**SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)**
(Affiliated to JNTUK, Kakinada), (Recognised by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade
Recognised as Scientific and Industrial Research Organisation
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

## SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

## M.TECH (INFORMATION TECHNOLOGY)
## DEPARTMENT OF INFORMATION TECHNOLOGY

**(**With effect from **2017-2018** Admitted Batch onwards**)**
Under Choice Based Credit System

### I-SEMESTER

| Code No. | Name of the Subject | Credits | Lecture Hrs | Tutorial Hrs | Lab Hrs | Contact Hrs/Week | Internal Marks | External Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| M17 IT 1101 | Advanced Data Structures | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1102 | Distributed Systems | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1103 | Software Requirements And Estimation | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1104 | Data Mining And Knowledge Discovery | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1105 | Advanced Computer Networks | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1106 | Web Technologies | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1107 | IT LAB1 | 2 | -- | -- | 3 | 3 | 50 | 50 | 100 |
| Total | | 20 | 18 | 6 | 3 | 27 | 230 | 470 | 700 |

## ADVANCED DATA STRUCTURES

| | | | | |
|---|---|---|---|---|
| **Lecture** | : 3 Periods | | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | | **Credits** | : 3 |

### COURSE OBJECTIVES:

1. An advanced data structures course considering practical and analytical aspects.
2. This is a lecture course presenting techniques and evaluation tools and a laboratory course with programming assignments emphasizing efficient implementation methodologies.

### COURSE OUTCOMES:

At the end of the course the student will be able to
1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their implementations.
3. Master different algorithm design techniques.
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

### SYLLABUS

**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.*

## DISTRIBUTED SYSTEMS

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

### COURSE OBJECTIVES:

1. This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
2. The structure of distributed systems using multiple levels of software is emphasized. Specific topics include:
   ➢ distributed algorithms
   ➢ distributed file systems
   ➢ distributed databases,
   ➢ security and protection
   ➢ distributed services such as the world-wide web, and
   ➢ examples of research and commercial distributed systems

### COURSE OUTCOMES:

At the end of the course the student will be able to
1. Explain various architectures used to design distributed systems, such as client-server and peer-to-peer.
2. Build distributed systems using various inter-process communication techniques, such as remote method invocation, remote events, and tuple spaces.
3. Build distributed systems using various techniques for tolerating partial failures, such as leasing and replication.
4. Build distributed systems using various inter process coordination techniques, such as distributed mutual exclusion, distributed monitors, and tuple spaces.
5. Explain various distributed algorithms, such as logical clocks and leader election.
6. Analyze and explain current distributed systems research literature.

### SYLLABUS

### UNIT-I:

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models-Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models-Interaction Model, Failure Model, Security Model.

**UNIT-II:**

Inter-process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter-process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication-IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

**UNIT-III:**

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects-Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

**UNIT-IV:**

Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

**UNIT-V:**

Distributed File Systems : Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

**TEXT BOOKS**:

1. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems-Concepts and Design", Fourth Edition, Pearson Publication

**REFERENCES BOOKS:**

1. "Distributed Operating Systems" By Andrew S Tanenbaum, Pearson Publication
2. "Advanced Concepts in Operating Systems",Sighal and Niranjan G.Shivaratna.
3. Java RMI Designing and Building,The Basics of RMI Applications, William Grosso, O'Reilly.

## SOFTWARE REQUIREMENTS AND ESTIMATION

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVES:**

The main objective of the course is to expose the students to Software requirements and estimation. Upon completion of this course, the student will be able to:

1. Understand the good practices for requirements engineering.
2. Understand requirements elicitation techniques,
3. Understand analysis models, Software quality attributes.
4. Understand software size estimation,
5. Understand Effort, Schedule and Cost Estimation.

**COURSE OUTCOMES:**

At the end of the course the student will be able to

1. Understand what software engineering is and why it is important.
2. Understand the concept of software processes and software process models.
3. Understand the principles of object orientation.
4. Understand the principle of software development on reusable technology.
5. Understand the type of software requirements (Functional & Non Functional).
6. Understand that the effective requirements management can be accomplished only by an effective software team.

## SYLLABUS

**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

**REFERENCE BOOKS:**

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 & JamesRobertson, Pearson Education, 2006.

## DATAMINING AND KNOWLEDGE DISCOVERY

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

### COURSE OBJECTIVES:

1. We understand Data Mining (Knowledge Discovery) as a life-cycle process from data to information and insights.
2. In times of Big data, Data Mining has become a central interest both for industry and academia.
3. In this course, we discuss several data-related aspects like preprocessing or privacy as well as selected aspects of Machine Learning.
4. An expansive definition of Data Mining, which is the derivation of insights from masses of data by studying and understanding the structure of the constituent data, and selected applications complete the course.

### COURSE OUTCOMES:

At the end of the course the student will be able to
1. Explain the fundamental concepts of Data mining & Knowledge discovery.
2. Understand the data preprocessing techniques.
3. Understand Machine Learning algorithms and strategies to discovery and to deploy the discovered results.
4. Argue the importance of domain knowledge during the data analysis.

### SYLLABUS

**UNIT I:**
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 II:** 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 Classfier, Support vector Machines: Linear SVM, Separable and Non Separable case.

**UNIT III**: 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 IV:** 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 V:** 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, Addision-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

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

### COURSE OBJECTIVES:

The objective of this course unit is twofold:
1. To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
2. To debate the current trends and leading research in the computer networking area.

### COURSE OUTCOMES:
At the end of the course the student will be able to
In general terms, the proposed UCT is envisioned to deliver the following learning outcomes:
1. To identify and discuss the concepts underlying IPv6 protocol, and their main characteristics and functionality;
2. To understand the principles and functionality of mobile IP, explaining its concretization in IPv6; to understand the needs of optimization of the mobility mechanisms and description of some extensions that aim to reduce handover latency and requirements from terminals;
3. To recognize the need for service integration and discuss how it can be accomplished;
4. To explain and examplify current QoS architectures and mechanisms, and the QoS support challenges in future networks;

### SYLLABUS

**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 4th edition,  *Behrouz A Fourzan, TMH*
2. Computer networks 4th edition  *Andrew S Tanenbaum, Pearson*
3. Computer networks,  *Mayank Dave,  CENGAGE*

**REFERENCE BOOKS:**
*1.* Computer networks, A system Approach, 5<sup>th</sup> edition, *Larry L Peterson and Bruce S Davie, Elsevier.*

**WEB TECHNOLOGIES**

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVE:**

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using PHP. Students will gain the skills and project-based experience in web application and development.

**COURSE OUTCOMES:**
At the end of the course the student will be able to

1. Develop a dynamic webpage by the use of java script and DHTML.
2. Write a well formed / valid XML document.
3. Connect to database and perform data manipulations.
4. Write programs in PERL.
5. Develop Ruby applications.

**SYLLABUS**

**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, SLT, 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, Hashs 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, *Robet 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, Maclntyre, 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

| Lab | : 3 Periods | Int.Marks | : 50 |
|-----|-------------|-----------|------|
| Exam | : 3 Hrs | Ext. Marks | : 50 |
| | | Credits | : 2 |

**COURSE OBJECTIVE:**

The main objective of this course is to do practice on computer networks programming, data mining tools and data structure programming.

**COURSE OUTCOMES:**
**At the end of the laboratory the student will be able to**

1. Student able to execute programmes in computer networks
2. Student able to know use of different data mining tools
3. Student able to execute programmes on data structures

## SYLLABUS

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

**TEXT BOOKS:**

1. Cryptography and Network Security, Forouzan, TMH, 2007.
2. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
3. Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss,  PEA , 2007

**REFERENCE BOOKS:**

1. Cryptography and Network Security, 2/e, Kahate , TMH.
2. Introduction to Data Mining with Case Studies,  GK Gupta , Prentice Hall.
3. Fundamentals of computer Algorithms, 2/e, Ellis Horowitz, Sartaj Sahni, Rajasekharan, Universities Press,  2008.
4. Data Structures with JAVATM, Hubbard, Huray, PHI,2009.

# SCHEME OF INSTRUCTION & EXAMINATION
## (Regulation R17)

## M.TECH (INFORMATION TECHNOLOGY)
## DEPARTMENT OF INFORMATION TECHNOLOGY

## (With effect from **2017-2018** Admitted Batch onwards)
## Under Choice Based Credit System

### II-SEMESTER

| Code No. | Name of the Subject | Credits | Lecture Hrs | Tutorial Hrs | Lab Hrs | Contact Hrs/ Week | Internal Marks | External Marks | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| M17 IT 1201 | Advanced Unix Programming | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1202 | Cyber Security | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1203 | Big Data Analytics | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1204 | Cloud Computing | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| #ELE-1 | Elective-I | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| #ELE-2 | Elective-II | 3 | 3 | 1 | -- | 4 | 30 | 70 | 100 |
| M17 IT 1213 | IT LAB2 | 2 | -- | -- | 3 | 3 | 50 | 50 | 100 |
| Total | | **20** | **18** | **6** | **3** | **27** | **230** | **470** | **700** |

| | Course Code | Course |
|---|---|---|
| #ELE-1 | M17 IT 1205 | Adhoc & Sensor Networks |
| | M17 IT 1206 | Semantic Webservices |
| | M17 IT 1207 | Principles Of Programming Languages |
| | M17 IT 1208 | Internet Of Things |
| #ELE-2 | M17 IT 1209 | Machine Learning |
| | M17 IT 1210 | Information Retrieval System |
| | M17 IT 1211 | Image Processing & Pattern Recognition |
| | M17 IT 1212 | Software Testing Methodologies |

## ADVANCED UNIX PROGRAMMING

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVES:**
1. To understand the fundamental design of the unix operating system
2. To become fluent with the systems calls provided in the unix environment
3. To be able to design and build an application/service over the unix operating system.
4. To learn the characteristics of an object-oriented programming language:
5. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
6. To enhance problem solving and programming skills in C++ with extensive programming projects.
7. To become familiar with the UNIX software development environment.

**COURSE OUTCOMES**:

1. Able to understand and reason out the working of Unix Systems
2. Able to build an application/service over a Unix system.
3. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System Understanding .
4. Demonstrate UNIX commands for file handling and process control Applying .
5. Write Regular expressions for pattern matching and apply them to various filters for a specific task applying.
6. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

### SYLLABUS

**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

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

### COURSE OBJECTIVES:

1. This Course focuses towards the introduction of Cyber security using various cryptographic algorithms and understanding Cyber security applications.
2. It also focuses on the practical applications that have been implemented and are in use to provide email and web security

### COURSE OUTCOMES:

1. Will have knowledge and understanding of: Classical encryption techniques, Block ciphers and the Data Encryption Standard Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms,
2. Will have understanding of: Digital signatures and authentication protocols, Network security practice, Applications, E-Mail, IP and web security, System security, Intruders, Malicious software, Firewalls.
3. Will develop their skills in: The programming of symmetric and/or asymmetric ciphers and their use in the networks.
4. Will learn protocols used in Web Security and Transport layer Security

### SYLLABUS

**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

| | | | | |
|---|---|---|---|---|
| Lecture | : 3 Periods | | Int.Marks | : 30 |
| Tutorial | : 1 Period. | | Ext. Marks | : 70 |
| Exam | : 3 Hrs. | | Credits | : 3 |

**COURSE OBJECTIVES:**

1. Introduce students the concept and challenge of big data (3 V's: volume, velocity, and variety).
2. Teach students in applying skills and tools to manage and analyze the big data

**COURSE OUTCOMES**:
At the end of the course, the students will be able to

1. Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data.
2. Collect, manage, store, query, and analyze various form of big data.
3. Gain hands-on experience on large-scale analytics tools to solve some open big data problems.
4. Understand the impact of big data for business decisions and strategy.

## SYLLABUS

**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 compar

**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$^{rd}$ 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

| Lecture | : 3 Periods | Int.Marks | : 30 |
|---------|-------------|-----------|------|
| Tutorial | : 1 Period. | Ext. Marks | : 70 |
| Exam | : 3 Hrs. | Credits | : 3 |

## COURSE OBJECTIVE:
The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

## COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Understanding the key dimensions of the challenge of Cloud Computing
2. Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
4. Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas

## SYLLABUS

### 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-I)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

### COURSE OBJECTIVES:

1. The course objective is to identify the major issues associated with ad-hoc/sensor networks.
2. Students will explore current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.
3. Students will learn how to program and communicate with embedded operating system such as TinyOS, a prominent application development environment for sensor systems using Motes.

### COURSE OUTCOMES:

At the end of the course, the students will be able to

1. Students will be able to describe the unique issues in ad-hoc/sensor networks. This will be accessed through assignments and labs.
2. Students will be able to describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks. This will be assessed through assignments, and classroom interaction.
3. Students will be able to discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks. This will be assessed through assignments, labs, and classroom interaction.
4. Students will be able to build and configure a testbed for a sensor network. This will be assessed through labs.
5. Students will be able to describe and implement protocols on a sensor test bed network. This will be assessed through assignments, labs, and classroom interaction.

### SYLLABUS

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

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

## SEMANTIC WEB SERVICES
### (ELECTIVE-I)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVE:**

1. Subject Knowledge Aims The aim of this course is to teach the students the concepts, technologies and techniques underlying and making up the Semantic Web.
2. Understand and discuss fundamental concepts, advantages and limits of the semantic web;
3. Understand and use ontology in the context of Computer Science and the semantic web; use the RDF framework and associated technologies such as RDFa;
4. Understand the relationship between Semantic Web and Web 2.0.
5. Methods Lectures, tutorials and practical sessions together with course notes, recommended reading, worksheets and some additional handouts. Assessment Assessed coursework.

**COURSE OUTCOMES:**

At the end of the course, the students will be able to
1. Understand the rationale behind Semantic Web.
2. Model ontologies using Resource Description Framework (RDF).
3. Design RDF Schemas for ontologies.
4. Model and design ontologies using Web Ontology Language (OWL).
5. Query ontologies using SPARQL.
6. Understand and reflect on the principles of Ontology Engineering.
7. Make an association between Semantic web and Web 2.0.
8. Apply Semantic web technologies to real world applications.

### SYLLABUS

**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, Artifical 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-I)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

## COURSE OBJECTIVES:

To introduce the
1. Major programming paradigms, and the principles and techniques involved in design and implementation of modern programming languages.
2. Notations to describe syntax and semantics of programming languages.
3. Concepts of ADT and object oriented programming for large scale software development.
4. Concepts of concurrency control and exception handling.

## COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Understand the fundamental principles underlying various programming languages features
2. Understand the basic algorithms in implementing simple programming languages
3. Understand some principles in the design of programming languages

## SYLLABUS

**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 Langugaes, 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
### (ELECTIVE-I)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVES:**

1. Assess the vision and introduction of IoT.
2. Understand IoT Market perspective.
3. Implement Data and Knowledge Management and use of Devices in IoT Technology.
4. Understand State of the Art - IoT Architecture.
5. Classify Real World IoT Design Constraints, Industrial Automation in IoT.

**COURSE OUTCOME:**
**At the end of the course, the students will be able to**

1. Interpret the vision of IoT from a global context.
2. Determine the Market perspective of IoT.
3. Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
4. Implement state of the art architecture in IoT.
5. Illustrate the application of IoT in Industrial Automation and identify Real World Design constraints.

### SYLLABUS

**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-II)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

## COURSE OBJECTIVES:

1. Introduce students to the basic concepts and techniques of Machine Learning.
2. Develop skills of using recent machine learning software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Gain experience for predicting the future values by known information.

## COURSE OUTCOMES:

At the end of the course, the students will be able to
1. Develop an appreciation for what is involved in learning from data
2. Understand a wide variety of learning algorithms
3. Understand how to apply a variety of learning algorithms to data.
4. Understand how to perform evaluation of learning algorithms and model selection.

## SYLLABUS

**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-II)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

## COURSE OBJECTIVES:

1. Become familiar with difference between Information retrieval and data Base Management Systems
2. To learn different indexing techniques to apply data Base systems
3. To understand various searching techniques to retrieve data from databases and ware houses.
4. To understand various methods for compression of files.

## COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Identify Data Base Management systems and data ware houses
2. Use knowledge of data structures and indexing methods in information retrieval Systems
3. Choose clustering and searching techniques for different data base systems

## SYLLABUS

**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.

**REFERENCE BOOKS**

1. Information Retrieval: Algorithms and Heuristics , Grossman, Ophir Frieder, 2/e,Springer, 2004.
2. Information Retrieval Data Structures and Algorithms , Frakes, Ricardo Baeza-Yates,PEA.
3. Information Storage and Retieval, Robert Korfhage, John Wiley &amp; Sons.
4. Introduction to Information Retrieval, Manning, Raghavan, Cambridge University Press.

## IMAGE PROCESSING & PATTERN RECOGNITION
### (ELECTIVE-II)

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVES:**
1. The objective of this course is Provide knowledge of models, methods and tools used to solve regression, classification, feature selection and density estimation problems .
2. Provide knowledge of learning and adaptation in supervised modes of learning
3. Provide knowledge of recognition, decision making and statistical learning problems.
4. Provide knowledge of current research topics and issues in Pattern Recognition and Machine Learning

**COURSE OUTCOMES:**
At the end of the course, the students will be able to
1. Identify areas where Pattern Recognition and Machine Learning can offer a solution
2. Describe the strength and limitations of some techniques used in computational Machine Learning for classification, regression and density estimation problems
3. Describe genetic algorithms, validation methods and sampling techniques
4. Describe some discriminative, generative and kernel based techniques

### SYLLABUS

**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 deritives, 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$^{nd}$ *edition.*
3. Digital Image processing , *Rafeal C.Gonzalez,Richard E.Woods,* 2$^{nd}$ edition, Pearson Education/PHI.

**REFERENCE BOOK:**

1. Digital Image Processing And Analysis – Chanda & Majumder

**SOFTWARE TESTING METHODOLOGIES**
**(ELECTIVE-II)**

| | | | |
|---|---|---|---|
| **Lecture** | : 3 Periods | **Int.Marks** | : 30 |
| **Tutorial** | : 1 Period. | **Ext. Marks** | : 70 |
| **Exam** | : 3 Hrs. | **Credits** | : 3 |

**COURSE OBJECTIVES:**

1. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
2. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
4. To gain software testing experience by applying software testing knowledge and methods to practice oriented software testing projects.
5. To understand software test automation problems and solutions.
6. To learn how to write software testing documents, and communicate with engineers in various forms. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

**COURSE OUTCOMES:**
**At the end of the course, the students will be able to**

1. Understand the myths and facts of software testing. Analyze and design test cases using black box testing technique which includes decision tables domain testing and transition testing.
2. Analyze and design test cases for a white box testing technique which includes path¬ testing, data flow graphs and matrix representation for a given problem.
3. Compute the path product and construct Regular Expression which is used to i identify¬ the alternate paths from source node to destination node for any application.
4. Execute how to run test script wizard and Execute how to do performance testing using¬ testing tools including Winrunner and JMeter respectively.
5. Demonstrate the importance of testing and its role in need of software development.

**SYLLABUS**
**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, 3rd 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

| | | | |
|---|---|---|---|
| **Lab** | : 3 Periods | **Int.Marks** | : 50 |
| **Exam** | : 3 Hrs | **Ext. Marks** | : 50 |
| | | **Credits** | : 2 |

**COURSE OBJECTIVE:**

The main objective of this course is to do practice on UNIX Programming, Shell Script, java Programming

**COURSE OUTCOMES:**

At the end of the laboratory the student will be able to

1. Student able to execute programmes in UNIX
2. Student able to excute programmes on JAVA
3. Student able to excute programmes on Network programming

### SYLLABUS

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 then 1500 then HRA =10% of basic salary and DA=90% if the basic salary is greater then 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?

**REFERENCE BOOKS:**

1. *UNIX Concepts and Applications by sumitabha Das,*McGraw Hill Education; 4 edition.
2. Practical UNIX and Internet Security, 2/e, Simson Garfinkel, Gene Spafford, O'Reilly.
3. Cryptography and Network Security, 2/e, Kahate , TMH.
4. Advanced Programming in the UNIX Environment, Stevens , PEA/PHI.
5. Cryptography and Network Security, William Stallings, PHI.

**SCHEME OF INSTRUCTION & EXAMINATION**
(Regulation R17)

**M.TECH (INFORMATION TECHNOLOGY)**
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**(**With effect from **2017-2018** Admitted Batch onwards**)**
Under Choice Based Credit System

**III-SEMESTER**

| Course Code | Course | Scheme of Examination | C | Int | Ext | Total |
|---|---|---|---|---|---|---|
| M17 IT 2101 | Comprehensive Viva-Voce | Viva-Voce | 2 | 50 | - | 50 |
| M17 IT 2102 | Seminar-I | Oral Presentation | 2 | 50 | - | 50 |
| M17 IT 2103 | Project Work Part-I | Review | 16 | 50 | - | 50 |
| | | **Total** | **20** | **150** | **-** | **150** |

1. The Viva-Voce for the Comprehensive Viva-Voce and Seminar-I shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. Candidates can do their Project Work Part-I&II work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor (Co-Guide) should be from the industry/research organization.

3. The Project Work Part-I should be submitted at the end of 3$^{rd}$ Semester and it will be evaluated through Review by a committee consisting of Head of the Department, PG coordinator and Project guide. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

# SCHEME OF INSTRUCTION & EXAMINATION
(Regulation R17)

## M.TECH (INFORMATION TECHNOLOGY)
## DEPARTMENT OF INFORMATION TECHNOLOGY

# (With effect from **2017-2018** Admitted Batch onwards)
## Under Choice Based Credit System

## IV-SEMESTER

| Course Code | Course | Scheme of Examination | C | Int | Ext | Total |
|---|---|---|---|---|---|---|
| M17 IT 2201 | Seminar-II | Oral presentation | 2 | 50 | - | 50 |
| M17 IT 2202 | Project Work Part-II | Viva-voce | 18 | | 100 | 100 |
| | | **Total** | **20** | **50** | **100** | **150** |

1. The viva-voce for Seminar-II shall be held with the Project Guide, PG coordinator, and Head of the Department. The marks shall be awarded in the ratio of 20, 10 and 20 Marks by the members respectively.

2. A publication of a paper on the thesis work in a National/International Journal at the end of 4th semester is mandatory for the submission of thesis work.

3. The Project Work Part-II should be submitted at the end of 4th semester and it will be evaluated through Viva–Voce examination by a committee consisting of External Examiner, Head of the Department, Project guide and PG coordinator. The marks shall be awarded in the ratio of 40, 20, 20 and 20 Marks by the members respectively.