<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrices, Probability and Statistics</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Data Structures and Algorithms</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Database Technology</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Object Oriented Software Engineering</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Python Programming</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Research Methodology and Intellectual Property</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Database Technology Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Data Structures and Python Programming Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Communication Skills Enhancement - I</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>25</strong></td>
<td><strong>900</strong></td>
</tr>
</tbody>
</table>

**SEMESTER II**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Programming</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Cloud Computing Technologies</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Artificial Intelligence and Machine Learning</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Mobile Application Development</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Cyber Security</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Professional Elective I</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Internet Programming Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Artificial Intelligence and Machine Learning Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Communication Skills Enhancement - II</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>26</strong></td>
<td><strong>900</strong></td>
</tr>
</tbody>
</table>

**SEMESTER III**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Science</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Multimedia Systems and Applications</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Accounting and Financial Management for Application Development</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Professional Elective II</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Professional Elective III</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Professional Elective IV</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Professional Elective V</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Data Science Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Multimedia Systems and Applications Laboratory</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>27</strong></td>
<td><strong>900</strong></td>
</tr>
</tbody>
</table>

**SEMESTER IV**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Work</td>
<td>12</td>
<td>400</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>12</strong></td>
<td><strong>400</strong></td>
</tr>
</tbody>
</table>

Total No. of Credits and Marks **90** **3100**

*Each credit is equivalent to 30 hours of student study comprising of all learning activities.*
## PROFESSIONAL ELECTIVES

### ELECTIVE I - SEMESTER II

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Project Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Agile Methodologies</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>E-Learning</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Software Testing and Quality Assurance</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Advanced Operating Systems</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Web Content Design and Management</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVE II - SEMESTER III

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Security</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Next Generation Wireless Networks</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Wireless Sensor Networks And Protocols</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Semantic Web</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Network Programming And Security</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Service Oriented Architecture</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVE III - SEMESTER III

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Network Analytics</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Mixed Reality</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Information Retrieval Techniques</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Software Architecture</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Ethical Hacking &amp; Cyber Forensics</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Data Warehousing and Data Mining</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVE IV - SEMESTER III

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Visualization Techniques</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Operations Research</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Professional Ethics in Information Technology</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Marketing Management</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Organizational Behavior</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Business Data Analytics</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

### ELECTIVE V - SEMESTER III

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blockchain Technologies</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>User Interface Design</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Soft Computing Techniques</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Deep Learning</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Big Data Processing</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Natural Language Processing</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- Provide methods for understanding the consistency and solving the equation as well as for finding the Eigenvalues and Eigenvectors of square matrix.
- Present foundation on Applied Probability
- Introduce the concepts of correlation and regression of random variables
- Use various statistical techniques in Application problems
- Understand the concept of Design of Experiments for data analysis

UNIT - I MATRICES AND EIGENVALUE PROBLEMS
Matrices - Rank of a Matrix - Consistently of a system of linear equations - Solution of the matrix equation $\Delta x = k$ - Row - reduced Echelon Form - Eigenvalues and Eigenvectors - Properties - Cayley - Hamilton Theorem - Inverse of a matrix.

UNIT - II PROBABILITY AND RANDOM VARIABLES

UNIT - III TWO-DIMENTIONAL RANDOM VARIABLES
Joint probability distributions - Marginal and conditional probability distributions - Covariance - Correlation - Linear regression lines - Regression curves - Transform of random variables - Central limit theorem (for independent identically random variables).

UNIT - IV TESTING OF HYPOTHESIS
Sampling distributions - Tests based on small and large samples - Normal, Student’s t, Chi-square and F distributions for testing of mean, variance and proportion and testing of difference of means variances and proportions - Tests for independence of attributes and goodness of fit.

UNIT - V DESIGN OF EXPERIMENTS
Analysis of variance - Completely randomized design - Random block design (One-way and Two-way classifications) - Latin square design - $2^2$ Factorial design.

OUTCOMES:
After the completion of the course the student will be able to
• Test the consistency and solve system of linear equations as well as find the Eigenvalues and Eigenvector.

• Apply the Probability axioms as well as rules and the distribution of discrete and continuous ideas in solving real world problems.

• Apply the concepts of correlation and regression of random variables in solving application problems.

• Use statistical techniques in testing hypothesis on data analysis.

• Use the appropriate statistical technique of design of experiments in data analysis.

REFERENCE BOOKS:


OBJECTIVES:
Understand and apply linear data structures-List, Stack and Queue
- Understand the graph algorithms.
- Learn different algorithm analysis techniques.
- Apply data structures and algorithms in real time applications
- Understand the principles of algorithm Design.
- Analyze the efficiency of an algorithm

UNIT I LINEAR DATA STRUCTURES
Introduction - Abstract Data Types (ADT) - Stack - Queue - Circular Queue - Double Ended Queue

UNIT II NON-LINEAR DATA STRUCTURES
Binary Tree - expression trees - Binary tree traversals - applications of trees - Huffman Algorithm

UNIT III GRAPHS
Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort - shortest - path algorithms - Dijkstra's algorithm - Bellman - Floyd's Algorithm - minimum spanning tree - Prim's and Kruskal's algorithms.

UNIT IV ALGORITHM DESIGN

UNIT V ALGORITHM ANALYSIS

OUTCOMES:
- Implement a program using stack, queue, linked list data structures
- Design and Implement Tree data structures and Sets
- Apply the Graph Data structure and to find shortest path among the several possibilities
- Perform analysis of various algorithms
- Analyze and design algorithms to appreciate the impact of algorithm design in practice.

REFERENCES:
COURSE OBJECTIVES

- Understand the importance of Modeling an Entity Relationship Diagram, Map the Entity Relationship Diagram to Relations and Database Normalization.
- Gain Knowledge on Designing Parallel Databases and Distributed Databases.
- Understand the Basics of XML Databases, Web Databases, Active Databases and Temporal Databases.
- Gain Basic Knowledge on Mongo DB No SQL Database.
- Understand the Basics of Data Warehousing and Data Mining

UNIT I RELATIONAL MODEL

Entity Relationship Model - Relational Data Model - Mapping Entity Relationship Model to Relational Model - Relational Algebra - Structured Query Language - Database Normalization - First Normal Form - Second Normal Form - Third Normal Form - Boyce Codd Normal Form - Fourth Normal Form - Fifth Normal Form.

UNIT II PARALLEL AND DISTRIBUTED DATABASES

Parallel Databases - I/O Parallelism - Inter-Query and Intra-Query Parallelism - Inter-Operation and Intra-Operation Parallelism - Distributed Database Architecture - Distributed Data Storage - Distributed Transactions - Distributed Query Processing - Distributed Transaction Management - ACID Properties - Concurrency Control.

UNIT III XML DATABASES, WEB DATABASES, ACTIVE DATABASES AND TEMPORAL DATABASES


UNIT IV NoSQL DATABASES

NoSQL Database vs.SQL Databases- CAP Theorem -Migrating from RDBMS to NOSQL - MongoDB - CRUD Operations- MongoDB Sharding - MongoDB Replication - Web Application Development using MongoDB with PHP and Java.

UNIT V DATA WAREHOUSING AND DATA MINING

Data Warehouse - Characteristics - Three Tier Architecture - Data Cube - Online Analytical Processing vs. Online Transaction Processing - Online Analytical Processing Operations - Star Schema - Snow Flake Schema - Fact Constellation Schema - Data Mart - Data Mining - Apriori Algorithm for Association Rule Mining - Decision Tree Induction using Information Gain for Classification - k-Means Clustering.
COURSE OUTCOMES:

- On completion of the course, the student will be able to:
- Design a Relational Database for an Enterprise.
- Design a Parallel Database and Distributed Database for an Enterprise.
- Apply Knowledge of XML Database, Web Database, Active Database and Temporal Database for Maintaining Data of an Enterprise.
- Model a Data Warehouse and Integration of a Data Mining System with A Data Warehouse

References

4. Jiawei Han, Jian Pei and Hanghang Tong, Data Mining Concepts and Techniques, Fourth Edition, Morgan Kaufmann Publishers, 2022.
OBJECTIVES:

- Be aware of the phases in object oriented software development
- Gain fundamental concepts of requirements engineering and analysis.
- Know about the different approach for object oriented design and its methods
- Understand how to perform object oriented testing and how to maintain software
- Provide various quality metrics and to ensure risk management.

UNIT I SOFTWARE DEVELOPMENT LIFE CYCLE

UNIT II OBJECT ORIENTED REQUIREMENTS ELICITATION & ANALYSIS

UNIT III OBJECT ORIENTED SOFTWARE DESIGN

UNIT IV OBJECT ORIENTED TESTING AND MAINTENANCE

UNIT V SOFTWARE QUALITY & METRICS
OUTCOMES:

- Able to identify the appropriate process model to develop the object oriented software
- Gain knowledge about requirement elicitation and analyzing techniques
- Able to choose and design suitable UML diagrams and methods
- Able to apply correct testing methods and maintain software systems.
- Able to estimate the object oriented application by applying metric data.

REFERENCES:


OBJECTIVES:

- Learn and develop Python programs with conditionals and loops.
- Understand the concepts of Python functions and use function calls.
- Design and Implement Python data structures - lists, tuples, dictionaries.
- Be familiar with input/output files in Python.
- Understand oops concepts in python.

UNIT I PYTHON BASICS

UNIT II DATA TYPES IN PYTHON

UNIT III FILE HANDLING AND EXCEPTION HANDLING
Files: Introduction - File Path - Opening and Closing Files - Reading and Writing Files -File Position - Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

UNIT IV MODULES, PACKAGES

UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON
Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

OUTCOMES:
Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Structure simple Python programs for solving problems.
- Read and write data from/to files in Python Programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Decompose a Python program into functions.
REFERENCES:


COURSE OBJECTIVES:
The course should enable the students to:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues; understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Acquire adequate knowledge of IPR.

UNIT I  RESEARCH METHODOLOGY
Research Methodology - An Introduction, Objectives, Types of research, Research approaches, Significance, Research methods versus Methodology, Research and Scientific method, Importance, Research process, Criteria, Problems encountered by researchers. Defining the research problem - Research problem, Selecting the problem, Necessity, Technique involved, An illustration. Reviewing the Literature - The place of the literature review in research, How to review the Literature, Writing about the literature reviewed.

UNIT II  RESEARCH DESIGN

UNIT III  RESEARCH TECHNIQUE AND TOOLS

UNIT IV  INTELLECTUAL PROPERTY RIGHTS
Intellectual Property - The concept, intellectual property rights (IPS) in India, development, Trade secrets, utility Models, IPR & Bio diversity, CBD, WIPO, WTO, Right of Property, Common rules, PCT, Features of Agreement, Trademark, UNESCO.
UNIT V PATENTS


OUTCOMES:
On completion of the course the student would be able to:

- Understand the research problem and Literature review.
- Understand the various research designs and their characteristics.
- Prepare a well-structured research paper and scientific presentations.
- Explore on various IPR Components and process of filing.
- Develop awareness the patent law and procedural mechanism in obtaining a patent.

REFERENCE BOOKS:

2. Research Methodology a step-by-step guide for beginners by Ranjit Kumar, SAGE publications Ltd 3rd Edition 2011 (For the topic Reviewing the Literature under Unit I)
COURSE OBJECTIVES

- Gain Knowledge on Data Definition Language, Data Manipulation Language and Transaction Control Language.
- Understand the Types of Joins, Aggregate Functions, Nested Queries, Creating Views and Creating Stored Procedures.
- Gain Basic Knowledge on Implementing Distributed, XML and Temporal Databases.
- Gain Basic Knowledge on Accessing and Updating a Relational Database using PHP and Java.
- Gain Basic Knowledge on Accessing and Updating a MongoDB NoSQL Database using PHP.

LIST OF EXERCISES

1. Data Definition Language - Create - Alter - Drop - Enforcing Primary Key and Foreign Key Constraints - Data Manipulation Language - Insert - Delete - Update - Transaction Control Language - Commit - Rollback - Save Points.
5. Distributed Database Implementation.
6. XML Database Implementation.
7. Temporal Database Implementation.
8. Accessing and Updating a Relational Database using PHP.
9. Accessing and Updating a Relational Database using JDBC.
10. MongoDB - CRUD Operations
11. Accessing and Updating MongoDB using PHP.

Exercises 1 to 9 should be implemented using a Relational Database (Oracle / MySQL / PostgreSQL). Exercises 10 and 11 should be implemented using MongoDB NoSQL Database.

COURSE OUTCOMES:

On completion of the course, the student will be able to:

- Create a Relational Database Enforcing Integrity Constraints and perform Data Manipulation Language Operations.
- Create Views and Stored Procedures.
- Implement Distributed, XML and Temporal Databases.
- Access and Update a Relational Database using PHP and Java.
- Access and Update a MongoDB NoSQL Database using PHP.
DATA STRUCTURES AND PYTHON PROGRAMMING LABORATORY  

CREDIT: 2

OBJECTIVES:

- Learn the basic programming constructs in Python.
- Implement Recursive programming in Python
- Implement Divide and Conquer algorithmic technique in Python
- Implement Tree Data structures in Python
- Implement Graphs in Python
- Deploy the standard libraries in Python

EXPERIMENTS:

1. Towers of Hanoi using Recursion
2. To implement Binary Search
3. Merge Sort
4. To implement AVL Trees using Python
5. To implement Splay Trees using Python
6. To implement Red black Trees using Python
7. To implement Graphs using Python
9. Implementing real-time/technical applications using Files and Exception handling.

OUTCOMES:

On completion of the course, students will be able to:

- Develop algorithmic solutions to simple computational problems
- Develop and execute Python programs.
- Decompose a Python program into functions.
- Represent compound data using Python data structures.
- Apply Python features in developing software applications.
OBJECTIVES:

• Provide opportunities to learners to practice English and thereby make them proficient users of the language.

• Enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology.

• Enhance the performance of students listening, speaking, reading and writing and thereby develop their career opportunities.

LIST OF ACTIVITIES:

Listening:

• Listening and practicing neutral accents

• Listening to short talks and lectures and completing listening comprehension exercises

• Listening to TED Talks

Speaking:

• Giving one minute talks

• Participating in small Group Discussions

• Making Presentations

Reading:

• Reading Comprehension

• Reading subject specific material

• Technical Vocabulary

Writing:

• Formal vs Informal Writing

• Paragraph Writing

• Essay Writing

• Email Writing

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

OUTCOMES:

On completion of the course the students will be able to:

• Listen and comprehend Lectures in English

• Articulate well and give presentations clearly

• Participate in Group Discussions successfully
• Communicate effectively in formal and informal writing
• Write proficient essays and emails
COURSE OBJECTIVES:

- Understand the fundamentals of web programming and client side scripting.
- Design and Implement the server side development using servlets, web socket.
- Learn the Spring framework and build applications using Spring.
- Learn and implement the concept of Java Persistence API.
- Study the advanced client side scripting and framework.

UNIT I  INTRODUCTION TO WEB & CLIENT SIDE PROGRAMMING
Introduction to Web: Server - Client - Communication Protocol (HTTP), JavaScript: Data Types and Variables - Expressions - Operators and Statements - Objects and Arrays - Functions - Classes - Modules - DOM - Events - Storage: Local Storage, Cookies, Indexed DB, JSON, AJAX.

UNIT II  SERVER SIDE PROGRAMMING

UNIT III  SPRING

UNIT IV  JAVA PERSISTENCE API AND HIBERNATE

UNIT V  ADVANCED CLIENT SIDE PROGRAMMING

COURSE OUTCOMES:
Upon completion of the course the students should be able to:

- Able to write client side scripting.
- Implement the server side of the web application.
- Develop Web Application using Spring.
- Implement a Java application using Java Persistence API.
- Design and implement a full-stack Single Page Application using React, Spring and JPA.
REFERENCE BOOKS

4. https://reactjs.org/docs
OBJECTIVES:

- Understand the basic concepts of Distributed systems
- Learn about the current trend and basics of Cloud computing
- Be familiar with various Cloud concepts
- Expose with the Server, Network and storage virtualization
- Be aware of Micro services

UNIT I DISTRIBUTED SYSTEMS

UNIT II INTRODUCTION TO CLOUD COMPUTING

UNIT III CLOUD INFRASTRUCTURE

UNIT IV CLOUD ENABLING TECHNOLOGIES

UNIT V MICROSERVICES
Defining Micro services - Emergence of Micro service Architecture - Design patterns of Micro services - The Mini web service architecture - Micro service dependency tree - Challenges with Micro services - SOA vs Micro service - Micro service and API - Deploying and maintaining Micro services.

OUTCOMES:
Upon completion of the course, the students will be able to
- Use Distributed systems in Cloud Environment
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing
- Identify the Architecture, Infrastructure and delivery models of Cloud computing
- Install, choose and use the appropriate current technology for the implementation of Cloud
- Adopt Micro services in Cloud environment

REFERENCES:
OBJECTIVES:

- Familiarize with the principles of Artificial intelligence like problem solving, inference, perception, knowledge representation, and learning.
- Understand the various characteristics of Intelligent agents
- Design and implement the machine learning techniques for real world problems
- Gain experience in doing research using Artificial intelligence and Machine learning techniques.

UNIT I - ARTIFICIAL INTELLIGENCE

UNIT II - KNOWLEDGE AND REASONING

UNIT III - BAYESIAN LEARNING

UNIT IV - PARAMETRIC MACHINE LEARNING
Logistic Regression: Classification and representation - Cost function - Gradient descent - Advanced optimization - Regularization - Solving the problems on overfitting. Perceptron - Neural Networks - Multi - class Classification - Backpropagation - Non-linearity with activation functions (Tanh, Sigmoid, Relu, PReLU) - Dropout as regularization.

UNIT V - NON PARAMETRIC MACHINE LEARNING

OUTCOMES:

- Apply the techniques of Problem Solving in Artificial Intelligence.
- Implement Knowledge and Reasoning for real world problems.
• Model the various Learning features of Artificial Intelligence
• Analyze the working model and features of Decision tree
• Apply k-nearest algorithm for appropriate research problem.

REFERENCES:
OBJECTIVES:

- Understand the need and characteristics of mobile applications.
- Design the right user interface for mobile application.
- Understand the design issues in the development of mobile applications.
- Learn the development procedure for mobile application.
- Develop mobile applications using various tools and platforms.

UNIT I INTRODUCTION

UNIT II USER INTERFACE
Generic UI Development - Multimodal and Multichannel UI - Gesture Based UI - Screen Elements and Layouts - Voice XML.

UNIT III APPLICATION DESIGN
Memory Management - Design Patterns for Limited Memory - Work Flow for Application development - Java API - Dynamic Linking - Plugins and rule of thumb for using DLLs - Concurrency and Resource Management.

UNIT IV MOBILE OS
Mobile OS: Android, iOS - Android Application Architecture - Android basic components - Intents and Services - Storing and Retrieving data - Packaging and Deployment - Security and Hacking.

UNIT V APPLICATION DEVELOPMENT
Communication via the Web - Notification and Alarms - Graphics and Multimedia: Layer Animation, Event handling and Graphics services - Telephony - Location based services.

OUTCOMES
On completion of the course, the student will be able to

- Understand the basics of mobile application development frameworks and tools
- Be able to develop a UI for mobile application
- Design mobile applications that manages memory dynamically
- Build applications based on mobile OS like Android, iOS
• Build location based services

REFERENCES:

OBJECTIVES

- Study the principles of cyber security and to identify threats and risks.
- Gain knowledge of how to secure physical assets and develop system security controls.
- Understand how to apply security for Business applications and Network Communications.
- Learn the technical means to achieve security.
- Learn to monitor and audit security measures.

UNIT I  PLANNING FOR CYBER SECURITY

UNIT II  SECURITY CONTROLS

UNIT III  CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS

UNIT IV  TECHNICAL SECURITY

UNIT V  SECURITY ASSESSMENT

OUTCOMES
On completion of the course, the student will be able to

- Develop a set of risk and security requirements to ensure that there are no gaps in an organization’s security practices.
• Achieve management, operational and technical means for effective cyber security.
• Audit and monitor the performance of cyber security controls.
• Spot gaps in the system and devise improvements.
• Identify and report vulnerabilities in the system

REFERENCES:
COURSE OBJECTIVES:

- Implement the client side of the web application using javascript.
- Implement the server side of the web application using Servlets and WebSockets.
- Develop a web application using Spring.
- Implement a Persistence layer using Hibernate and Spring Data JPA.
- Develop a full stack single page application using React, Spring and Hibernate.

LIST OF EXERCISES

1. Create an event registration application using javascript. It should implement different widgets for registration form and registered records view using tabs. It should perform the form validation.
2. Create a javascript application in an Object Oriented way using Classes and Modules. It should also use browser storage for persistence.
3. Build a web application using Gradle. The server side of the application should implement RESTful APIs using Servlet and do necessary logging. The client side of the application should be a single page application which consumes the RESTful APIs through AJAX.
4. Build a chat application using WebSocket.
5. Create a Spring MVC application. The application should handle form validation, file upload, session tracking.
6. Implement a RESTful Spring Boot application using Spring REST, Spring Security and Spring Cache.
7. Design a complex system using JPA and Hibernate. The system should have multiple entities and relationships between the entities. The database schema should be generated through Hibernate. Provide RESTful endpoints for CRUD operations for the defined entities. Also, support pagination and searching using JPA's JPQL and Criteria API.
8. Create a Spring RESTful Application with Spring Data JPA. Support pagination and searching using Specifications.
9. Create a React application with different components and interactions between the components.
10. Develop a full-stack application using React and Spring. Make use of Spring REST, Spring Security, Spring Data JPA, Hibernate, Spring Boot, Gradle and React's higher order component.
COURSE OUTCOMES:

- Implement client and server side of the web application.
- Implement a real time application using Web Socket.
- Use Spring framework in web development.
- Implement applications using Java Persistence API.
- Implement applications using the JavaScript framework React.
OBJECTIVES:

- Familiarize with the machine learning algorithms and implement in practical situations.
- Involve the students to practice AI algorithms and techniques.
- Learn to use different algorithms for real time data sets.

List of Experiments:

1. Write a program to illustrate problem solving as a search.
2. Write a program to illustrate local search algorithms.
3. Write a program to demonstrate logical agents.
4. Evaluate forward chainer and rule base on at least four different databases. Try to create at least one database that demonstrates an interesting feature of the domain, or an interesting feature of forward chaining in general.
5. Demonstrate agent based on propositional logic.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
10. Apply the technique of pruning for a noisy data monk2 data, and derive the decision tree from this data. Analyze the results by comparing the structure of pruned and unpruned tree.
11. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets
12. Implement Support Vector Classification for linear kernel.
13. Implement Logistic Regression to classify the problems such as spam detection. Diabetes predictions so on.

OUTCOMES:

- Apply the techniques of Problem Solving in Artificial Intelligence.
- Implement Knowledge and Reasoning for real world problems.
- Model the various Learning features of Artificial Intelligence
• Analyze the working model and features of Decision tree
• Apply k-nearest algorithm for appropriate research problem.
OBJECTIVES:

- Provide opportunities to learners to practice their communication skills to make them become proficient users of English.

- Enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology to communicate globally.

- Enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

1. SOFT SKILLS
   - People skills
   - Interpersonal skills
   - Team building skills
   - Leadership skills
   - Problem solving skills

2. PRESENTATION SKILLS
   - Preparing slides with animation related to the topic
   - Introducing oneself to the audience
   - Introducing the topic
   - Presenting the visuals effectively - 5 minute presentation

3. GROUP DISCUSSION
   - Participating in group discussions
   - Brainstorming the topic
   - Activities to improve GD skills.

4. INTERVIEW SKILLS
   - Interview etiquette - dress code - body language
   - Attending job interviews
   - Answering questions confidently
   - Technical interview - telephone/Skype interview
   - Emotional and cultural intelligence
   - Stress Interview

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

OUTCOMES:

- Upon Completion of the course, the students will be able to:

- Students will be able to make presentations and participate in Group discussions with confidence.

- Students will be able to perform well in the interviews.

- Students will make effective presentations.
OBJECTIVES:

- Know the fundamental concepts of data science and analytics.
- Learn fundamental data analysis using R.
- Understand various data modeling techniques.
- Learn the basic and advanced features of open source big data tools and frameworks.
- Study various analytics on stream data.

UNIT I  INTRODUCTION TO DATA SCIENCE AND BIG DATA

UNIT II DATA ANALYSIS USING R

UNIT III DATA MODELING
Bayesian Modeling - Support Vector and Kernel Methods - Principal Component Analysis - Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS VsMongoDB, MongoDB Database Model, Data Types and Sharding - Data Modeling in HBase: Defining Schema - CRUD Operations

UNIT IV DATA ANALYTICAL FRAMEWORKS

UNIT V STREAM ANALYTICS

OUTCOMES:
On completion of the course, the students will be able to:

- Convert real world problems to hypothesis and perform statistical testing.
- Perform data analysis using R.
• Design efficient modeling of very large data and work with big data platforms.
• Implement suitable data analysis for stream data.
• Write efficient Map Reduce programs for small problem solving methods.

REFERENCES:
MULTIMEDIA SYSTEMS AND APPLICATIONS

OBJECTIVES:
Upon Completion of the course, the students should be able to:

- Enrich student learning in Multimedia systems basics
- Train the students to acquire knowledge in multimedia Tools and authoring
- Acquire knowledge about multimedia data compression techniques
- Acquire knowledge in the area of multimedia communication systems
- Know about popular multimedia application areas.


UNIT V MULTIMEDIA APPLICATIONS: Applications for WWW. Multimedia databases - Indexing and Retrieval, Visualization, Virtual, Augmented and Mixed Reality, Interactive E-learning, HCI and UX design, Games and Animation, Real-Time video conferencing.

OUTCOMES:
On completion of the course, the students will be able to:

- Handle the multimedia elements effectively
- Use Multimedia Hardware and Software for Editing and Authoring multimedia applications
- Implement Compression algorithms for various multimedia applications
- Develop effective strategies to deliver Quality-of-Experience in networked Multimedia applications
- Design and develop multimedia applications in various domains.
REFERENCES:


OBJECTIVES:

- Understand the basic principles of Double entry system and preparation of cash book.
- Learn how to prepare final accounts and balance sheet.
- Acquire knowledge about partnership accounts
- Understand the process of estimating the depreciation of a particular asset.
- Learn single and double entry accounting.

UNIT I INTRODUCTION TO ACCOUNTING

UNIT II FINAL ACCOUNTS
Preparation of Final Accounts of a Sole Trading Concern - Adjustments Receipts and Payments Account, Income & Expenditure Account and Balance Sheet of Non Trading Organizations.

UNIT III PARTNERSHIP ACCOUNTS
Partnership Accounts-Final accounts of partnership firms - Basic concepts of admission, retirement and death of a partner including treatment of goodwill - rearrangement of capitals. (Simple problems on Partnership Accounts).

UNIT IV DEPRECIATION

UNIT V SINGLE ENTRY ACCOUNTING
Single Entry - Meaning, Features, Defects, Differences between Single Entry and Double Entry System - Statement of Affairs Method - Conversion Method

OUTCOMES:

- Able to understand the basics of accounting
- Able to understand balance sheet preparation and do analysis
- Able to understand the partnership accounts
- Able to appreciate and depreciate the assets of an organization in accounting
- Able to understand Single Entry Accounting

REFERENCES:


OBJECTIVES:

- Provide hands-on cloud and data analytics frameworks and tools.
- Use the Python/R packages for performing analytics.
- Learn using analytical tools for real world problems.
- Familiarize the usage of distributed frameworks for handling voluminous data.
- Write and deploy analytical algorithms as Map Reduce tasks.

EXPERIMENTS:

Do the following experiments use R/Python:

1. Download, install and explore the features of R/Python for data analytics.
2. Use the Diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   b. Bivariate Analysis: Linear and logistic regression modeling.
   c. Multiple Regression Analysis
   d. Also compare the results of the above analysis for the two data sets.
3. Apply Bayesian and SVM techniques on Iris and Diabetes data set.
4. Apply and explore various plotting functions on UCI data sets.

Implement the following using Hadoop, Map Reduce, HDFS, Hive:

1. Perform setting up and Installing Hadoop in its two operating modes: pseudo-distributed and fully distributed.
2. Implement the following file management tasks in Hadoop: adding files and directories, retrieving files and Deleting files
3. Performing a Map Reduce Job for word search count (look for specific keywords in a file).
Implement stop word elimination problem: Input a large textual file containing one sentence per line and a small file containing a set of stop words (one stop word per line) and save the results in an output textual file containing the same sentences of the large input file without the words appearing in the small file.
4. Implement a Map Reduce program that processes a weather data set to:
   (i) Find average, max and min temperature for each year in National Climate Data Centre data set.
   (ii) Filter the readings of a set based on value of the measurement. The program must save the line of input files associated with a temperature value greater than30.0 and store it in a separate file.
5. Install, deploy & configure Apache Spark cluster. Run Apache Spark applications using Scala.
6. Install and run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
7. Mini projects on the following:
   (i) Simulate a simple recommender system with Amazon product dataset, Social tweet data set etc. on Hadoop.
   (ii) Perform a very large text classification run on Hadoop.

OUTCOMES:
On completion of the course, the students will be able to:

- Install analytical tools and configure distributed file system.
- Have skills in developing and executing analytical procedures in various distributed frameworks and databases.
- Develop, implement and deploy simple applications on very large datasets.
- Implement simple to complex data modeling in NoSQL databases.
- Develop and deploy simple applications in cloud.
OBJECTIVES:

- Learn tools relevant to multimedia systems.
- Implement animations on multimedia dataset.
- Design and develop games using multimedia tools.

EXPERIMENTS:

1. Editing various images (Image restoration, Changing colour image to Grey scale and vice versa) and adding special effects to images using tools like Photoshop, Gimp and flash.
2. Creating and Editing various video clippings and adding special effects using tools like Adobe Premier Pro.
3. Creating and Editing various audio files and adding special effects using tools like Sound Forge and Audacity.
4. Creating three dimensional models and animations using tools like Blender, 3DS Max, Unity.
5. Working on Text compression algorithms like Run length and Huffman.
6. Implementation of transformations like DCT and FFT Designing User Interfaces and developing simple games using multimedia tools.
7. Creating simple multimedia applications using any popular Authoring tools.

OUTCOMES:

On completion of the course, the students will be able to:

- Create 3D models and animations on datasets.
- Develop multimedia applications using authoring tools.
- Design and develop models of text compression.
OBJECTIVES:

- Know how to do project planning for the software process.
- Learn the cost estimation techniques during the analysis of the project.
- Understand the quality concepts for ensuring the functionality of the software.
- Learn risk management concepts.
- Explore globalization issues and its impacts.

UNIT I SOFTWARE PROJECT MANAGEMENT CONCEPTS

UNIT II SOFTWARE EVALUATION AND COSTING

UNIT III SOFTWARE ESTIMATION TECHNIQUES

UNIT IV RISK MANAGEMENT

UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT
OUTCOMES:

- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Can apply the software estimation and recent quality standards for evaluation of the software projects.
- Acquire knowledge and skills needed for the construction of highly reliable software project.
- Able to create reliable, replicable cost estimation that links to the requirements of project planning and managing.

REFERENCES:

OBJECTIVES:

- Provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- Provide a good understanding of software design and a set of software technologies and APIs.
- Do a detailed examination and demonstration of Agile development and testing techniques.
- Know the benefits and pitfalls of working in an Agile team.
- Be aware of Agile development and testing.

UNIT I AGILE METHODOLOGY

UNIT II AGILE PROCESSES

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING

UNIT V AGILITY AND QUALITY ASSURANCE

OUTCOMES:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system.
• Perform iterative software development processes: how to plan them, how to execute them.
• Point out the impact of social aspects on software development success.
• Develop techniques and tools for improving team collaboration and software quality.
• Show how agile approaches can be scaled up to the enterprise level

REFERENCES


OBJECTIVES:

- Learn the various E-learning approaches and Components.
- Explore Design Thinking.
- Understand the types of design models of E-learning.
- Learn about E-learning Authoring tools.
- Know about evaluation and management of E-learning solutions

UNIT I  INTRODUCTION

UNIT II  DESIGNING E-LEARNING COURSE CONTENT
Design Models of E-Learning - Identifying and Organizing E-Learning Course Content: Needs Analysis - Analyzing the Target Audience - Identifying Course Content - Defining Learning Objectives - Defining the Course Sequence - Defining Instructional Methods - Defining Evaluation and Delivery Strategies - Case Study.

UNIT III  CREATING INTERACTIVE CONTENT

UNIT IV  LEARNING PLATFORMS
Types of Learning Platforms - Proprietary vs. Open - Source LMS - LMS Vs LCMS - Internally Handled and Hosted LMS - LMS Solutions - Functional Areas of LMS.

UNIT V  COURSE DELIVERYAND EVALUATION
Components of an Instructor-Led or Facilitated Course - Planning and Documenting Activities - Facilitating Learners Activities - E-Learning Methods and Delivery Formats - Using Communication Tools for E-Learning - Course Evaluation.

OUTCOMES:
On completion of course, the students will be able to:

- Distinguish the phases of activities in models of E-learning.
- Identify appropriate instructional methods and delivery strategies.
- Choose appropriate E-learning Authoring tools.
- Create interactive E-learning courseware.
• Evaluate the E-learning courseware.

REFERENCE BOOKS:


OBJECTIVES:

- Understand software quality assurance and the usage of different types of softwares.
- Know the Quality Metrics of various Software.
- Know the methodologies used in developing software.
- Learn test automation tools.
- Test the product finally to check the product Quality.

UNIT I INTRODUCTION: 

UNIT II TESTING METHODOLOGIES: 

UNIT III TEST STRATEGIES: 

UNIT IV TEST AUTOMATION AND MANAGEMENT: 

UNIT V SQA IN PROJECT MANAGEMENT: 
Project progress control - costs - quality management standards - project process standards - management and its role in SQA - SQA unit.

OUTCOMES:
Up on completion of the course the students will be able to

- Develop Quality plans and use SQA components in project life cycle.
- Analyze the product Quality.
- Judge the use of infrastructure components and use configuration items for Quality control.
- Use various testing methods and verify.
- Assess Quality standards of various software products.

REFERENCE BOOKS:


OBJECTIVES:

- Understand the concepts of distributed systems.
- Get an insight into the various issues and solutions in distributed operating systems.
- Learn about real-time operating systems.
- Gain knowledge on the design concepts of mobile operating systems.
- Understand cloud operating systems.


OUTCOMES:
Upon Completion of the course, the students should be able to:

- Identify the features of distributed operating systems.
- Demonstrate the various protocols of distributed operating systems.
- Identify the different features of real time operating systems.
- Discuss the features of mobile operating systems.
- Discuss the features of cloud operating systems.
REFERENCES:


WEB CONTENT DESIGN AND MANAGEMENT

OBJECTIVES:

- Explore the detailed design practices, standards.
- Gain an insight into Content Management System for content design.
- Use any Content Management System tool for better content management.
- Get familiarized with Web Analytics for better management.


UNIT III WEB CONTENT DESIGN: Features - Automated Templates - Template Processor - Front Controller Pattern - Content Modeling - Content Aggregation - Plug-Ins - Search Engine Optimization - Recommended Usage Of Tools - WORDPRESS.


OUTCOMES:

Up on completion of the course, the students will be able to

- Design web pages that follow standards and are usable.
- Design web sites that are appealing.
- Be able to use Content management System for designing web Content.
- Take advantage of Content Management System tools for managing content for large web sites.
- Be able to use analytics tools for better management.

REFERENCES:


SOFTWARE SECURITY

CREDIT: 3

OBJECTIVES:

- Know the importance and need of software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.


OUTCOMES:

On completion of the course the students should be able to:

- Identify various vulnerabilities related to memory attack.
- Apply security principles in software development.
- Evaluate the extent of risks.
- Involve selection of testing techniques related to software security in testing phase of software development.
• Use tools for securing software.

REFERENCES:


OBJECTIVES:

- Learn the fundamentals of 5G internet.
- Understand the concept of small cells in 5G mobile networks.
- Learn the mobile clouds in 5G network context.
- Understand the role of cognitive radios in 5G networks.
- Learn the security issues in 5G networks.

UNIT I PERVASIVE CONNECTED WORLD AND 5G INTERNET: Historical Trend of Wireless Communications - Evolution of LTE Technology to Beyond 4G - 5G Roadmap - Ten Pillars of 5G - Internet of Things and Context Awareness - Networking Reconfiguration and Virtualization Support - Mobility - Quality of Service Control.

UNIT II SMALL CELLS FOR 5G MOBILE NETWORKS: Introduction to Small Cells - Capacity Limits and Achievable Gains with Densification - Mobile Data Demand - Demand vs. Capacity - Small Cell Challenges.


OUTCOMES:

Up on completion of the course, the student will be able to:

- Compare the 5G network with older generations of networks.
- Identify suitable small cells for different applications in 5G networks.
- Simulate 5G network scenarios.
- Connect applications to mobile cloud.
- Design applications with 5G network support.
- Analyze the security risks in 5G networks.
REFERENCES:
OBJECTIVES:
The student should be made:

- Learn about the physical layer and MAC layer of WSNs.
- Understand the data centric computing to be followed in WSNs.
- Study about the routing protocols followed in WSNs.
- Study about data aggregation and in-network processing.
- Explore various motes, sensor network operating systems, databases and development platforms.

UNIT I FUNDAMENTALS OF WSN:

UNIT II MAC LAYER OF WSN AND ZIGBEE STANDARD:

UNIT III DATA CENTRIC COMPUTING IN WSN:
- Data Gathering and Dissemination - Broadcasting and Geocasting from Sink - Data Aggregation - LMST based Aggregation - Power Efficient Data gathering and Aggregation (PEDAP) - In-Network Processing - Aggregate Queries - Routing Challenges and Strategies in WSNs - SPIN, Directed Diffusion, Rumour Routing, Energy Aware Routing, Gradient based Routing.

UNIT IV SYNCHRONIZATION, LOCALIZATION AND TRACKING IN WSNs:
- Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning - Ranging techniques - Range based localization algorithms - Location services - Scene analysis, GPS and RFID.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS:

OUTCOMES:
Outcomes to be changed with respect to contents
At the end of the course, the student should be able to:

- Understand different types of sensors, their actuators and the architecture of motes.
- Design the topology of WSNs using different types of ZigBee devices and understanding their roles.
• Understand apply data centric computing in wireless sensor networks.
• Apply appropriate localization techniques for different scenarios.
• Manage sensor networks by synchronizing the time, locating and tracking objects.
• Carry out experiments in simulators and real sensors.

REFERENCES:

OBJECTIVES:

Upon Completion of the course, the students should be able to:

- Learn the fundamentals of semantic web and to conceptualize and depict Ontology for semantic web.
- Understand the languages for semantic web.
- Learn about the ontology learning algorithms and to utilize in the development of an application.
- Know the fundamental concepts of ontology management.
- Learn the applications related to semantic web.


OUTCOMES:

- Create ontology for a given domain.
- Develop an application using ontology languages and tools.
- Understand the concepts of semantic Web.
- Use ontology related tools and technologies for application creation.
• Design and develop applications using semantic web.
• Understand the standards related to semantic web.

REFERENCES:


OBJECTIVES:

- Understand the basics of Network Programming
- Be familiar with building network applications
- Design and implement client server Applications using TCP and UDP Sockets
- Expose with various socket options
- Get aware of Network security for Network Programming

UNIT I  INTRODUCTION
TCP/IP Layer Model - Multicast, broadcast and Any cast - Socket address Structures - Byte ordering functions - address conversion functions - Elementary TCP Sockets - socket, connect, bind, listen, accept, read, write, close functions - Iterative Server - Concurrent Server

UNIT II  ELEMENTARY TCP SOCKETS
TCP Echo Server - TCP Echo Client - Posix Signal handling - Server with multiple clients - boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown

UNIT III  SOCKET OPTIONS AND MULTIPLEXING
Socket options - getsocket and setsocket functions - generic socket options - IP socket options - ICMP socket options - TCP socket options I/O multiplexing - I/O Models - select function - shutdown function - TCP echo Server (with multiplexing) - poll function - TCP echo Client (with Multiplexing)

UNIT IV  ELEMENTARY UDP SOCKETS
UDP echo Server - UDP echo Client - Multiplexing TCP and UDP sockets - Domain name system - get host by name function - Ipv6 support in DNS - get host by adr function - getservbyname and getservbyport functions.

UNIT V  NETWORK SECURITY

OUTCOMES:

- Upon completion of the course, the student will be able to
- Design and implement the client/server programs using variety of protocols
- Understand the key protocols which support Internet
- Demonstrate advanced knowledge of programming interfaces for network communication
- Use the basic tools for design and testing of network programs in Unix environment.
- Identify some of the factors driving the need for network security
REFERENCE BOOKS:


OBJECTIVES:

- Understand the basic principles of service orientation.
- Analyze various software architectures.
- Introduce service oriented and micro services architecture.
- Analyze and implement a web service based applications.
- Understand the technology underlying service design and micro services applications.


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

- Analyze and design SOA based solutions.
- Understand the basic principles of service orientation.
- Analyze and implement a web service based applications.
- Understand the technology underlying service design.
- Implement SOA with Micro services applications.
- Classify and make reasonable decision on the adoption of different SOA platforms.
REFERENCES:


OBJECTIVES:

- Gain knowledge about social networks, its structure and their data sources.
- Study about the knowledge representation technologies for social network analysis.
- Analyze the data left behind in social networks.
- Gain knowledge about the community maintained social media resources.
- Learn about the visualization of social networks.

UNIT I  INTRODUCTION TO SEMANTIC WEB
The development of Semantic Web - Emergence of the Social Web - The Development of Social Network Analysis - Basic Graph Theoretical Concepts of Social Network Analysis - Electronic Sources for Network Analysis - Electronic Discussion Networks, Blogs and Online Communities, Web-based Networks.

UNIT II  KNOWLEDGE REPRESENTATION ON THE SEMANTIC WEB
Ontology-based knowledge Representation - Ontology languages for the Semantic Web: RDF and OWL-Modeling Social Network Data - Network Data Representation, Ontological Representation of Social Individuals and Relationships -Aggregating and Reasoning with Social Network Data.

UNIT III  SOCIAL NETWORK MINING

UNIT IV  COMMUNITY MAINTAINED SOCIAL MEDIA RESOURCES
Community Maintained Resources - Supporting technologies for community maintained resources- User motivations-Location based social interaction - location technology- mobile location sharing - Social Information Sharing and social filtering - Automated recommender system.

UNIT V  VISUALIZATION OF SOCIAL NETWORKS

OUTCOMES:
Up on completion of the course, the students will be able to:

- Explain the basic principles behind network analysis algorithms.
- Model and represent knowledge for social semantic Web.
- Use extraction and mining tools for analyzing Social networks.
- Discuss about community maintained social media resources.
• Develop personalized visualization for Social networks.

REFERENCES:


OBJECTIVES:

- Impart the fundamental aspects and principles of mixed reality technologies.
- Know the internals of the hardware and software components involved in the development of mixed reality enabled applications.
- Learn about the graphical processing units and their architectures.
- Gain knowledge about mixed reality application development.
- Know the technologies involved in the development of mixed reality based applications.


OUTCOMES:

Upon completion of the course, the students should be able to

- Familiarize with the basic concepts of mixed reality.
- Understand the tools and technologies related to Mixed Reality.
- Know the working principle of mixed reality related Sensor devices.
• Develop the Virtual Reality applications in different domains.
• Design of various models using modeling techniques.
• Expose the concept of Virtual Reality and Mixed reality Programming with toolkits.

REFERENCES:
1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create Compelling VR Experiences for Mobile”, Packt Publisher, 2018
OBJECTIVES:

- Understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- Get an understanding of machine learning techniques for text classification and clustering.
- Understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- Understand the concepts of digital libraries

UNIT I  INTRODUCTION: MOTIVATION

UNIT II  MODELING

UNIT III  INDEXING
Static and Dynamic Inverted Indices - Index Construction and Index Compression - Searching - Sequential Searching and Pattern Matching - Query Operations - Query Languages - Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis - Measuring Effectiveness and Efficiency

UNIT IV  CLASSIFICATION AND CLUSTERING
Text Classification and Naïve Bayes - Vector Space Classification - Support vector machines and Machine Learning on Documents - Flat Clustering - Hierarchical Clustering - Matrix decompositions and latent semantic indexing - Fusion and Meta learning

UNIT V  SEARCHING THE WEB

OUTCOMES:
Upon completion of this course, the students should be able to:

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Model an information retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
• Design an efficient search engine and analyze the Web content structure.

REFERENCES:


OBJECTIVES:

- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I INTRODUCTION AND ARCHITECTURAL DRIVERS

UNIT II QUALITY ATTRIBUTE WORKSHOP
Quality Attribute Workshop - Documenting Quality Attributes - Six part scenarios - Case studies.

UNIT III ARCHITECTURAL VIEWS
Introduction - Standard Definitions for views - Structures and views - Representing views - available notations - Standard views - 4+1 view of RUP, Siemens 4 views, SEI’s perspectives and views - Case studies

UNIT IV ARCHITECTURAL STYLES
Introduction - Data flow styles - Call-return styles - Shared Information styles - Event styles - Case studies for each style.

UNIT V DOCUMENTING THE ARCHITECTURE
Good practices - Documenting the Views using UML - Merits and Demerits of using visual languages - Need for formal languages - Architectural Description Languages - ACME - Case studies. Special topics: SOA and Web services - Cloud Computing - Adaptive structures

OUTCOMES:
Upon Completion of the course, the students will be able to

- Explain influence of software architecture on business and technical activities
- Summarize quality attribute workshop
- Identify key architectural structures
- Use styles and views to specify architecture
- Design document for a given architecture

REFERENCES:


OBJECTIVES:

- Understand the hacking techniques of computer forensics.
- Learn about data recovery methods.
- Identity the threats in computer forensics.


UNIT III DATA RECOVERY: Data Recovery - Evidence Collection and Data Seizure - Duplication and Preservation of Digital Evidence - Computer Image Verification and Authentication.

UNIT IV ELECTRONIC EVIDENCE: Discover of Electronic Evidence - Identification of Data - Reconstructing Past Events - Networks.

UNIT V THREATS: Fighting against Macro Threats - Information Warfare Arsenal - Tactics of the Military - Tactics of Terrorist and Rogues - Tactics of Private Companies.

OUTCOME:
Upon Completion of the course, the students will be able to

- Distinguish between hackers and normal users.
- Apply the principles of computer forensics for security.
- Implement the data recovery methods.
- Manage threats and the tactics.

REFERENCES:
3. Chad Steel, —Windows Forensics, Wiley India, 2006.
DATA WAREHOUSING AND DATA MINING  
CREDIT: 3

OBJECTIVES:

Upon Completion of the course, the students should be able to:

- Expose the students to the concepts of Data warehousing Architecture and Implementation.
- Understand Data mining principles and pre-process techniques.
- Expose the students to the concepts of Association Rule Mining Techniques.
- Study the overview of classification and predictions in data mining.
- Identify the major categorization of clustering techniques in Data mining.


UNIT II DATA MINING & DATA PREPROCESSING:  Introduction to KDD process - Knowledge Discovery from Databases - Need for Data Preprocessing - Data Cleaning - Data Integration and Transformation - Data Reduction - Data Discretization and Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING:  Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

UNIT IV CLASSIFICATION & PREDICTION:  Classification vs Prediction - Data preparation for Classification and Prediction - Classification by Decision Tree Introduction - Bayesian Classification - Rule Based Classification - Classification by Back propagation - Support Vector Machines - Associative Classification - Lazy Learners - Other Classification Methods - Prediction - Accuracy and Error Measures - Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods - Model Section.

UNIT V CLUSTERING:  Cluster Analysis: - Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods - Density-Based Methods - Grid-Based Methods - Model-Based Clustering Methods - Clustering HighDimensional Data - Constraint-Based Cluster Analysis - Outlier Analysis.

OUTCOMES:

On completion of the course, the students will be able to:

- Able to construct the multidimensional data modeling.
- Evolve the importance of data preprocessing.
- Discover the knowledge imbibed in the high dimensional system.
- Experiment Ensemble Methods of various classification algorithms.
- Evaluate various mining techniques on complex data objects.
REFERENCES:


DATA VISUALIZATION TECHNIQUES

CREDIT: 3

OBJECTIVES:

- Understand the categories of data quality principles.
- Describe data through visual representation.
- Provide basic knowledge about how large datasets are represented into visual graphics.
- Easily understand about the complex relationships within the data.
- Design effective visualization techniques for any different problems.

UNIT I INTRODUCTION
Visualization - visualization process - role of cognition - Pseudocode conventions - Scatter plot - Data foundation: Types of data - Structure within and between records - Data preprocessing - Human perceptions and information processing.

UNIT II VISUALIZATION FOUNDATIONS

UNIT III DESIGNING EFFECTIVE VISUALIZATION
Steps in Designing Visualization - problems in Designing Effective Visualization - Comparing and evaluating visualization techniques - Visualization Systems.

UNIT IV INFORMATION DASHBOARD DESIGN

UNIT V VISUALIZATION SYSTEMS

OUTCOME:
On completion of the course the student should be able to:

- Describe principles of visual perception
- Apply visualization techniques for various data analysis tasks - numerical data
- Apply visualization techniques for various data analysis tasks - Non numerical data
- Design effective visualization techniques for different problems
- Design information dashboard.

REFERENCES:

1. Matthew O. Ward, Georges Grinstein, Daniel Keim “Interactive Data Visualization:


OBJECTIVES:

- Provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Computer Applications.
- Understand, develop and solve mathematical model of linear programming problems
- Understand, develop and solve mathematical model of Transport and assignment problems
- Know network modeling for planning and scheduling the project activities
- Learn methods of game theory.

UNIT I  LINEAR PROGRAMMING MODELS
Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M method, degeneracy and unbound solutions.

UNIT II  TRANSPORTATION AND ASSIGNMENT MODELS

UNIT III  SCHEDULING BY PERT AND CPM
Introduction - Rules to frame a Network - Fulkerson’s Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT & CPM.

UNIT IV  QUEUEING MODELS
Characteristics of Queueing Models - Poisson Queues - (M /M/1): (FIFO / ∞ / ∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

UNIT V  GAME THEORY
Competitive game, rectangular game, saddle point, minimax (maxmini) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point - mixed strategy for 2 X 2 games.

OUTCOMES:

Upon Completion of the course, the students will be able to

- Understand and apply linear programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution
- Prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing model to reduce the waiting time in queue.
- Choose the best strategy using decision making methods under game theory.

REFERENCES:

Delhi, 2017


OBJECTIVES:

- Understand the concepts of computer ethics in work environment.
- Enhance the threats in computing environment
- Gain knowledge about the intricacies of accessibility issues
- Ensure safe exits when designing the software projects

UNIT I INTRODUCTION TO ETHICS

UNIT II ETHICS IN INFORMATION TECHNOLOGY
IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed -Professional Codes of Ethics - Professional Organizations - Certification - IT Professional Ethics, Three Codes of Ethics, Management Conflicts.

UNIT III FREEDOM OF EXPRESSION, PRIVACY

UNIT IV FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS

UNIT V SOCIAL NETWORKING ETHICS AND ETIQUETTES

OUTCOMES:
Upon Completion of the course, the students will be able to

- Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.
- Able to envision the societal impact on the products/ projects they develop in their career
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

REFERENCES:

OBJECTIVE:

- Provide basic knowledge of concepts, principles, tools and techniques of Marketing.
- Provide an exposure to the students pertaining to marketing strategies, which they are expected to possess when they enter the industry as practitioners.
- Give them an understanding of the various marketing Strategies used in consumer and industrial marketing.

UNIT I INTRODUCTION TO MARKETING MANAGEMENT

UNIT II MARKETING ENVIRONMENT

UNIT III CONSUMER AND BUSINESS BUYER BEHAVIOUR

UNIT IV SEGMENTATION, TARGETING AND POSITIONING

UNIT V INTERNATIONAL MARKETING MANAGEMENT & RECENT TRENDS
Introduction - Nature of International Marketing - International Marketing Concept - International Market Entry Strategies - Approaches to International Marketing - Cause related marketing - Ethics in marketing -Online marketing trends.

OUTCOMES:

- Knowledge of basic understanding in solving marketing related problems.
- Awareness of marketing management process, strategies and the marketing mix elements.
- Clear understanding of functional area of marketing
- Demonstrating conceptual knowledge and analytical skills in analyzing the marketing
environment.

- Develop skills in recent trends in global marketing.

REFERENCES:


OBJECTIVE:

- The objective is to enable the students to understand the Organizational Behavior, and Organizational Change and dynamic of groups.
- Learn process, learning theories.
- Understand leadership and power centers.
- Know organizational dynamics concepts.

UNIT I ORGANISATIONAL BEHAVIOUR
Organization Behaviour - Definition - Scope and Application in Management - Contributions of Other Disciplines to OB. Emerging Issues in Organizational Behaviour- Organizational behaviour models

UNIT II INDIVIDUAL PROCESSES

UNIT III LEADERSHIP AND POWER
Meaning - Importance - Leadership styles - Theories - Leaders Vs Managers - Sources of power - Power centers - Power and Politics.

UNIT IV GROUP DYNAMICS
Meaning - Types of Groups - Functions of Small Groups - Group Size Status - Managerial Implications - Group Behaviour - Group Norms - Cohesiveness - Group Thinking

UNIT V ORGANISATIONAL CHANGE AND DEVELOPMENT

OUTCOMES:
On completion of the course should be able to:

- Students will have a better understanding of human behavior in organization.
- They will know the framework for managing individual and group performance.
- Characteristics of attitudes and components of attitudes — A brief discussion
- List the determinants of personality
- List the characteristics of various leadership styles.

REFERENCES:


OBJECTIVES:

- Understand the basics of business analytics and its life cycle.
- Gain knowledge about fundamental business analytics.
- Learn modeling for uncertainty and statistical inference.
- Understand analytics using Hadoop and Map Reduce frameworks.
- Acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS

UNIT II ESSENTIALS OF BUSINESS ANALYTICS
Descriptive Statistics - Using Data - Types of Data - Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation - Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map - Data Dashboards.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE

UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK
Introducing Hadoop - RDBMS versus Hadoop - Hadoop Overview - HDFS (Hadoop Distributed File System) - Processing Data with Hadoop - Introduction to Map Reduce - Features of Map Reduce - Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation - Extensions to Map Reduce

UNIT V OTHER DATA ANALITICAL FRAMEWORKS
Overview of Application Development Languages for Hadoop - PigLatin - Hive - Hive Query Language (HQL) - Introduction to Pentaho, JAQL - Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala - Introduction to NoSQL Databases - Hbase and MongoDB.

OUTCOMES:

- On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
• Convert any real world decision making problem to hypothesis and apply suitable statistical testing.

• Write and Demonstrate simple applications involving analytics using Hadoop and Map Reduce

• Use open source frameworks for modeling and storing data.

REFERENCES:


OBJECTIVES:

- Decompose a blockchain system’s fundamental components, how they fit together and examine a decentralization using blockchain.

- Explain how Cryptocurrency works, from when a transaction is created to when it is considered part of the blockchain.

- Explain the components of Ethereum and Programming Languages for Ethereum.

- Study the basics Hyperledger and Web3.

- Provide a details of alternative blockchain and blockchain projects in different perspective.

UNIT I INTRODUCTION TO BLOCKCHAIN: History of Blockchain - Types of Blockchain - Consensus - Decentralization using Blockchain - Blockchain and Full Ecosystem Decentralization - Platforms for Decentralization.

UNIT II INTRODUCTION TO CRYPTOCURRENCY: Bitcoin - Digital Keys and Addresses - Transactions - Mining - Bitcoin Networks and Payments - Wallets - Alternative Coins - Theoretical Limitations - Bitcoin Limitations - Name Coin - Prime Coin - Zcash - Smart Contracts - Ricardian Contracts.


UNIT V ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS: Kadena - Ripple-Rootstock - Quorum - Tendermint - Scalability - Privacy - Other Challenges - Blockchain Research - Notable Projects - Miscellaneous tools.

OUTCOME:

Upon Completion of the course, the students will be able to

- Understand the technology components of Blockchain and how it works behind-the scenes.

- Aware of different approaches to developing decentralized applications.

- Understand the Bitcoin and its limitations by comparing with other alternative coins.

- Establish deep understanding of the Ethereum model, its consensus model, code execution.

- Understand the architectural components of a Hyperledger and its development framework.

- Come to know the Alternative blockchains and emerging trends in blockchain.
REFERENCES:


OBJECTIVES:

- Determine the necessity of user interaction by understanding usability engineering and user modeling.
- Learn the methodologies for designing interactive systems.
- Investigate the core and complex design issues for interaction.
- Examine the evaluation methodologies of design.
- Understand design issues for web and mobile platforms

UNIT I INTRODUCTION: Context of Interaction - Ergonomics - Designing Interactive systems - Understanding Users cognition and cognitive frame works, User Centred approaches - Usability, Universal Usability, Understanding and conceptualizing interaction, Guidelines, Principles and Theories.


OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basics of human computer interactions via usability engineering and cognitive modeling.
- Understand the basic design paradigms, complex interaction styles.
- Understand the fundamental design issues.
- Evaluate of interaction designs and implementations.
• Use models and theories for user interaction.

• Use above concepts for web and mobile applications.

REFERENCES:


OBJECTIVES:

- Gain knowledge of soft computing theories and its fundamentals.
- Design a soft computing system required to address a computational task.
- Introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- Familiarize with genetic algorithms and other random search procedures while seeking global optimum in self-learning situations.

UNIT I FUSSY COMPUTING

UNIT II FUNDAMENTALS OF NEURAL NETWORKS

UNIT III BACKPROPAGATION NETWORKS

UNIT IV COMPETITIVE NEURAL NETWORKS
Kohenen’s Self Organizing Map - SOM Architecture, learning procedure - Application; Learning Vector Quantization - learning by LVQ; Adaptive Resonance Theory - Learning procedure - Applications.

UNIT V GENETIC ALGORITHM

OUTCOMES:
On completion of the course, the students will be able to:

- Identify and describe soft computing techniques and their roles in building intelligent
• Recognize the feasibility of applying a soft computing methodology for a particular problem.
• Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
• Apply genetic algorithms to optimization problems.
• Design neural networks to pattern classification and regression problems using soft computing approach.

REFERENCES:


OBJECTIVES:

- Understand how to represent the high-dimensional data, such as images, text and data.
- Explain convolution neural network
- Introduce major deep learning algorithms and their applications to solve real world problems.
- Explore about optimization and generalization in Deep learning
- Understand about deep reinforcement learning

UNIT I NEURAL NETWORK

UNIT II CONVOLUTION NEURAL NETWORK
Introduction-Filter and Feature Maps-Full Description of CNN-Max Pooling- Full Architectural Description of CNN-Image Preprocessing Pipeline Enable More Robust Models-Accelerating Training with Batch Normalization-Visualizing Learning with Convolution Network-Leveraging and Learning Convolution Filters - Predefined Convolutional Filters Network (PCFNet)- Transfer Learning with Convolutional Neural Networks.

UNIT III DEEP NETWORKS

UNIT IV OPTIMIZATION AND GENERALIZATION

UNIT V DEEP REINFORCEMENT LEARNING
Markov Decision Processes-Explore versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients-Q Learning and Deep Q Networks-Improving and Moving Beyond DQN

OUTCOME:
On completion of the course, the students will be able to

- Describe the fundamental concepts of Neural Networks
- Apply Convolution Neural Network techniques to solve problems in image processing
- Summarize the characteristics of deep Learning
- Comprehend the Optimization and Generalization in Deep Learning
- Interpret the concepts of Deep Reinforcement Learning to solve real world problems.

REFERENCES


OBJECTIVES:

- Know the fundamental concepts of big data and analytics.
- Explore tools and practices for working with big data.
- Explore association and recommendations systems.
- Learn about stream computing.
- Know about the research that requires the integration of large amounts of data.

UNIT I  INTRODUCTION TO BIG DATA
Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value - Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - Map Reduce and YARN - Map Reduce Programming Model

UNIT II  CLUSTERING AND CLASSIFICATION

UNIT III  ASSOCIATION AND RECOMMENDATION SYSTEM

UNIT IV  STREAM MEMORY

UNIT V  NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION
NoSQL Databases: Schema-less Models!- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding --Hbase - Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

OUTCOMES:
Upon completion of the course, the students will be able to:
• Work with big data tools and its analysis techniques
• Analyze data by utilizing clustering and classification algorithms
• Learn and apply different mining algorithms and recommendation systems for large volumes of data
• Perform analytics on data streams
• Learn NoSQL databases and management.

REFERENCES:
OBJECTIVES:

- Learn the fundamentals of natural language processing
- Understand word level and syntactic analysis.
- Understand the role of semantics of sentences and pragmatics
- Get knowledge about the machine translation.
- Learn text classification methods.

UNIT I INTRODUCTION OF BASIC TEXT PROCESSING

UNIT II LANGUAGE MODELLING AND SMOOTHING
Language modeling - smoothing models - Computational Morphology - Finite state Methods for morphology - Introduction to POS tagging - Hidden Markov model for POS tagging - Models for sequential parsing - MaxEnt- CRF.

UNIT III SYNTAX, PARSING, SEMANTICS

UNIT IV TOPIC MODELS AND INFORMATION EXTRACTION
Topic Model- Latent Dirichlet Allocation - Gibbs sampling for LDA - Formulation and Application - LDA Variants- Entity Linking - Information extraction - Relation extraction - Distant Supervision

UNIT V TEXT SUMMARIZATION & TEXT CLASSIFICATION
Optimization Based models for summarization - Evaluation- Text classification - sentiment analysis - Affective lexicon - Learning affective lexicons - computing with affective lexicons

OUTCOMES:
Upon completion of the course, the students will be able to:

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To apply NLG and machine translation
REFERENCES:


