SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

COMPUTER SCIENCE & ENGINEERING

Structure & syllabus for

B.E. (Computer Science & Engineering)

w.e.f. Academic Year 2015-16
## SOLAPUR UNIVERSITY, SOLAPUR

Computer Science and Engineering

Structure of B. E. (Computer Science & Engineering,) w.e.f. July 2015

**SEMESTER – I**

<table>
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<tr>
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<td>Vocational Training</td>
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**SEMESTER -II**

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<td>Information &amp; Cyber Security</td>
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### Elective – I
1. Human Computer Interaction
2. Digital Signal Processing
3. Software Testing & Quality Assurance
4. Business Intelligence

### Elective – II
1. Object Oriented Modeling & Design
2. Wireless Ad hoc Networks
3. Intelligent Systems
4. Mobile Application Development

### Elective – III
1. Data Warehousing & Mining
2. Image Processing
3. Information Retrieval
4. Cloud Computing

### Elective – IV
1. Storage Area Network
2. Web 2.0 & Rich Internet Application
3. Artificial Neural Network
4. Big Data Analytics
Note:

1. The term-work will be assessed based on continuous internal evaluation including class tests, assignments, performance in laboratories, Interaction in class, quizzes, group discussions as applicable.
2. The batch size for practical/tutorials be of 15 students. On forming the batches, if the strength of remaining students exceeds 7 students, then a new batch may be formed.
3. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I
4. For project, the group shall be about 4/5 students.
5. Minimum strength of the students for Electives be 15.
6. A new elective may be introduced at SEMESTER I / II on any advanced topic in Computer Science and Engineering with prior permission from University.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
1. ADVANCED COMPUTER ARCHITECTURE

Teaching Scheme
Lecture: 3 Hours /Week
Tutorial: 1 Hour /Week

Examination Scheme
Theory: 100 Marks
Termwork: 25 Marks

COURSE OBJECTIVES:
1) To learn the fundamental aspects of computer architecture design and analysis.
2) The course focuses on study of processor design, pipelining, superscalar architecture.

COURSE OUTCOMES:
1) Enables information about computer performance, instruction set architecture design and implementation
2) Introduces uniprocessor implementation alternatives (single-cycle, multiple-cycle and pipelined implementations)

SECTION – I

Unit 1: Introduction to Parallel Processing (7 Hrs.)
Basic Concepts, Types and Level of Parallelism, Classification of Parallel architectures, Basic Parallel Techniques-Pipelining and Replication, relationships between languages and Parallel architectures.

Unit 2: Advanced Pipelining (6 Hrs.)
Instruction Level Parallelism: Concepts and Challenges, overcoming data hazards with dynamic scheduling, reducing branch penalties with dynamic hardware prediction.

Unit 3: Vector Processing (7 Hrs.)
Why Vector processor?, Basic vector architecture, two real world issues: Vector length and stride, effectiveness of compiler vectorization, enhancing vector performance.

SECTION – II

Unit 4: Introduction to Data-Parallel Architectures (6 Hrs.)

Unit 5: Dataflow Architecture (6 Hrs.)
Concepts of dataflow computing, static and dynamic architectures, dataflow operators, dataflow language properties, advantages and potential problems.
Unit 6: SIMD and MIMD Architectures: (7 Hrs.)

Text Books:
2. Advanced Computer Architectures A design space approach - Sima, Fountain, Kacsuk-Pearson

Reference Books:
4. Computer Organization and Architecture-An Integrated Approach - Miles Murdocca, VincentHeuring – Wiley India (For Multiple Choice Questions)

Termwork
Minimum 8 to 10 assignment based on above topics.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I

2. DISTRIBUTED SYSTEMS

Teaching Scheme
Lecture : 3 Hours /Week
Practical : 2 Hour /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVES :
1) Provide the fundamental concepts of Distributed operating systems, its design issues and challenges in modes of communication of distributed systems and their implementation.
2) Expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles and paradigms.
3) Provide experience in analyzing a distributed computing model and implementing typical algorithms related to Synchronization, deadlock detection and avoidance used in distributed systems.
4) Enhance students’ understanding of key issues related to principles of Distributed file systems and provides case study of stand-alone general purpose distributed file system of Hadoop.

COURSE OUTCOME :
1) Understand the basics of distributed systems and middleware.
2) Design and simulate distributed system software modules using various methods, strategies, and techniques presented in the course that fulfills requirements for desired properties.
3) Apply principles of distributed systems in a real world setting across multidisciplinary areas.
4) Apply knowledge of Hadoop Distributed File system, its architecture and working for active research at the forefront of these areas.

SECTION - I

Unit 1: Fundamentals (7 Hrs.)

Message Passing - Introduction, Desirable features of good message passing system, Issues in IPC by Message passing, RPC, RMI Synchronization, Buffering, Multidatagram messages, Encoding and decoding of message data, Process addressing, Failure Handling, Group communication, Case Study: RMI, CORBA. Advances in Distributed Systems
Unit 2: Architecture of Distributed System (6 Hrs.)
Introduction, Motivations, Concepts of Distributed System, Process Synchronization, System architecture types, Distributed operating system, NOS, Middleware Communication Networks, Communication primitives, Architectural models of Distributed System

Synchronization
Introduction, Inherent Limitations of a Distributed System, Lamport’s logical clock, Vector clock, Global states, Concept of Process, Process Migration, Threads Clock synchronization, Event ordering, Mutual Exclusion, Deadlock, Election Algorithms Issues in Designing Distributed System and role of middleware in Distributed System

Unit 3: Distributed Mutual Exclusion (8 Hrs.)
Introduction, Classification of mutual exclusion algorithms, Preliminaries, A simple solution to distributed mutual exclusion, non token based algorithms, Ricart Agrawala algorithm, Token based algorithms, Suzuki Kasami’s broadcast algorithms

Distributed Deadlock detection – Introduction, Preliminaries, Deadlock handling strategies, Issues in deadlock detection and resolution, Control organizations for distributed deadlock detection, Centralized deadlock detection algorithms, Distributed deadlock detection algorithms, Avoidance and Prevention algorithms, Hierarchical deadlock detection algorithms

Agreement Protocols – Introduction, System Model, Classification of agreement problems, Solutions to the Byzantine Agreement problem, Applications of Agreement algorithm, Distributed Synchronization and Agreement Protocol, Concepts of Mutual exclusion, Deadlock, Solution to Distributed Mutual exclusion

SECTION II

Unit 4: Distributed File Systems (8 Hrs.)
Distributed Resource Management, Concepts of File System, Scheduling Algorithms Distributed File System
Introduction, Architecture, Mechanisms for building distributed file system, Design issues, Case studies, Log structured file systems, Google FS

Distributed Shared Memory – Introduction, Architecture and Motivation, algorithms for implementing DSM, Memory Coherence, Coherence protocols, Design issues, Case studies- Linda

Distributed Scheduling – Introduction, Motivation, Issues in load distribution, Components of load distributing algorithms, Stability, Load distributing algorithms, Performance Comparison, Selecting a suitable load sharing algorithms, Requirements for load distributing, Load sharing policies, Task migration, Distributed File System: Comparisons

Unit 5: Recovery (8 Hrs.)
Recovery and Security mechanism, Concepts of Database system Security, Basic concepts of Recovery and Types of Failures
Recovery – Introduction, Basic concepts, Classification of failures, Backward and forward error recovery, Backward error recovery, Recovery in concurrent systems, Consistent set of checkpoints, Synchronous and Asynchronous check pointing and recovery

Fault tolerance – Introduction, Issues, Atomic actions and committing, Commit Protocols, Non blocking Commit protocols, Voting protocols, Majority based Dynamic Voting protocol,
Dynamic vote, Reassignment protocols, Failure Resilient Processes, Reliable communication, Case studies-BAR Fault Tolerance, Targon/32 UNIX

**Access and Flow control** – Introduction, Preliminaries, Access matrix Model, Implementations of Access Matrix, Safety in Access matrix model, advanced models of protection, Case studies-Unix OS

Distributed Fault tolerance and Security, Advances in Recovery and security mechanisms

**Unit 6 : Grid Computing**


**SOA:** Basic SOA Definition, Overview of SOA, SOA and Web Services, Service Oriented Grid, SOA Design and Development, Advantages and Future of SOA

Grid computing, Cloud and SOA

**Text books:**

1. Distributed O.S Concepts and Design||, P.K.Sinha, PHI
2. Advanced concepts in Operating Systems||, Mukesh Singhal & N.G.Sivaratri, TMH
3. Distributed Computing||, Sunita Mahajan, Seema Shah, OXFORD University Press

**Reference Books:**

1. Distributed System Principles and Paradigms||, Andrew S. Tanenbaum, 2nd edition , PHI
2. Distributed Systems||, Colouris , 3rd Edition

**Term Work:** It should consist of the following assignments:

1. Implementation of RMI for any given application.
3. Implementation of different sorting algorithms using dispatcher thread model.
4. Implementation of logical clock using counter.
5. Implementation of Berkeley’s algorithm.
7. Implementation of stateful and stateless server in file reading application.
8. Implementation of Bully Algorithm.
9. Study of HDFS.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
3. MODERN DATABASE SYSTEMS

Teaching Scheme
Lecture : 3 Hours /Week
Practical : 2 Hour /Week

Examination Scheme
Theory : 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVES:
1) Introduce different databases like distributed, parallel & object oriented databases.
2) Acquaint with Query processing and its phases including query optimization.
3) Illustrate data mining & warehousing with OLAP implementations.
4) Demonstrate Bigdata with Hadoop & its components.

COURSE OUTCOMES:
1) Differentiate between Distributed & Parallel databases.
2) Implement object oriented databases, mining concepts.
3) Implement different query processing algorithms.
4) Tabulate SQL, NoSQL & New SQL with its applications.
5) Articulate technologies like Hadoop, MongoDB, Cassandra, Pig, Hive.

SECTION-I

Unit 1 : Database System architectures (7 Hrs.)
Centralized & C/S architectures, Server systems, Distributed systems, Distributed databases –
homogeneous & heterogeneous databases, Distributed data storage, Distributed transactions,
Commit protocols, Concurrency control in distributed databases, Availability, Distributed query
processing, Heterogeneous distributed databases

Unit 2 : Parallel Databases (7 Hrs.)
Introduction, I/O parallelism, Inter-query parallelism, Intra-query parallelism, Intra-operation
parallelism, Inter-operation parallelism

Unit 3 : Data Analysis and Mining (6 Hrs.)
Introduction to decision support, OLAP: Multidimensional Data Model, Multidimensional
Aggregation Queries, Window Queries in SQL: 1999, Implementation Techniques for OLAP,
Data Warehousing, Introduction to data mining, The knowledge Discovery Process, Counting
coopercurrences, Mining for rules, Clustering, Similarity search over sequences

SECTION-II

Unit 4 : Object Based Databases (6 Hrs.)
Overview, Complex Data Types, Structured Types and Inheritance in SQL, TableInheritance,
Array and Multisets Types in SQL, Object Identity and Reference Types inSQL, Object Oriented
DBMS versus Object Relational DBMS
**Unit 5 : Query Processing & Optimization** (6 Hrs.)

**Unit 6 : BIG data and HADOOP** (6 Hrs.)
Big data, characteristics of Big data, introduction to HADOOP, High level architecture of HADOOP, HDFS file system architecture, special feature of HADOOP, working with HADOOP commands, working of MAP reduce with an example.

**Unit 7 : NoSQL** (4 Hrs.)
Getting started with NoSQL, Key value stores, Document databases, Graph stores, New SQL

**Unit 8 : Case Study** (2 Hrs.)
Postgre SQL, MongoDB

**Text Book :**

**Reference Books:**

**Termwork :**
Practical Assignments (minimum 10 to be implemented):
1. Implement 2PC protocol.
2. Implement join operation on n relations using parallelism approach.
3. Implement the Round Robin partitioning for parallel database environment.
4. Implement the Hash partitioning for parallel database environment.
5. Implement the Range partitioning for parallel database environment.
6. Implement Interquery parallelism in parallel databases.
7. Implementation of intraquery parallelism using multithreading
8. Implement Range partitioning Sort algorithm using intraquery parallelism through interoperation
9. Implementation of Asymmetric fragment & replicate join
10. Write a program to join r1  r2  r3  r4 using Independent Parallelism for Interoperation parallelism.
11. Implement OLAP queries.
12. Implement algorithm for finding Frequent Itemsets for a given minimum support.
13. Implement algorithm for finding association rules for given minimum support and confidence.

w.e.f. Academic year 2015-2016
15. Implement queries for type inheritance and table inheritance.
SOLAPUR UNIVERSITY, SOLAPUR
BE(COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
ELECTIVE-I : 1. HUMAN COMPUTER INTERACTION

Teaching Scheme
Lecture : 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVES:
1) Know how to analyze and consider user’s need in the interaction system
2) Understand various interaction design techniques and models
3) Understand the theory and framework of HCI
4) Understand and analyze the cognitive aspects of human – machine interaction

COURSE OUTCOMES:
1) To develop good design for human machine interaction system
2) Analyze the user’s need in interaction system
3) To design new interaction model to satisfy all types of customers
4) Evaluate the usability and effectiveness of various products
5) To know how to apply interaction techniques for systems

SECTION - I

Unit 1 Overview of HCI, Theories and Principles (6 Hrs)

Unit 2 Managing Design Processes and Tools and Testing (6 Hrs)

Unit 3 Design Principles for Designing GUI Objects (6 Hrs)
Direct manipulation (examples, explanations), Visual Thinking and Icons, 3D Interfaces, Virtual Reality, Fitt’s Law, Introduction to Menu Selection, Form Fill-in, and Dialog Boxes, Task Related Organizations, Fast Movement through Menus, Item Presentation Sequence, Response Time and Display Rate, Data Entry with Menus, Menu Layout, Command-Organizational Strategies, Naming and Abbreviations, Command Menus, Web user interface, Natural Language in Computing

SECTION - II

Unit 4 Interaction Styles (6 Hrs)
Introduction to Interaction Devices, Keyboards and Function Keys, Pointing devices, Speech and
Auditory Interfaces, Speech Recognition, Image and video displays, Printers, Response time and display rate with respect to display, Goals of Collaboration, Asynchronous and Synchronous Interfaces, Face-to-Face Interfaces, Ubiquitous Computing.

**Unit 5 Presentation Design Issues** (6 Hrs)

**Unit 6 Information Search and visualization** (6 Hrs)
Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization, OAI Model for Website Design.

**Text Books :**
1) Human Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd and Russel Beale, Prentice Hall Publication

**Reference Books :**

**Termwork :**
Minimum 10 to 12 assignments based on above topics.
SOLAPUR UNIVERSITY, SOLAPUR
BE(COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
ELECTIVE-I : 2. DIGITAL SIGNAL PROCESSING

Teaching Scheme
Lecture : 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVES :
1) Know digital signal processing fundamentals.
2) Understand and implementation of the DFT.
3) Learn the basic forms of FIR and IIR filters and to design filters.
4) Understand the applications of DSP.

COURSE OUTCOME :
1) Apply digital signal processing fundamentals.
2) Implement DFT
3) Design filters.

SECTION –I

Unit 1 : Classification of signals and systems (6 Hrs.)
Introduction, Continuous time and discrete time signals, Classification of signals, Simple manipulations of discrete time signals, Classification of systems, Representation of systems.

Unit 2 : Z-Transforms (5 Hrs.)
Introduction, Definition of Z transform, Properties of Z transform, Evaluations of the inverse z transform.

Unit 3 : Discrete Fourier Transform (5 Hrs.)
Representation of periodic sequence: Discrete fourier series, Properties of discrete fourier series, Fourier transform of periodic signals, Sampling the fourier transform.

Unit 4 : Realization of Digital Linear System (7 Hrs.)
Introduction, Basic realization block diagram and the signal flow graph, Basic structure for IIR system, Basic structure for FIR systems.

SECTION-II

Unit 5 : Filter Design Techniques (6 Hrs.)
Introduction, Design of discrete time IIR filters from continuous time filters, Frequency transformations of lowpass IIR filters, Design of FIR filters by windowing.
Unit 6 : Computation of Discrete Fourier Transform (6 Hrs.)
Introduction, Efficient computation of the discrete fourier transform, Decimation in time FFT algorithms, Decimation in frequency FFT algorithms.

Unit 7 : Application of Digital Signal Processing (5 Hrs.)
Application of DSP in biomedical engineering, Voice processing, Application of RADAR, Application of image processing.

Unit 8 : Digital Signal Processors (5 Hrs.)
Introduction, First generation TMS320C1X processor, Second generation TMS320C2X processor.

Text Books
1. Discrete-Time Signal Processing – Alan V. Oppenheim and Ronald W. Schafer – PHI

Reference Books

Termwork
Minimum 6 - 8 assignments based on each topic of above syllabus.
COURSE OBJECTIVES
1) To learn the principles, techniques and tools of software testing in order to improve the quality of software product.
2) To gain knowledge of the software testing process, various methods of testing, different levels of testing, software quality concepts, assurance & standards
3) To learn generation and execution of test plan, cases & scripts.
4) To learn manual and automatic software testing & various kinds of testing tools.
5) To discover correctness, completeness and quality of software.
6) To recognize the importance of software testing in Software Development Life Cycle.

COURSE OUTCOMES
1) Understand what a software bug is, how serious they can be, and why they occur.
2) Test software to meet quality objectives & requirements
3) Apply testing skills to common testing tasks
4) Perform the planning and documentation of test efforts
5) Understand software quality concepts, assurance & standards
6) Use testing tools to test software in order to improve test efficiency with automation

SECTION I
Unit 1: Fundamentals of Software Testing (8 Hrs)

Unit 2: Methods of Testing (6 Hrs)
Software Verification and Validation, Black-Box and White-Box Testing, Static and Dynamic Testing, Black-Box Testing Techniques-Equivalence Partitioning, Data Testing, State Testing, Other Black Box Test Techniques. White-Box Testing Techniques-Data Coverage, Code Coverage, Other White Box Test Techniques.
Unit 3: Levels of Testing (8 Hrs)

SECTION II

Unit 4: Test Planning & Documentation (8 Hrs)
Test Planning-The goal of Test Planning, Test Planning Topics, Writing and Tracking Test Cases-The Goal of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting Bugs- Getting Your Bugs Fixed, Isolating and Reproducing Bugs, Not All Bugs Are Created Equal, Bug-Tracking Systems.

Unit 5: Quality Concepts & Software Quality Assurance (6 Hrs)

Unit 6: Automated Testing and Testing Tools (8 Hrs)

Text books:

References:
Reference books:
3. Beautiful Testing: Leading Professionals Reveal How They Improve Software By Adam Goucher, Tim Riley, Publisher O’reilly
4. Foundations of Software Testing By Rex Black, Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Published by Cengage Learning India Pvt Ltd.
5. Lessons Learned in Software Testing by Cem Kaner, James Bach, Bret Pettichord, Publisher Wiley
6. Testing Computer Software Cem Kaner, Jack Falk, Hung Q. Nguyen, Publisher Wiley

Reference tutorials:

Term work:
Assignment:
Minimum 6 - 8 assignments based on each topic of above syllabus.
Two assignments on use of Selenium for software testing.
Teaching Scheme
Lecture : 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

Pre-requisites:
Before studying the subject, students should be aware of DBMS concepts, OO concepts, WWW, Overview of Data Warehouse, Software Engineering

COURSE OBJECTIVES:
1) Study the advanced database techniques
2) Acquaint the students with some refers to skills, Processes, technologies, applications and practices used to support decision making issues and build business intelligence systems

COURSE OUTCOME :
1) Gain an awareness of the basic issues in BI & Modeling techniques.
2) Compare and contrast emerging architectures for B. I.
3) Familiarize with the E-T-L techniques in B.I. and other advanced topics
4) Interpret B.I. applications

SECTION – I

Unit 1 : Introducing the Technical Architecture (7 Hrs.)

Unit 2: Introducing Dimensional Modeling (6 Hrs.)
Making the Case for Dimensional Modeling, Dimensional Modeling primer, Enterprise Data Warehouse Bus Architecture, More on Dimensions & Facts.

Unit 3 : Designing the Dimensional Modeling (5 Hrs.)

SECTION - II

Unit 4 : Introducing Extract, Transformation & Load (6 Hrs.)
Round up the requirements, the 34 subsystems of ETL, Extracting Data, Cleaning & Conforming data.
**Unit 5 : Introducing Business Intelligence Applications (6 Hrs.)**

**Unit 6 : Designing & Developing B.I Applications (6 Hrs.)**

**Text Book:**
1) The Data Warehouse Lifecycle Toolkit By Raiph Kimball,Ross, 2nd edition, Wiley Publication

**Reference Books:**
1) Data Warehousing in the Real World – Anahory & Murray, Pearson Edt.
2) Data Warehousing Fundamentals – Ponniah [Wiley Publication]

**Term Work:**
It should consist of 10-12 assignments with emphasis on configuration and development of Business Intelligence applications using tools –
1. ETL
2. Reporting tools - Infomatica, Datastage, Abitinio, Microstrategy and Business Objects,
3. Cognos, PowerAnalyzer, Hyperion
4. Relational Database management Systems - Oracle, Terradata, MS SQL
5. Non-relational databases - delimited flat files, Peoplesoft data, XML data.

The assignments must include installation and testing of BI applications, setting up user security, and study process of maintenance of BI applications.
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
ELECTIVE – II : 1. OBJECT ORIENTED MODELING & DESIGN

Teaching Scheme
Lecture : 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVE :
1. Model and design real world problems.
2. Analyze the risk factor for software development project.
3. Develop the skills to determine which process of object oriented Analysis and design technique should be applied to a given project.

COURSE OUTCOME:
1. List the objects of Unified Modeling Language for a given problem statement.
2. Explain the working understanding of the object oriented analysis and design.
3. Apply the knowledge of object oriented modeling and design to the given software development project.
4. Devise the real world problem using object oriented modeling technique.

SECTION-I
Unit 1 : Introduction (4 Hrs.)
Object Oriented development and themes, evidence for usefulness, modeling as a Design Technique.

Unit 2 : Object Modeling (6 Hrs.)
Objects, classes, links and associations, generalization and inheritance, grouping constructs, aggregation, abstract classes, generalization as extension and restriction, multiple inheritance, metadata, candidate keys and inheritance.

Unit 3 : Dynamic and Functional Modeling (6 Hrs.)
Events, states, operations, concurrency, nested state diagrams, advanced dynamic modeling concepts, relation of object and dynamic models, DFD, relation of functional to object and dynamic models

Unit 4 : Methodology preview and Analysis (4 Hrs.)
SECTION-II

Unit 5 : Behavioral Modeling using UML (6 Hrs.)
Interactions, Use cases, Use case diagram, Interaction Diagrams and Activity diagrams, Events and signals, State Machines, Processes and Threads, Time and space, State chart diagrams.

Unit 6 : Architectural Modeling using UML (6 Hrs.)
Components, Deployment, Collaboration, Patterns and Frameworks, Component diagrams and Deployment Diagrams

Unit 7 : Implementation of OMT (6 Hrs.)
Use of programming language and database system, Object oriented style, feature of object-oriented languages, Applications of OMT like object diagram compiler, Computer animation, Case study of Hotel management system, course management system

Unit 8 : Design Patterns – 1 (4 Hrs.)
What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

Textbook:
1. Object oriented Modeling and Design: Rambaugh, Premerlani, Eddy, Lorenson (PHI )

Reference Books:

Termwork:
1. Describe object oriented methodology and themes.
2. Prepare a list of objects that you would expect each of the following system to handle also draw the class and object diagram for the same.
   a. Arithmetic expression   b. Air transportation system.
3. Dynamic and Functional Modelling
   a. Draw the state diagram for telephone answering machine. The machine should answer after five rings. If the telephone is answered before five rings, the machine should do nothing.
b. Design functional model for flight simulator.


5. Draw Use case Diagram for Student Registration System.

6. Draw Sequence and collaboration diagram for buying online product.

7. Draw Deployment diagram for Home Network. (Hint: Modern homes usually have a network of interconnected devices of different kinds and with various types of connections and communication protocols. It contains cable modem, wireless router, various computers and devices.)

8. Draw Component diagram for online examination system.

9. What is a Design pattern and what makes a pattern? Describe Pattern categories and Relationships between patterns.
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
ELECTIVE – II : 2. WIRELESS AD-HOC NETWORKS

Teaching Scheme
Lecture : 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork : 25 Marks

COURSE OBJECTIVE:
1) Understand need for ad hoc networks.
2) Explain the constraints of physical layer that affect the design and performance of ad hoc network.
3) Understand why protocols required for wired network may not work for wired network at MAC, Network and Transport Layer.
4) Explain the operations and performance of various MAC layer protocols, unicast routing protocols and transport layer protocols proposed for ad hoc networks.
5) Understand security issues and QoS requirements.

COURSE OUTCOMES :
1) Understand the challenges in design of wireless ad hoc networks.
2) Understand and analyze proposed protocols at MAC and routing layers of ad hoc networks.
3) Understand and analyze attacks pertaining to network layer.

SECTION- I

Unit 1 : Preliminary Considerations (5 Hrs.)

Unit 2 : Theoretic Framework for Multi-Hop Adhoc Wireless Network (6 Hrs.)
Ideal Scenario :-Introduction, Preliminaries, Communication Theoretic Basics: Bit Error Rate, Link Signal-to-Noise ratio.
Realistic Scenario: - Introduction, Preliminaries, Communication Theoretic Basics: Inter node Interferences.

Unit 3 : Connectivity in AdHoc Wireless Network (5 Hrs.)
Introduction, Quasi-Regular Topology, Random Topology.
SECTION- II

Unit 4 : Transport Capacity in AdHoc Wireless Networks (5 Hrs.)
Introduction, Model and Assumption, Preliminaries, Single-Route Effective Transport Capacity, Average Effective Transport Capacity.

Unit 5 : Impact of Mobility and Route Reservation (5 Hrs.)
Impact of Mobility : Introduction, Preliminaries, Switching Model, Mobility Models
Route Reservation: introduction, Related Work, Network Model & Assumptions, Two Switching Schemes.

Unit 6 : Transmission Power (6 Hrs.)
Introduction, Model and Assumption, Connectivity, BER at the end of Multi-Hop Route, Optimal Common Transmit Power, Performance Metrics.

Text Books:
1. Mobile AdHoc Networking – Stefano Basagni, Marco Conti Et al. by Wiley India Publications. (For Chapter I )
2. AdHoc Wireless Network – Ozan Tonguz, Gianluigi Ferrrari by Wiley India Publications. (For all Chapters )

Term Work: 4 to 5 assignments problems based on mathematical background learned chapters.
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
ELECTIVE – II : 2. INTELLIGENT SYSTEMS

Teaching Scheme
Lecture: 3 Hours /Week

Examination Scheme
Theory: 100 Marks
Termwork: 25 Marks

COURSE OBJECTIVES:
1) Introduce the basic concepts of artificial intelligence.
2) Introduce new approaches to solve a wide variety of research-oriented problem.
3) Get clear concept of decision support system and heuristic search algorithms.

COURSE OUTCOME:
1) Understand basic concepts of artificial intelligence.
2) Apply with new value added technologies to make it intelligent system.
3) Apply logic for practical implementation using AI languages like LISP, PROLOG etc.

SECTION – I

Unit 1: Decision Making and Computerized Support (7 Hrs.)

Unit 2: Decision Making and Computerized Support (5 Hrs.)

Unit 3: Decision Support Systems : an Overview (5 Hrs.)

Unit 4 Decision Support Systems Development (5 Hrs.)
Introduction to DSS development, The Traditional SystemDevelopment Life cycle, Prototyping: TheDSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, EndUser-Developed DSS.
SECTION – II

Unit 5 : Group Support Systems  
(6 Hrs.)

Unit 6 : Enterprise Information Systems  
(5 Hrs.)
Concepts and definitions, Evolution of Executive and Enterprise Information Systems, Executive’s roles and information needs, Characteristics and capabilities of Executive Support Systems, Comparing and integrating EIS and DSS, Supply and Value Chains and Decision Support, Supply Chain problems and solutions, MRP, ERP / ERM, SCM.

Unit 7 : Knowledge Management  
(6 Hrs.)
Introduction, Organizational learning and Transformation, Knowledge management initiatives, Approaches to Knowledge management, IT in Knowledge management, Knowledge management systems implications, Role of people in Knowledge management, Ensuring success of Knowledge management.

Unit 8 Integration, Impacts, and Future of Management-Support Systems  
(6 Hrs.)

Text Books:
(Chapter 1, 2, 3, 6, 7, 8 excluding 8.7 to 8.9, 9, 15)

Reference Books:
2) Artificial Intelligence by Elaine Rich and Kevin Knight – MGH

Termwork:
Minimum 8 to 10 assignments on the above topics.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
ELECTIVE – II : 4) MOBILE APPLICATION DEVELOPMENT

Teaching Scheme
Lecture : 3 Hours /week

Examination Scheme
Theory: 100 Marks
Termwork: 25 marks

COURSE OBJECTIVES:
1) Develop mobile applications using modern mobile development tools for android.
2) Independently manage all phases of mobile project development.
3) Develop applications that effectively combine mobile device capabilities such as communication, computing.

COURSE OUTCOMES:
1) Familiarize with mobile apps development aspects.
2) Design & develop mobile apps, using Android as a development platform.
3) Perform testing, signing, packaging and distribution of mobile apps.

SECTION – I

Unit 1 : Android Operating System (8 Hrs.)

Unit 2 : Getting started with Mobility (8 Hrs.)
Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development

Unit 3 : User Interface Design. (6 Hrs.)
App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities.

Unit 4 : Mobile Application Functionality (6 Hrs.)
App functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs

SECTION – II

Unit 5: Native data handling (6 Hrs.)
On-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)
Unit 6 : Sprucing up mobile apps           (10 Hrs.)
Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)

Unit 7 : Testing mobile apps             (6 Hrs.)
Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk

Unit 8 : Taking apps to Market           (6 Hrs.)
Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Google play store.

Text Books:
1. “Android Application Development All in one for Dummies” by Barry Burd
2. “Mobile Apps Development” by Anubhav Pradhan, Anil V Deshpande
3. “Embedded Android-Porting, Extending, and Customizing” by Karim Yaghmour (O'Reilly Media)

Reference Books:
2. Android Developer Tools Essentials by Mike Wolfson (O'Reilly Media).

List of Assignments:
Students should implement and learn to use the android application development and testing tools to accomplish the following assignments during regular course schedule.
1) Understand the app idea and design user interface/wireframes of mobile app
2) Set up the mobile app development environment
3) Using emulator to deploy and run mobile apps
4) Develop and debug mobile app components – User interface, services, notifications, broadcast receivers, data components.
5) Testing mobile app - unit testing, black box testing and test automation
The student should attend vocational training arranged at Industry or Institute and should complete a mini project on the technology on which training was given. A report regarding satisfactory completion of the training should be submitted to the college by competent authority from Industry / Institute. The evaluation of Term Work will be carried out by a panel of Examiners decided by the institute.
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
LAB I : PROJECT PHASE I

Teaching Scheme
Practical : 4 Hours /Week

Examination Scheme
Termwork : 50 Marks
POE : 50 Marks

COURSE OBJECTIVES:
1) Formulate a realistic problem statement using SDLC.
2) Follow an appropriate designing technique for further development of a project.
3) Get acquainted to work in a team.
4) Develop soft skills including presentation, writing & convincing.

COURSE OUTCOMES:
1) Define a realistic problem statement.
2) Select & apply an appropriate technique to create a design.
3) Work in teams with good coordination.
4) Present their work through oral communication & writing skills.

Strategy:
1) A project group shall be about 4 students.
2) Students have to study existing system, problems in existing system, proposed system, its definition, scope, design, introduction to programming tools, hardware and software platforms, planning, activity charts, planning for testing, test case design etc.
3) Project leader should maintain the progress register in which each member weekly contribution should be written and the guide will countersign the same.
4) A project design report will be submitted as a term work document at the end of semester.
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
LAB II : PYTHON

Teaching Scheme
Lecture : 2 Hours /Week
Practical : 2 Hours/Week

Examination Scheme
Termwork : 50 Marks

COURSE OBJECTIVES :
1) Introduce to the core components of programming using the Python programming language.
2) Introduce library packages to write desktop applications using python

COURSE OUTCOME:
1) Use fundamental library packages available in python,
2) Design python application using procedure oriented and object oriented approach.
3) Develop database application in python,

SECTION - I
Unit 1 : Introduction to Python (03 Hrs.)
Introducing the Python Interpreter, Program Execution, Execution Model Variations, The Interactive Prompt, System Command Lines and Files

Unit 2 : Introduction to procedural programming in Python (04 Hrs.)
Data types, Collection data types, Control structures and functions, Exception Handling, Custom Functions,

Unit 3 : Modules and packages (06 Hrs.)
String handling, command line programming, time and dates, JSON handling, File and directory handling, Create, read, write delete, and rename files, Traverse directories, PyPI: Python Package Index, pypi.python.org/pypi, Using pip to install python packages from PyPI

SECTION - II
Unit 4 : Object oriented programming (04 Hrs.)
Attributes and methods, Inheritance and polymorphism, Unit testing and profiling

Unit 5 : Database programming (04 Hrs.)
DBM databases, Executing Queries, SQL databases

Unit 6 : Network and Web Programming (04 Hrs.)
Interacting with HTTP services as a client, Creating TCP, UDP Server, Creating Simple REST based interface, Authenticating Clients, Understanding Event-Driven I/O

w.e.f. Academic year 2015-2016
Unit 7: Testing, Debugging and exceptions  

(5 Hrs.)

Testing output, Unit tests in Python, Handling Multiple exceptions, creating custom exceptions, Debugging programs

Text Book:

Reference Books:
2. Learning Python FIFTH EDITION Mark Lutz
3. Programming Python (English) 4Th Edition Mark Lutz

Termwork:
Minimum 12 to 15 assignments based on above topics.
COURSE OBJECTIVES:
1) Study different types of information systems in an organisation
2) Understand various MIS operating in functional areas of an organisation and explain its relationship with the various activities of the organisation.
3) Understand how MIS is developed and implemented for various levels in an organisation.
4) Explore the use of some common IS development tools.

COURSE OUTCOME:
1) Understand information systems and their uses,
2) Use computerized management information systems,
3) In-depth analysis and decision making,
4) Apply modern project management techniques,
5) Aware of security issues related to information systems

SECTION I

Unit 1: Introduction (4 Hrs.)
Management Information system (MIS) Concept, definition, Role of Management Information system, Impact of the management information system, Computers in Management, The role and importance of information systems, MIS and User, Management as control system, Uses of MIS, Characteristics of MIS, MIS: support to management.

Unit 2: Information system and decision making (6 Hrs.)
Information System Software, Information needs at different organization levels, Major types of information system in organization and relationship between them, Enhancing management decision making, decision support systems (DSS) –understands DSS, characteristics components, major DSS applications. Group decision support systems (GDSS), - elements, characteristics, how GDSS can enhance group decision - making? Executive support systems (ESS) – role of ESS in the organization, developing ESS, benefits of ESS.

Operational Information Systems in Business, APPLICATION OF MIS IN VARIOUS FUNCTIONAL AREAS: Marketing information systems, financial information systems, human resource information systems, production information systems.
Unit 3: Strategic Role of Information Systems (4 Hrs.)
Information as a strategic resources and concept of strategic information system, Contribution of information systems to pursue competitive strategies.

Unit 4: Basics of information system (4 Hrs.)
Building Information System- Overview of system development life cycle, Role of data in Information System, Major problem areas in information system, causes of information system success and failure, evolution of success of information systems, Principle causes of information system failure.

SECTION II

Unit 5: Information Systems Resource Management and security (5 Hrs.)

Unit 6: E-commerce (4 Hrs.)
E–Commerce - Concept, Types and Applications of E-Commerce, E-market, M- Commerce.

Unit 7: ERP (7 Hrs.)

Text Books:

Reference Books:
1. Information Technology for management by Ramesh Behl
2. Management information system by Shashikala parimi, dreamtech
3. ERP by Alexis , Leon
4. Revati Shriram (security Audit for this bit Chap. 5)
Term work
Teacher should prepare a group of 4-5 students (or based on their project group) assign them any case study based on the above chapters and tell them to collect and present that case study in the form of seminar. Evaluation will be done by teacher by considering different factors.

These are few topics for case study, teacher can suggest any other topic for case study
1. IT application in Management: BSNL CDR project (Call-Data-Record)
2. Information System Software: Case study on DSS for ITC, Big Bazaar, Raymond Clothing’s
3. Application of MIS in different Functional Area: AADHAR Based Biometric Attendance System implemented in all government organizations. www.attendance.gov.in
4. Information system resource management: IRCTC next Generation Ticketing System
5. Ecommerce: A comprehensive case study on FLIPKART, SNAPDEAL, MYNTRA etc
6. ERP: One Case study on each module of ERP
7. Mc Donald’s supply chain management (SCM)
8. Cognizant implementation of People soft (Human Resource Management System)
9. Tata Motors CRM DMS Project (CRM)
10. AICTE, New Delhi (SAP CRM Project)
11. VRL Implementation of SCM (Logistics & Supply Chain Management)
SOLAPUR UNIVERSITY, SOLAPUR
B. E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II

2. INFORMATION AND CYBER SECURITY

Teaching Scheme       Examination Scheme
Lecture : 3 Hrs/Week Theory: 100 Marks
Practical : 2 Hrs/Week Term Work : 25 Marks
POE: 25 Marks

COURSE OBJECTIVES :
1) Provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security.
2) Provide concept-level hands-on experience in specific topic area.
3) Provide the ability to examine and analyze real-life security cases.

COURSE OUTCOME :
1) Recognize common attack patterns.
2) Evaluate vulnerability of an information system and establish a plan for risk management.
3) Demonstrate how to detect and reduce threats in Web security.
4) Evaluate the authentication and encryption needs of an information system.
5) Explain the Public Key Infrastructure process
6) Demonstrate how to secure a wireless network
7) Evaluate a company’s security policies and procedures

SECTION – I

Unit 1: Symmetric Ciphers

Unit 2: Block Cipher and Data Encryption Standard
Simplified DES, Block Cipher principles, The Data Encryption Standard, The strength of DES, Differential and Linear Cryptanalysis, Block Cipher design principles, Block Cipher Mode of Operation.

Unit 3 : Public Key Cryptography
Public Key Cryptography and RSA – Principles of Public Key Cryptosystems, The RSA Algorithm, Key management - Other public key cryptosystems – Key Management, Diffie-Hellman Key Exchange.
Unit 4: Message Authentication and HASH Functions: (5 Hrs.)

SECTION – II
Unit 5: IP Security and E-Mail Security (7 Hrs.)
Electronic Mail Security – Secure Electronic Transaction, Pretty Good Privacy, S/MIME

Unit 6: Introduction to Cybercrime: (5 Hrs.)

Unit 7: Tools and Methods used in Cybercrime: (7 Hrs.)
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL injection, Buffer overflow.

Text Book:
1) Williams Stallings–Cryptography and Network security principles and practices. Pearson Education (LPE) (Unit I to V)
2) Nina Godbole --Information systems security-Security management, metrics, frameworks and best practices(WILEY) (Unit VI and VII)

Reference Books:
3) Schneir, Bruce, “Applied Cryptography: Protocols and Algorithms”

Practical List:
It should consist of the 08-10 practical based on following guidelines
1) Implementation of Substitution Cipher
2) Implementation of Poly alphabetic Cipher (Vigenere Cipher and Vernam Cipher)
3) Implementation of Transposition Cipher
4) Implementation of Play fair Cipher
5) Implementation of Secure file transfer in Client/Server environment (use any one of above method for encryption and decryption).
6) Write a program to simulate RSA algorithm.
7) Write a program to simulate any Authentication system.
8) Write a program to simulate the PGP.
9) Study different cybercrimes and implement a system to detect any one cyber crime
10) Study and implementation of proxy servers, Keyloggers, Detection of phishing attacks.
COURSE OBJECTIVES:
This subject enables students to
1) Learn basics in data mining (DM), and knowledge discovery in databases.
2) Understand data preprocessing methods in data mining.
3) Acquaint with data warehouses and OLAP.
4) Learn important data mining techniques.
5) Learn different data mining applications.

COURSE OUTCOME:
1) Apply the concepts, strategies, and methodologies related to the design and construction of data mining applications
2) Comprehend several data preprocessing methods
3) Utilize data warehouses and OLAP for data mining and knowledge discovery activities
4) Determine an appropriate mining strategy for given large dataset
5) Apply appropriate mining techniques to extract unexpected patterns and new rules that are "hidden" in large databases

SECTION - I

Unit 1 : Introduction (5 Hrs.)
Fundamentals of data mining, Data mining techniques-classification,regression,time-series,prediction,clustering,summarization,association rules, sequence discovery, Information Extraction using Neural Networks, KDD environment, Data mining metrics, Major issues in Data Mining, Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Data transformation and Discretization.

Unit 2 : Data Warehouse and OLAP Technology for Data Mining (4 Hrs.)
Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.
Unit 3 : Mining Frequent Patterns, Associations and Correlations (6 Hrs.)
Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Frequent Itemsets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional, Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Unit 4 : Classification and Prediction (6 Hrs.)
What is Classification & Prediction, Issues regarding Classification and prediction, statistical based algorithms, distance based algorithms, Decision tree, Prediction: Linear and non linear regression.

SECTION - II

Unit 5 : Cluster Analysis (7 Hrs.)
Data types in cluster analysis, Categories of clustering methods, Partitioning algorithms- K-Means & K-Mediods, Hierarchical Clustering- Agglomerative and Divisive Clustering, BIRCH and ROCK methods, DBSCAN, Outlier Analysis

Unit 6 : Mining Streams, Time Series and Sequence Data (6 Hrs.)
Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multirelational Data Mining.

Unit 7 : Mining Object, Spatial, Multimedia, Text and Web Data (5 Hrs.)
Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Unit 8 : Applications and Trends in Data Mining (5 Hrs.)
Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

Text Books:
1) Data Mining – Concepts and Techniques - Jiawei Han, Micheline Kamber & Jian Pei, Morgan Kaufmann Publishers, Elsevier, 3rd Edition.
2) Data Mining: Introductory And Advanced Topics- Margaret H Dunham, Pearson Education
3) Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference Books:
2) Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia.
3) Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.
4) Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley student Edition
Termwork:
Minimum 8 to 10 assignment based on above topics.
Teaching Scheme
Lecture: 3 Hours /week

Examimation Scheme
Theory: 100 Marks
Termwork: 25 marks

Prerequisites
Familiarity with Fourier transforms.

COURSE OBJECTIVES:
1) Study the Image fundamentals.
2) Study the mathematical morphology necessary for Image processing and Image segmentation.
3) Study the Image Representation and description and feature extraction.
4) Study the principles of Pattern Recognition.
5) Know the various applications of Image processing.

COURSE OUTCOMES:
1) Know the basic concepts in Image Processing.
2) Segment the various types of Images.
3) Represent the images in different forms.
4) Develop algorithms for Pattern Recognition.
5) Implement the features of Image processing in applications.

SECTION - I
Unit 1: Image, digitized image & it's properties (8 Hrs.)
Elements of visual perception & its attributes, Digitized Image - image function, mathematical representation. Image digitization - Sampling & Quantization, Properties - distance, pixel adjacency, region, background, holes, brightness, segmentation, border, edge, convex hull, histograms, color, Noise. Image analysis - Level of image data Representation Traditional & hierarchical data structure, Example of Image Processing.

Unit 2: Image pre – processing (6 Hrs.)
Brightness transformation, geometric transformation, Local Processing, Image smoothing and edge detection, Introduction to Image restoration.

Unit 3: Image enhancement in special domain (6 Hrs.)
Threshold, Edge-based segmentation, Edge relaxation, Border tracing, Hough transform. Region-based segmentation, Region merging, Region splitting, Split & Merge.
SECTION –II

Unit 4 : Image Enhancement in frequency domain (7 Hrs.)

Unit 5 Space reorientation and Detection (7 Hrs.)
Region Identification, Contour-based representation. Chain codes, B-Spline reorientation, Region –based representation, moments, Convex Hull.

Unit 6 : Image Compression (6 Hrs.)
Redundancy & fidelity criteria, Error free compression, Methods of compression, standards, Binary, continuous tone still, Video

Text Book:
1) Computer vision & Image processing - by Milan Sonaka.
2) Digital Image Processing - by Gonzalez (Addision Wesley)

Reference Book:
1) Elements of Digital Image Processing & Computer Vision – by Andrew Low(MGH)
2) Digital Image Processing - Pratt.

Termwork:
Minimum 8 to 10 assignments on above topics.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
ELECTIVE – III : 3) INFORMATION RETRIEVAL

Teaching Scheme
Lecture : 3 Hours /week

Examination Scheme
Theory: 100 Marks
Termwork: 25 marks

COURSE OBJECTIVES:
1) Aquaint students to information retrieval process and information models.
2) Introduce measures of evaluation performance of information retrieval systems.
3) Learn different querying methods.
4) Learn indexing structures like inverted index, hash files, suffix arrays for given collection of documents.
5) Study different sequential and pattern matching algorithms.
6) Learn difference in data retrieval, information retrieval and multimedia retrieval systems.
7) Learn different components of search engine and ranking algorithms.

COURSE OUTCOMES:
1) Implement text retrieval models like Boolean, vector and probabilistic and structured retrieval model.
2) Evaluate the performance of information retrieval systems.
3) Implement different querying patterns in retrieval models.
4) Implement different indexing structure like inverted index, hash files, suffix arrays for given collection of documents.
5) Implement different sequential searching algorithms and pattern matching algorithms.
6) Implement multimedia IR system and indexing on multimedia data.
7) Implement different ranking algorithms to find ranking of the documents.
8) Design and develop information retrieval systems.

SECTION – I

Unit 1 : Information Retrieval & IR Models (9 Hrs.)

Unit 2 : Query Languages (5 Hrs.)
Keyword based querying, Pattern Matching, Structural Queries.

Unit 3 : Indexing and Searching (8 Hrs.)
Inverted Files and Indices for text search, Boolean Queries, Sequential searching, Pattern Matching, Structural Queries.
SECTION – II

Unit 4: Multimedia IR - Models and Languages (5 Hrs.)
Data Modelling & Query Languages

Unit 5: Multimedia IR - Indexing and Searching (5 Hrs.)
Spatial Access Methods, A generic multimedia indexing approaches, One dimensional time series, Two Dimensional color images, Automatic Feature Extraction.

Unit 6: Web Retrieval (7 Hrs.)
Search Engines, Web Crawling, Browsing, Metasearchers, Searching using Hyperlinks

Unit 7: Digital Libraries (3 Hrs.)
Architectural issues of Digital Libraries, Document models, Representation, and Access

Text Book -

Reference:
1) www.dcc.ufmg.br/irbook or sunsite.dcc.uchile.cl/irbook
3) Information Storage and Retrieval- Robert R Korthage, WILEY-INDIA

Termwork
1. Study of different search Engines.
2. Create Logical View of a document.
3. Create information retrieval model based on Boolean Model.
4. Create information retrieval model based on Implement Vector Model.
5. Construct index structure like inverted index, suffix array for given document.
6. Implementation of sequential algorithms like KMP, BM, Shift-OR, BDM etc.
COURSE OBJECTIVES:
1) Develop knowledge about Cloud computing model and associated concepts, terminologies.
2) Develop skills necessary to identify cloud deployment types and deploy them for various use cases.
3) Build necessary cognizance to identify benefits and challenges of cloud computing for an IT Organization in building IT solutions.

COURSE OUTCOME:
1) Explain the concepts of Cloud Computing and the various deployment and service models of Cloud Computing, benefits and challenges of Cloud Computing
2) Describe the Public Cloud and its Models
3) Explain about the various Players of Public Cloud and their offerings, Virtual Public Cloud
4) Describe Private Cloud and its deployment models, Building blocks of Private Cloud
5) Explain about Hybrid Cloud
6) Describe the Security concerns of Cloud Computing, Multi-Cloud Management System
7) Explain the various vendors of a secure Cloud model

SECTION - I

Unit 1: Overview of Cloud Computing

Unit 2: Working with Private Cloud
Unit 3: Working with Public Clouds (12 Hrs.)
What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Players. Infrastructure as a Service Offerings, IaaS Vendors, PaaS offerings, PaaS vendors, Software as a Service. Implementing public cloud (one out of AWS, Windows Azure, IBM or Rackspace)

Unit 4: Overview of Cloud Security (6 Hrs.)

SECTION - II

Unit 5: Overview of Multi-Cloud Management Systems (4 Hrs.)
Explain concept of multi-cloud management, Challenges in managing heterogeneous clouds, benefits and advantages of multi-cloud management systems. Implementing Multi-Cloud Management System (e.g. RightScale Cloud Management System)

Unit 6: Business Clouds (6 Hrs.)
Cloud Computing in Business, Various Biz Clouds focused on industry domains (Retail, Banking and Financial sector, Life Sciences, Social networking, Telecom, Education). Cloud Enablers (Business Intelligence on cloud, Big Data Analytics on Cloud)

Unit 7: Future directions in Cloud Computing (4 Hrs.)
Future technology trends in Cloud Computing with a focus on Cloud service models, deployment models, cloud applications, and cloud security, Migration paths for cloud, Selection criteria for cloud deployment, Current issues in cloud computing leading to future research directions.

Text Book:

Reference Book:
2) Cloud computing: Implementation, management and security By Rittinghouse, John, W.
**Termwork**

1) Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.

2) Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in syllabus.
## SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
ELECTIVE – IV : 1) STORAGE AREA NETWORK

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<th>Teaching Scheme</th>
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<td><strong>Lecture</strong></td>
<td><strong>Theory</strong></td>
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<tr>
<td>3 Hours /week</td>
<td>100 Marks</td>
</tr>
<tr>
<td><strong>Termwork</strong></td>
<td>25 marks</td>
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### COURSE OBJECTIVES:
1. Understand the fundamentals of storage centric and server centric systems with RAID concepts.
2. Understand how to maintain the data with the concepts of backup for both simple and complex systems.

### COURSE OUTCOME:
1. Identify the need for performance evaluation and the metrics used in the context of Storage Network.
2. Deploy and maintain the data with the concepts of Storage Network Application, Management and Network Back-Up.

## SECTION – I

### Unit 1: Introduction
(9 Hrs.)

### Unit 2: I/O Techniques
(8 Hrs.)
I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

### Unit 3: Storage Virtualization
(9 Hrs.)
Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.
SECTION - II

Unit 4: Application of Storage Networks (8 Hrs.)
Application of Storage Networks: Definition of “Storage Network”; Storage Sharing; Availability of Data; Adaptability and Scalability of IT Systems;

Unit 5: Network Back Up (9 Hrs.)
General Conditions for Network Back Up; Network Back-up Services; Server components; Back-up Clients; Performance Gains as a result of Network Back-Up; Performance Bottlenecks of Network Back-Up; Limited Opportunities for Increasing performance; Next Generation Back-Up; Back-Up of File Systems; Back up of Databases; Organizational Aspects of Back-Up.

Unit 6: Management of Storage Network (9 Hrs.)

Text Book:
1) Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

Reference Books:

Termwork:
Minimum 8 to 10 assignments on the above topics.
<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture: 3 Hours /week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Termwork: 25 marks</td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
1) Develop ability to develop Rich Internet applications.
2) Inculcate the principles and concepts of Web 2.0

**COURSE OUTCOMES:**
1) Develop Web 2.0 based Rich Internet applications
2) Demonstrate his ability to design Rich Internet Application using Client side and Server side frameworks.

### SECTION - I

**Unit 1**
(4 Hrs.)

**Unit 2**
(5 Hrs.)

**Unit 3**
(4 Hrs.)
Web 1.0: HTML, URLs, and HTTP, The Web Model and REST, Considerations for Building an HTTP Service, More Representations, XML, Alternatives to XML.

**Unit 4**
(4 Hrs.)

### SECTION - II

**Unit 5**
(5 Hrs.)
Combining Protocols to Build Web Services: Clarifying Web Services, REST Services, WS-* Services, REST versus WS-*. Serving XML over HTTP: How Is Serving HTML Different?, Serving Static Content, Serving Dynamic Content, XQuery and XML Databases, Serving JSON, Dealing with Non-XML Sources, Converting Relational Data to XML, Converting Binary Data to XML.

**Unit 6**
(6 Hrs.)
Mashups, HTML Scraping, and Web Services: Popular Examples: Mapping Mashups, Why Use Mashups?, The Business Model of Mashups, Screen Scraping, Creating Feeds,

**Unit 7**
(5 Hrs.)

**Unit 8**
(4 Hrs.)
Web 2.0 Business Strategy: Value created by Users, Building Social Connections, Strategies to be incorporated by Businesses

**Textbooks:**
2) Professional Web 2.0 Programming By Eric van der Vlist, Danny Ayers, Erik Bruchez, Joe Fawcett, Alessandro Vernet – Wrox (John Wiley & Sons).

**Reference Books:**
1) Web 2.0 Security: Defending Ajax, RIA, and SOA by Shreeraj Shah - Charles River Media
3) Professional Rich Internet Applications: AJAX and Beyond (Programmer to Programmer) By Dana Moore, Raymond Budd, Edward Benson- Wrox.

**Termwork :**
1) Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
2) Assignments must be of nature which require students to identify technologies mentioned in syllabus.
3) 15 – 20 assignments on the above syllabus.
SOLAPUR UNIVERSITY, SOLAPUR
B.E. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
ELECTIVE – IV : 3) ARTIFICIAL NEURAL NETWORK

Teaching Scheme
Lecture : 3 Hours /week

Examination Scheme
Theory: 100 Marks
Termwork: 25 marks

COURSE OBJECTIVES :
1) Cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.

COURSE OUTCOME :
1) Expose the students to the concepts of feed forward neural networks.
2) Provide adequate knowledge about feedback neural networks.
3) Teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.
4) Provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
5) Provide adequate knowledge of application of fuzzy logic control to real time systems.

SECTION - I
Unit 1 : Introduction to ANN (6 Hrs.)
Features, structure and working of Biological Neural Network, Trends in Computing Comparison of BNN and ANN

Unit 2 : Basics of Artificial Neural Networks (8 Hrs.)
History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

Unit 3 : Backpropagation Networks (BPN) (8 Hrs.)
Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

SECTION - II
Unit 4 : Activation & Synaptic Dynamics (6 Hrs.)
Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks

Unit 5 : Basic functional units of ANN for pattern recognition tasks (8 Hrs.)
Basic feedforward, Basic feed back and basic competitive learning neural network, Pattern association, pattern classification and pattern mapping tasks.

w.e.f. Academic year 2015-2016
Unit 6: Applications of ANN (8 Hrs.)
NET Talk: to convert English text to speech, Recognition of consonant vowel (CV) segments, texture classification and segmentation.

Text Books:
1. Artificial neural Networks- B. Yegnanarayana-PHI
3. Neural Networks- Satish Kumar

Termwork:
Minimum 8 to 10 assignments on the above topics.
### Teaching Scheme

| Lecture          | 3 Hours /week |

### Examination Scheme

| Theory          | 100 Marks |
| Termwork        | 25 marks  |

### COURSE OBJECTIVES:

1. Explain need for Big Data Analytics
2. Develop ability to analyze and process Big Data.
3. Build necessary skills to write Map Reduce programs for analyzing Big Data problems.

### COURSE OUTCOMES:

1. Identify need for Big Data analysis
2. Analyze and identify Big data processing technology for analyzing the Big data.
3. Write Map Reduce programs to process Big Data by identifying the use case.

### SECTION - I

**Unit 1** (1 Hr.)
Types of Digital Data, a. Structured, i) Sources of structured data, ii) Ease with Structured data, b. Semi-Structured, i) sources of semi-structured data, c. Unstructured, i) sources of unstructured data, ii) Issues with terminology, iii) Dealing with unstructured data

**Unit 2** (1 Hr.)
Big data, What is big data?, Why big data?, Other characteristics of data but not definitional for big data, Challenges with big data, Big data stack, Exercises - Puzzle, fill in the blanks

**Unit 3** (2 Hrs.)
Big Data Analytics, Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment, Big Data technology Landscape, a) NoSQL Databases, b) NoSQL Vs. RDBMS, c) NewSQL, b) Hadoop, c) Hadoop 1.0 vs. Hadoop 2.0, Exercises, Data Science is multidisciplinary, Data Scientist - Your new best friend

**Unit 4** (6 Hrs.)

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*SOLAPUR UNIVERSITY, SOLAPUR*
*B.E. (COMPUTER SCIENCE & ENGINEERING)*
*SEMESTER - II*
*ELECTIVE – IV : 4) BIG DATA ANALYTICS*

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Unit 5  (6 Hrs.)
Recap of NoSQL databases, MongoDB – CRUD, MongoDB- Arrays, Java Scripts, Cursors,
Map Reduce Programming, Aggregations

Unit 6  (6 Hrs.)
Cassandra- CQLSH - CRUD, Counter, List, Set, Map, Tracing, Hands on Practice

Unit 7  (7 Hrs.)
Introduction to Hive - The Problem, Solution - Hive Use Case, a) Data Growth, b) Schema
Flexibility and Evolution, c) Extensibility
What is Hive? History of Hive and Recent Releases of Hive, Hive Features, Hive Integration
and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive Data Types and
Collection Types Hive File Formats, Hive Query Language – Statements - DDL,DML
Hive Partitions – Bucketing, Views, Sub Query, Joins, Hive User Defined Function,
Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive
Analytic Functions

Unit 8  (7 Hrs.)
Introducing Pig, a) History and Anatomy of Pig, b) Pig on Hadoop, c) Pig Features, d) Pig
Philosophy, e) Word count example using Pig.
Use Case for Pig, Pig Primitive Data Types , Colletion Types and NULL, Pig Latin Overview
Pig Latin Grammar - Comments, Keywords, Identifiers, Case sensitivity in Pig, Common
Operators in Pig, Pig Statements - LOAD, STORE, DUMP.
Interactive Shell – GRUNT, FILTER, SORT, GROUP BY, ORDER BY, JOIN, LIMIT
Pig Latin Script - Local Mode, Map Reduce Mode, Running Pig Script Working with Field,
Tuple, Bag User Defined Function, Parameters in Pig.

Unit 9  (4 Hrs.)
Introduction to Jasper Report using Jasper Soft Studio, Reporting using MongoDB, Reporting
using Cassandra

Text Book :
2) Programming Hive By Edward Rutherglen, Dean Wampler, Jason Rutherglen,
   Edward Capriolo. - O'reilly Media.
   Using MongoDB (Definitive Guide Apress) 2e by David Hows, Eelco Plugge, Peter
   Membrey, Tim Hawkins
4) Programming Pig by Alan Gates - O'reilly Media.
6) Jaspersoft : Reports Ultimate Guide 3e. (e-Resource)

Reference Book :
2) Big Data For Dummies By Judith Hurwitz, Alan Nugent , Fern Halper , Marcia
   Kaufman : John Wiley & Sons
3) Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for
   Today's Businesses (Wiley CIO) By Michael Minelli, Michele Chambers, Ambiga
   Dhiraj : John Wiley & Sons
4) Mining of Massive Datasets by Anand Rajaraman, Jure Leskovec, Jeff rey D. Ullman,
   Cambridge University Press.
**Termwork:**
1) Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
2) Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in syllabus.
COURSE OBJECTIVES

1) Inculcate skills necessary to design, develop and style a web based user interfaces.
2) Develop ability to identify use cases for applying client and server side scripting web technologies.
3) Develop skills necessary to develop efficient, scalable, web based APIs and applications
4) Develop skills required to create light weight browser based web applications using client side scripting frameworks.

COURSE OUTCOME:

1) Design, develop and apply styling to a web based applications.
2) Analyze requirements of developing web applications and choose client or server side scripting technology.
3) Build efficient and scalable web APIs and applications.
4) Develop light weight browser based functionalities leveraging client side scripting frameworks.

SECTION - I

Unit 1 : HTML5, CSS3, DHTML (3 Hrs.)

Unit 2 : XML (4 Hrs.)

Unit 3 : JavaScript and jQuery (4 Hrs.)
Introduction, Understanding of variables, data types, control flow, and basic function usage in JavaScript, Event Handling, JS Built-in Objects JSON: JavaScript Object and Array Creation Using Literals, JavaScript Objects in Arrays & Arrays in Objects, JSON syntax, JSON Parsers, JSON Data Transfer Between Client and Server, AJAX, jQuery: jQuery Fundamentals, using jQuery Selectors, Interacting with the DOM, Handling Events.
Unit 4 : RESTful Web Services  
(3 Hrs.)
REST and the Rebirth of HTTP, RESTful Architectural Principles, The Object Model, Model the URIs, Defining the Data Format, Assigning HTTP Methods, JAX-RS.

SECTION - II

Unit 5 : PHP and MySQL  
(3 Hrs.)
Introduction to PHP 5 and PHP 6, variables and constants, program flow, functions, arrays and files and directories, Forms and Databases, integration with MySQL applications on PHP.

Unit 6 : Ruby on Rails  
(3 Hrs.)
Introduction, rails in depth using active record, Controller in depth and view in depth, developing Applications using ruby on rails.

Unit 7 : Node.js  
(4 Hrs.)
Introduction to Node.js, Modularizing code, Handling Exceptions, Events and Streams, Understanding Events, Understanding Streams, Reading and writing streams, Accessing Local Resources, Process Object, Manipulating File System, Understanding Buffers, Node.js and the Web, Handling web requests, Building a web server, Understanding the need for Web sockets, Real time interaction using Web Sockets

Unit 8 : AngularJS  
(4 Hrs.)
Fundamentals of Client Side MVC frameworks, Models, Views, Scopes, Controllers, jQuery vs. AngularJS.

Text Books:
1) Head First HTML5 Programming by Eric Freeman (Author), Elisabeth Robson - O'Reilly Media
2) HTML5 and CSS3, 2nd Edition Level Up with Today's Web Technologies by Brian P. Hogan - Pragmatic Bookshelf; Second Edition
3) Designing Next Generation Web Projects with CSS3 by Sandro Paganotti - CreateSpace Independent Publishing Platform
5) Head First jQuery by Ryan Benedetti, Ronan Cranley - O'Reilly Media
6) Ruby on Rails by Timothy Fisher – Wiley India
7) Web Services – An Introduction – by B.V. Kumar, S.V. Subrahmanya Tata McGraw Hill Publication
8) Professional Node.js Building JavaScript Based Scalable Software by Pedro Teixeira – Wiley India.
9) RESTful Web Services: Web services for the real world by Leonard Richardson, Sam Ruby - O'Reilly Media
10) Angular JS Paperback by S Brad Green - O'Reilly Media

Reference Books:
1) HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and Jquery by Kogent Learning Solutions Inc.
2) Beginning PHP6, Apache, MYSQL Web Development by Timothy Boronczyk , Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K.Glass – Wiley India.
3) HTML 5 Applications, Zachary Kessin, O’Reilly, Shroff Publishers and Distributions Pvt. Ltd.

**Termwork:**

1) Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.

2) Assignments must be of nature which require students to identify the use case scenarios for using client side and server side scripting technologies mentioned in syllabus.

3) 15 – 20 assignments on the above syllabus.
Teaching Scheme
Practical: 6 Hours/Week

Examination Scheme
Termwork: 100 marks
POE: 100 marks

COURSE OBJECTIVES:
1) Formulate a realistic problem statement using SDLC.
2) Follow an appropriate designing technique for further development of a project.
3) Get acquainted to work in a team.
4) Develop soft skills including presentation, writing & convincing.

COURSE OUTCOMES:
1) Define a realistic problem statement.
2) Select & apply an appropriate technique to create a design.
3) Work in teams with good coordination.
4) Present their work through oral communication & writing skills.

1) Project – II should contain the work like Design review, Implementation details, coding, Technologies used, Testing, Task distribution. Project leader should maintain the progress register in which each members weekly contribution should be written and the guide will countersign the same.

2) A project report will be submitted as a term work document at the end of semester. Report must include References, Appendix, User manual / Technical reference manual, CD containing Project documentation, implementation, code, required utilities, Software and Manuals.

3) Every student must prepare well formatted, printed and hard bound report.
Teaching Scheme
Lecture: 2 Hours/Week
Practical: 2 Hours/Week

Examination Scheme
Theory: 100 Marks
Termwork: 25 marks

COURSE OBJECTIVES:
1) Build knowledge about various Open Source Technologies prevalent in IT industry.
2) Develop cognizance about pros and cons associated with Open Source Technologies and their effects on IT organization.
3) Develop skills necessary to reap benefits of Open source Technologies in delivering cost effective and enterprise grade IT solutions.

COURSE OUTCOME:
1) Demonstrate skills in choosing a proper open source alternative to proprietary solutions.
2) Analyze IT needs and demonstrate his cognizance in deciding Open source technologies to be adopted.
3) Develop cost effective enterprise grade IT solutions leveraging Open source technologies.

SECTION I
Unit 1: OST (Open Source Technologies) Overview (3 Hrs.)
Evolution & development of OST and Contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU Project, principle and methodologies, Indian Contexts of OST, Applications, Pros and cons of OST, Adoption of Open source Technologies in Industry.

Unit 2: Open Source Licenses (4 Hrs.)
The MIT License, The BSD License, The Apache License, v1.1 and v2.0, The Academic Free License, Application and Philosophy of MIT and BSD Licenses, GNU General Public License, GNU Lesser General Public License, The Mozilla Public License, Application and Philosophy of GNU GPL and GNU LGPL, Artistic and Creative Commons Licenses

Unit 3: Open Source Networking and Security (5 Hrs.)
Basic networking commands, Secure Configuration of Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with iptables. Setting up Network and cryptographic services, SSL, Managing Certificate Security with OpenSSL, working with the GNU Privacy guard. (5 hrs)

Unit 4: Open Source Web servers and RDBMS (4 Hrs.)
Open Source RDBMS: Installation, configuration and administration under Windows and Linux environment: MySQL, PostgreSQL.
SECTION II

Unit 5: Popular Open Source Softwares (3 Hrs.)

Unit 6: Git (Open Source version control system) (3 Hrs.)
Introduction to Git, Installation, Getting started, Basics of Git.

Unit 7: Open source IT Systems Monitoring tools (4 Hrs.)
Installation, customization and maintenance of Cacti, Icinga, Nagios.

Unit 8: Open source Project Management (4 Hrs.)
Installation, customization and maintenance of RedMine, OpenProject, LibrePlan

Textbooks:
2) Apache HTTP Server Documentation Version 2.2 by by Apache Software Foundation
3) MySQL 5.5 Reference Manual (Chapter 2 and 3 of manual) (e-Resource)
5) Official Documentation of ATutor, Moodle, Drupal, Joomla, Wordpress, Liferay Portal,
6) Alfresco, Umbraco, Redmine, Nagios, Cacti, Icinga, OpenProject, LibrePlan (e-Resources)
7) Version Control with Git Powerful tools and techniques for collaborative software development By Jon Loeliger O'Reilly Media

Reference Books:
1) BOSS Linux: http://bosslinux.in
2) (NRCFOSS) initiative of the Department of Information Technology, Ministry of Communications & Information Technology, Government of India, http://www.nrcfoss.org.in/

Termwork
1) Minimum 2 to 3 Assignments per topic.
2) Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
3) Assignments must be of nature which require students to identify the use case scenarios for installing, deploying, maintaining various open source tools mentioned in syllabus.