentation The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation. 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. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata Mc-Graw Hill, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007

## WEB TECHNOLOGIES

### UNIT-I:

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

### UNIT-II:

**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

**AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.

### UNIT-III:

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

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

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

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

### UNIT-V:

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

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

## **BIG DATA ANALYTICS**

### **UNIT-I**

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

### **UNIT-II**

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

### **UNIT-III**

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

### **UNIT-IV**

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

### **UNIT-V**

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**SOFTWARE LINKS:**

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

## SCRIPTING LANGUAGES

### UNIT - I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

### UNIT - II

Advanced perl finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

### UNIT- III

PHP Basics PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

### UNIT - IV

Advanced PHP Programming PHP and Web Forms, Files, PHP Authentication and Methodologies - Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the M crypt package, Building Web sites for the World.

### UNIT -V

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

Python Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

### TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

### REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz, SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1, I.Bayross and S.Shah, The X Team, SPD.
5. Core Python Programming, Chun, Pearson Education.

6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.

**SE LAB 1****Web Technologies programs:**

1. Write Ruby program reads a number and calculates the factorial value of it and prints the Same.
2. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.
3. Write a Ruby program that uses iterator to find out the length of a string.
4. Write Ruby program which uses Math module to find area of a triangle.
5. Write Ruby program which uses tk module to display a window
6. Define complex class in Ruby and do write methods to carry operations on complex objects.
7. Write perl program takes set names along the command line and prints whether they are regular files or special files
8. An example perl program to connect to a MySQL database table and executing simple commands.
9. Example PHP program for cotactus page.

**Big Data Analytics programs:**

(i) Perform setting up and Installing Hadoop in its three operating modes:

Standalone, Pseudo distributed, fully distributed

(ii) Use web based tools to monitor your Hadoop setup.

7. Implement the following file management tasks in Hadoop:

- Adding files and directories
- Retrieving files
- Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilitie

8. Run a basic Word Count MapReduce program to understand MapReduce Paradigm.
9. Write a mapreduce program that mines weather data.  
Weather sensors collecting data every hour at many locations across the globe  
Gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

10. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes



## SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

### UNIT- I

**Envisioning Architecture:** The Architecture Business Cycle, Software Architecture, Designing the Architecture, Documenting the architecture, Reconstructing Software Architecture

### UNIT- II

**Creating Architecture:** Quality Attributes, Moving from quality to architecture, Architectural styles and patterns, UNIT Operations, Achieving qualities, designing the Architecture, Documenting the architecture, Reconstructing Software Architecture, shared information systems

**Analyzing Software Architecture:** Analyzing development qualities at the architectural level, SAAM, ATAM, CBAM, Architecture Reviews

### UNIT- III

**Moving from Architecture to Systems:** Software Product Lines, Building systems from off the shelf components, Reuse of Architectural assets within an organization.

### UNIT- V

**Patterns:** What is pattern? Pattern categories, Pattern Description, Patterns and Software Architecture, Pattern Systems, Classification, Selection

**Design Patterns Catalog:** Creational Pattern, Structural Pattern, Behavioral Patterns, Pattern Community, Designing a document editor

### UNIT- V

**Case Studies :** Key word in Context, The World Wide Web - a case study in interoperability, Instrumentation software, cruise control, three vignettes in mixed styles,

### TEXT BOOKS:

1. Software Architecture in Practice, 2nd Edition by Len Bass, Paul Clements, Rick Kazman, Pearson Edition
2. Design Patterns, by Erich Gamma, Pearson Education

### REFERENCE BOOKS:

1. Beyond Software architecture, Luke I-Iohmann, Addison weslcy, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR,2001
3. Pattern Oriented Software Architecture,F.Buschmann&others,John Wiley&Sons.
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

## SOFTWARE QUALITY ASSURANCE AND TESTING

### UNIT – I

**Software quality assurance Framework and Standards SQA Frame work:** What is Quality? Software Quality Assurance. Components of Software quality Assurance.

**Software Quality Assurance Plan :** Steps to develop and implement a Software quality Assurance Plan.

**Standards:** ISO9000, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma

### UNIT II

**Software Quality Assurance Metrics and Measurement Software Quality Assurance Metrics:** Product Quality metrics, In- Process Quality metrics, Metrics for Software Maintenance. Examples of Metric Programs, Software quality indicators Fundamentals in Measurement Theory

### UNIT -III

**Building Software Testing Environment :** Writing Policy for software testing, Economics of testing, Building a structured approach to software testing .

**Software Testing process:** Defects Hard to find, Functional and structured testing, Workbench concept, Customising the software testing process, testing tactics check list

### UNIT -IV

**Software Testing Techniques :** Black-Box testing, Boundary value analysis, Bottom-up, Branch Coverage, Cause- Effect graphing, CRUD, Database, exception, Gray\_box, Histogram, Inspections, JADs, Pareto Analysis, prototyping, random Testing, Risk based Testing, Regression Testing, Structured Walkthrough, Thread testing, Performance Testing, White Box Testing

**Software Testing Tools:** Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win Runner and Rational Testing Tools, Java testing Tools, JMetra, JUNIT and Cactus

### UNIT -V

**Testing Process :** Advantages of following a process, Cost of computer testing, Seven step software Testing Process, Define the scope of testing, Developing the test plan, Verification Testing. Validation Testing, Analysing and reporting test results, Acceptance and operational Testing, Post Implementation Analysis

**Testing Specialised Systems and Applications :** Testing Client/Server System, Testing COTS and Contracted Software, Testing security, Testing Data Warehouse .

**TEXT BOOKS:**

1. William E.Perry:Effective Methods for Software Testing, 3<sup>rd</sup> Edition,Wiley Publication,

**REFERENCE BOOKS:**

1 Testing and Quality Assurance for Component-based Software, by Gao, Tsao and Wu, Artech House Publishers

2 Software Testing Techniques, by Bories Beizer, Second Edition, Dreamtech Press

3 Managing the Testing Process, by Rex Black, Wiley

## CYBER SECURITY

### UNIT I:

#### Introduction:

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

### UNIT II:

#### Conventional Encryption:

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

### UNIT III:

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

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

### UNIT IV:

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

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

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

### UNIT V :

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

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

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

### TEXT BOOKS:

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

### REFERENCE BOOKS:

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

## SERVICE ORIENTED ARCHITECTURES

### UNIT - I

**SOA Fundamentals:** Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

### UNIT - II

**SOA Planning and Analysis:** Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical onstraints, business constraints, runtime qualities, no runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA)

### UNIT - III

**SOA Design and implementation:** Service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture,

### UNIT - IV

mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance

### UNIT - V

**Managing SOA Environment :** Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle

### TEXT BOOKS

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Prentice Hall Publication, 2005.
2. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, “Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap”, IBM Press Publication, 2005.

### REFERENCES

1. Thomas Erl, “Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services”, Prentice Hall Publication, 2004
2. Dave Chappell, “Enterprise Service Bus”, O’Reilly Publications, 2004

3. Sanjiva Weerawarana, Francisco Curbera, Frank Leymann, Tony Storey, Donald F.Ferguson, “Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WSAddressing, WS-BPEL, WS-Reliable Messaging, and More”, Prentice Hall Publication, 2005

## SECURE SOFTWARE ENGINEERING (Elective -1)

### UNIT- I

**Why Is Security a Software Issue?** Introduction, The Problem, Software Assurance and Software Security, Threats to Software Security, Sources of Software Insecurity, The Benefits of Detecting Software Security Defects Early, Managing Secure Software Development  
**What Makes Software Secure?** Introduction, Defining Properties of Secure Software, How to Influence the Security Properties of Software, How to Assert and Specify Desired Security Properties

### UNIT -II

**Requirements Engineering for Secure Software:** Introduction, Misuse and Abuse Cases, The SQUARE Process Model, SQUARE Sample Outputs, Requirements Elicitation, Requirements Prioritization

### UNIT- III

**Secure Software Architecture and Design:** Introduction, Software Security Practices for Architecture and Design: Architectural Risk Analysis, Software Security Knowledge for Architecture and Design: Security Principles, Security Guidelines, and Attack Patterns  
**Considerations for Secure Coding and Testing:** Introduction, Code Analysis, Coding Practices, Software Security Testing, Security Testing Considerations Throughout the SDLC

### UNIT -IV

**Security and Complexity: System Assembly Challenges:** Introduction, Security Failures, Functional and Attacker Perspectives for Security Analysis: Two Examples, System Complexity Drivers and Security, Deep Technical Problem Complexity

### UNIT -V

**Governance, and Managing for More Secure Software:** Introduction, Governance and Security, Adopting an Enterprise Software Security Framework, How Much Security Is Enough?, Security and Project Management, Maturity of Practice

### TEXT BOOKS:

1. Software Security Engineering: A Guide for Project Managers, Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley Professional

### REFERENCE BOOKS:

1. Howard , M and Lipner,S : The Security Development Lifecycle , Microsoft Press, 2006
2. Swiderski, F and Snyder W. :, Threat Modeling, Microsoft Press, 2004.
3. Viega, J and MCGraw G., : Building Secure Software: How to avoid Security Problems in the Right Way, Addison-Wesley,2001
4. The Open Web Application Security Project: A Guide to Building Secure Web Applications and Web Services”, 2.0 Black Hat Edition, 2005

# SYSTEMS ENGINEERING (Elective-1)

## UNIT- I

**Management Information Systems: A Framework:** Importance of MIS, MIS: A Definition Nature and Scope of MIS ,

**Structure and Classification of MIS :** Structure of MIS, MIS Classification

**Information and System Concepts:** Information: A Definition, Types of Information, Dimensions of Information, System: A Definition, Kinds of Systems, System Related Concepts, Elements of a System, Human as an Information Processing System

**Information Systems for Competitive Advantage:** Introduction, Changing concepts of Information System, Competitive Advantage, Information systems Strategies for Dealing with competitive Force, Porter's Value Chain Model, Strategic Information Systems (SIS)

## UNIT –II: BUSINESS APPLICATIONS OF IS

**e – Commerce :** Introduction, e – Commerce

**ERP Systems :** Introduction, Enterprise Information Systems

**Decision – Support Systems:** Decision – Making: A Concept, Simon's Model of Decision - Making Types of Decisions, Methods for Choosing Among Alternatives, Decision – Making and MIS, Decision Support Systems – Why?, Decision Support Systems: A framework, Characteristics and Capabilities of DSS

**Business Intelligence and knowledge Management System :** Business Intelligence, Knowledge Management System

## UNIT – III

**Information System Planning :** Information System Planning: WHY?, Planning Terminology Information System Planning, The Nolan Stage Model, The Four –Stage Model of is planning Selecting A Methodology, Information Resources Management (IRM), Organisation Structure and Location of MIS

**System Acquisition :** Acquisition of Information Systems , Acquisition of Hardware and Software

## UNIT – IV

**System Implementation:** IMPLEMENTATION PROCESS, Organisational Change

**Evaluation & Maintenance of IS :** Evaluation of MIS , System Maintenance

**IS Security and Control:** IS Security Threats, Protecting Information System, IS Security Technology The Disaster Recovery Plan

## UNIT – V : BUILDING OF IS

**System Development Approaches:** System Development Stages, System Development Approaches

**System Analysis and Design: SYSTEM ANALYSIS -** Introduction, Requirement Determination, Strategies for Requirement Determination, Structured Analysis Tools

**SYSTEMS DESIGN:** Design Objectives, Conceptual Design, Design Methods, Detailed System Design.



**TEXT BOOKS:**

1. Management Information System, Managerial Perspectives, D P Goyal, 3 ed, McMillan Publications.

**REFERENCE BOOKS:**

1. Information Systems for Modern Management, third edition by R. G. Murdick, J. E. Ross and J. R. Clagget, PHI – 1994.

## **ERP & SUPPLY CHAIN MANAGEMENT** **(Elective -1)**

### **UNIT- I**

**Introduction to ERP:** Overview – Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining – On–line Analytical Processing, Supply Chain Management.

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

### **UNIT- II**

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

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

### **UNIT- III**

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

### **UNIT- IV**

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

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

### **UNIT- V**

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

### **TEXT BOOKS:**

1. ERP Demystified, 2/e, Alexis Leon, TMH, 2007.
2. Supply Chain Management: Strategy, Planning, Operation, Sunil Chopra, Peter Meindel, PEA, 2002

**REFERENCE BOOKS:**

1. Enterprise Resource Planning- Concepts and Practice; V.K. garg & N.K. V. Krishna, 1998. PHI.

## **E-COMMERCE** **(Elective -1)**

### **UNIT I:**

Electronic Commerce, Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce, Mercantile Process models.

### **UNIT II:**

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

### **UNIT III:**

Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

### **UNIT IV:**

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.

Advertising and Marketing, Information based marketing, Advertising on Internet, on-line marketing process, market research.

### **UNIT V:**

Consumer Search and Resource Discovery, Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing.

### **TEXT BOOK:**

1. Frontiers of Electronic Commerce, Kalakata, Whinston, PEA, 2006.

### **REFERENCE BOOKS:**

1. E-Commerce Fundamentals and Applications Hendry Chan, Raymond Lee, Dillon, Chang, John Wiley.
2. E-Commerce, A Managerial Perspective, Turban E, Lee J, King, Chung H.M., PEA, 2001.
3. E-Commerce An Indian Perspective, 3/e, P.T. Joseph, PHI, 2009.
3. E-Commerce, S.Jaiswal, Galgotia.
5. Electronic Commerce, Gary P.Schneider, Thomson.

## USER INTERFACE DESIGN (Elective 2)

### UNIT - I

**Introduction:** Importance of user Interface, definition, importance of good design. Benefits of good design. A brief history of Screen design

**The graphical user interface:** Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – interface popularity, characteristics- Principles of user interface.

### UNIT - II

**Design process:** Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

### UNIT -III

**Screen Designing :** Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

### UNIT - IV

**Windows:** Windows new and Navigation schemes selection of window, selection of devices based and screen based controls.

**Components :** Components text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.

### UNIT - V

**Software tools :** Specification methods, interface, Building Tools.

**Interaction Devices:** Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

### TEXT BOOKS :

1. Human Computer Interaction. 3/e, Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, PEA,2004.
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

### REFERENCE BOOKS :

1. Designing the user interface. 4/e, Ben Shneidermann , PEA.
2. User Interface Design, Soren Lauesen , PEA.
3. Interaction Design PRECE, ROGERS, SHARPS, Wiley .
4. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.

# CLOUD COMPUTING

(Elective -2)

## UNIT I:

**Introduction:** Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing

**Parallel and Distributed Systems:** introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

## UNIT II:

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Intercloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing

**Cloud Computing :** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

## UNIT III:

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades

**Cloud Resource Management and Scheduling:** Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling

## UNIT IV:

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, BigTable, Megastore ( text book 1), Amazon Simple Storage Service(S3) (Text book 2)

**Cloud Security:** Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

## UNIT V:

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1)

**Google:** Google App Engine, Google Web Toolkit (Text Book 2)

**MicroSoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

## TEXT BOOKS:

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

**REFERNCE BOOK:**

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

## **SOFTWARE DEFINED NETWORKS** **(Elective-2)**

### **UNIT 1:**

History and Evolution of Software Defined Networking (SDN): Separation of Control Plane and Data Plane, IETF Forces, Active Networking. Control and Data Plane Separation: Concepts, Advantages and Disadvantages, the Open Flow protocol.

### **UNIT 2:**

Network Virtualization: Concepts, Applications, Existing Network Virtualization Framework (VMware and others), Mininet based examples.

### **UNIT 3:**

Control Plane: Overview, Existing SDN Controllers including Floodlight and OpenDaylight projects.

### **UNIT 4:**

Customization of Control Plane: Switching and Firewall Implementation using SDN Concepts. Data Plane: Software-based and Hardware-based; Programmable Network Hardware.

### **UNIT 5:**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications. Data Center Networks: Packet, Optical and Wireless Architectures, Network Topologies.

### **TEXT BOOKS:**

1. SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies, By Thomas D. Nadeau, Ken Gray Publisher: O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10: 1-4493-4230-2.
2. Software Defined Networks: A Comprehensive Approach, by Paul Goransson and Chuck Black, Morgan Kaufmann, June 2014, Print Book ISBN: 9780124166752, eBook ISBN : 9780124166844



## **REFERENCE BOOKS:**

1. SDN and OpenFlow for Beginners by Vivek Tiwari, Sold by: Amazon Digital Services, Inc., ASIN: , 2013.
2. Network Innovation through OpenFlow and SDN: Principles and Design, Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.
3. Open Networking Foundation (ONF) Documents, <https://www.opennetworking.org>, 2015.
4. OpenFlow standards, <http://www.openflow.org>, 2015.
5. Online Reading Lists, including: <http://www.nec-labs.com/~lume/sdn-reading-list.html>, 2015.

# **INTERNET OF THINGS**

## **(Elective -2)**

### **UNIT I:**

The Internet of Things: An Overview of Internet of things ,Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices

Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

### **UNIT II:**

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

### **UNIT III:**

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

### **UNIT IV:**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

### **UNIT V:**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World.

### **TEXTBOOKS:**

3. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
4. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

### **REFERNCE BOOKS:**

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , Oreilly.

## **SE LAB 2**

### **SOFTWARE TESTING LAB**

1. Study of various tools Study various tools such as Win Runner, Load Runner, Test Director, Rational Rose Suite etc.
2. Perform experiments to do the following:
  - a. Requirements Testing
  - b. Use – case Scenario Testing
  - c. Unit Testing
  - d. Regression Testing
  - e. Integration Testing
  - f. Validation Testing
  - g. Acceptance Testing
  - h. System Testing
3. Prepare test plan and develop test case hierarchy
4. Generate Test cases and Test Documentation in the following case studies
  - a. Library System
  - b. Course Registration System
  - c. Implement a Quiz System
  - d. Student Marks Analyzing System
  - e. Online Ticket Reservation System

### **DESIGN PATTERNS LAB:**

1. Using UML design Abstract factory design pattern
2. Using UML design Builder Design pattern
3. Using UML design Facade Design pattern
4. Using UML design Bridge Design pattern
5. Using UML design Decorator Design pattern
6. User gives a print command from a word document. Design to represent this chain of responsibility design pattern.