PROGRAM EDUCATIONAL OBJECTIVES:

- Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.
- Apply principles of Data Science to the analysis of business problems.
- Employ cutting edge tools and technologies to analyze Big Data.

PROGRAM OUTCOMES POs:
Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes**

- Understand the impact of big data for business decisions and strategy
- Gain hands-on experience on large-scale analytics tools to solve some open big data problems
- Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data

Mapping of POs/PSOs to PEOs

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<td>Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.</td>
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| **2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. | | |
| 3 | 2 | 3 |

| **3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. | | |
| 3 | 2 | 3 |

| **4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. | | |
| 3 | 2 | 2 |

| **5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. | | |
| 2 | 3 | 3 |

| **6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. | | |
| 2 | 2 | 2 |

| **7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. | | |
| 2 | 1 | 2 |
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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### ANNA UNIVERSITY, CHENNAI
### AFFILIATED INSTITUTIONS
### M.E.BIGDATA ANALYTICS
### REGULATIONS – 2017
### CHOICE BASED CREDIT SYSTEM
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OBJECTIVES:
This course is designed to provide the solid foundation on topics in applied probability and various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling. It is framed to address the issues and the principles of estimation theory, testing of hypothesis and multivariate analysis.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 12
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables - Regression curve – Correlation.

UNIT III ESTIMATION THEORY 12

UNIT IV TESTING OF HYPOTHESIS 12
Sampling distributions – Type I and Type II errors – Small and large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components - Population principal components – Principal components from standardized variables

TOTAL: 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following topics:
- Basic probability axioms and rules and the moments of discrete and continuous random variables.
- Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

REFERENCES:

CP5151 ADVANCED DATA STRUCTURES AND ALGORITHMS

OBJECTIVES:
- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To select and design data structures and algorithms that is appropriate for problems.
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING

UNIT II HIERARCHICAL DATA STRUCTURES

UNIT III GRAPHS

UNIT IV ALGORITHM DESIGN TECHNIQUES

UNIT V NP COMPLETE AND NP HARD

TOTAL: 60 PERIODS
OUTCOMES:
Upon the completion of the course the students should be able to:
- Design data structures and algorithms to solve computing problems
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems
- Apply suitable design strategy for problem solving

REFERENCES:

BD5101 FOUNDATIONS OF DATA SCIENCE L T P C
3 2 0 4

OBJECTIVES:
- Able to apply fundamental algorithmic ideas to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Document and transfer the results and effectively communicate the findings using visualization techniques.

UNIT I INTRODUCTION TO DATA SCIENCE 12
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

UNIT II MODELING METHODS 12

UNIT III INTRODUCTION TO R 12

UNIT IV MAP REDUCE 12
Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop MapReduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution.
UNIT V        DELIVERING RESULTS

TOTAL : 60 PERIODS

OUTCOMES:
- Obtain, clean/process and transform data.
- Analyze and interpret data using an ethically responsible approach.
- Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.
- Apply computing theory, languages and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses.
- Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges.

REFERENCES:
10. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

BD5102        BIG DATA MINING AND ANALYTICS        L T P C
3 0 0 3

OBJECTIVES:
- To understand the computational approaches to Modeling, Feature Extraction
- To understand the need and application of Map Reduce
- To understand the various search algorithms applicable to Big Data
- To analyse and interpret streaming data
- To learn how to handle large data sets in main memory
- To learn the various clustering techniques applicable to Big Data

UNIT I        DATA MINING AND LARGE SCALE FILES
UNIT II SIMILARITY DETECTION

UNIT III MINING DATA STREAMS
Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows

UNIT IV LINK ANALYSIS AND FREQUENT ITEMSETS

UNIT V CLUSTERING

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
- Design algorithms by employing Map Reduce technique for solving Big Data problems
- Design algorithms for Big Data by deciding on the apt Features set
- Design algorithms for handling petabytes of datasets
- Design algorithms and propose solutions for Big Data by optimizing main memory consumption
- Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

REFERENCES:

CP5152 ADVANCED COMPUTER ARCHITECTURE LTCP 3 0 0 3

OBJECTIVES:
- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To learn the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.
UNIT I  FUNDAMENTALS OF COMPUTER DESIGN AND ILP  

UNIT II  MEMORY HIERARCHY DESIGN  

UNIT III  MULTIPROCESSOR ISSUES  
Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study-Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks

UNIT IV  MULTICORE ARCHITECTURES  

UNIT V  VECTOR, SIMD AND GPU ARCHITECTURES  

TOTAL :45 PERIODS

OUTCOMES:
Upon completion of this course, the students should be able to:
- Identify the limitations of ILP.
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism.
- Discuss the various techniques used for optimising the cache performance
- Design hierarchal memory system
- Point out how data level parallelism is exploited in architectures

REFERENCES:
BD5103 DISTRIBUTED COMPUTING L T P C 3 0 0 3


UNIT II RPC: Introduction, RPC model, transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshalling arguments and results, Sever management, parameter-passing semantics, Call semantics, Communication protocols for RPCs, Complicated RPC, Client-server binding, exceptional handling, security, special types of RPC, RPC in heterogeneous environments, Lightweight RPC, Optimization for better performance, Case studies-Sun RPC, DCE, RPC.

UNIT III Distributed Shared Memory and Synchronization: Introduction, General architecture of DSM systems, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency model, Replacement strategy, Thrashing, Different approaches to DSM, Advantages of DSM, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.


REFERENCE S:
1. PRADEEP K. SINHA Distributed Operating System - PHI.

CP5161 DATA STRUCTURES LABORATORY L T P C 0 0 4 2

OBJECTIVES:
• To acquire the knowledge of using advanced tree structures.
• To learn the usage of heap structures.
• To understand the usage of graph structures and spanning trees.
LIST OF EXPERIMENTS:
Each student has to work individually on assigned lab exercises. Lab sessions could be scheduled as one contiguous four-hour session per week or two two-hour sessions per week. There will be about 15 exercises in a semester. It is recommended that all implementations are carried out in Java. If C or C++ has to be used, then the threads library will be required for concurrency. Exercises should be designed to cover the following topics:

EXPERIMENTS:
1. Implementation of Merge Sort and Quick Sort-Analysis
2. Implementation of a Binary Search Tree
3. Red-Black Tree Implementation
4. Heap Implementation
5. Fibonacci Heap Implementation
6. Graph Traversals
7. Spanning Tree Implementation
8. Shortest Path Algorithms (Dijkstra's algorithm, BellmannFord Algorithm)
9. Implementation of Matrix Chain Multiplication
10. Activity Selection and Huffman Coding Implementation.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of this course, the students will be able to:
• Design and implement basic and advanced data structures extensively.
• Design algorithms using graph structures
• Design and develop efficient algorithms with minimum complexity using design techniques.

BD5111 BIG DATA COMPUTING LAB L T P C
0 0 4 2

OBJECTIVES
• To understand setting up of Hadoop Cluster
• To solve problems using Map Reduce Technique
• To solve Big Data problems

LIST OF EXERCISES
1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster(one master and multiple slaves).
2. MapReduce application for word counting on Hadoop cluster
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce
5. Page Rank Computation
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries

TOTAL:60 PERIODS

OUTCOMES
Set up multi-node Hadoop Clusters
• Apply Map Reduce algorithms for various algorithms
- Design new algorithms that uses Map Reduce to apply on Unstructured and structured data

CP5191  MACHINE LEARNING TECHNIQUES  L  T  P  C

3  0  0  3

OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms

UNIT I  INTRODUCTION  9

UNIT II  LINEAR MODELS  9

UNIT III  TREE AND PROBABILISTIC MODELS  9

UNIT IV  DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS  9

UNIT V  GRAPHICAL MODELS  9

TOTAL: 45 PERIODS
OUT COMES:

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

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Apply the appropriate machine learning strategy for any given problem
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem
- Design systems that uses the appropriate graph models of machine learning
- Modify existing machine learning algorithms to improve classification efficiency

REFERENCES:

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I  INTRODUCTION TO IoT
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II  IoT ARCHITECTURE
M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III  IoT PROTOCOLS

UNIT IV  BUILDING IoT WITH RASPBERRY PI & ARDUINO
Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on
OBJECTIVES:
- To understand the design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the emerging databases like Mobile, XML, Cloud and Big Data

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9
UNIT II INTELLIGENT DATABASES
Active Databases: Syntax and Semantics (Starburst, Oracle, DB2) - Taxonomy - Applications - Design Principles for Active Rules - Temporal Databases: Overview of Temporal Databases TSQL2 - Deductive Databases - Recursive Queries in SQL - Spatial Databases - Spatial Data Types - Spatial Relationships - Spatial Data Structures - Spatial Access Methods - Spatial DB Implementation.

UNIT III XML DATABASES

UNIT IV MOBILE DATABASES

UNIT V MULTIMEDIA DATABASES

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, a student should be able:
- To develop skills on databases to optimize their performance in practice.
- To analyze each type of databases and its necessity.
- To design faster algorithms in solving practical database problems.

REFERENCES:

CP5092 CLOUD COMPUTING TECHNOLOGIES

OBJECTIVES:
- To understand the concepts of virtualization and virtual machines.
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions.
- To gain knowledge on the concept of virtualization that is fundamental to cloud computing
- To understand the various issues in cloud computing
- To be able to set up a private cloud
- To understand the security issues in the grid and the cloud environment

UNIT I  VIRTUALIZATION  9

UNIT II  VIRTUALIZATION INFRASTRUCTURE  9

UNIT III  CLOUD PLATFORM ARCHITECTURE  9

UNIT IV  PROGRAMMING MODEL  9
Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Developing Map Reduce Applications - Design of Hadoop file system – Setting up Hadoop Cluster - Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack, Nimbus

UNIT V  CLOUD SECURITY  9
Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud – Cloud Security and Trust Management

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the students should be able to:
- Employ the concepts of storage virtualization, network virtualization and its management
- Apply the concept of virtualization in the cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Develop services using Cloud computing
- Apply the security models in the cloud environment

REFERENCES:

BD5201 BIG DATA SECURITY

OBJECTIVES:
- To understand the significance of privacy, ethics in big data environment
- Analyzing the steps to secure big data
- To integrate the big data analytics into the enterprise and its ecosystem
- To understand the security concerns of big data.

UNIT I INTRODUCTION TO BIG DATA
Arrival of analytics - Big Data Reaches Deep - Obstacles Remain - Data Continue to Evolve - Realizing Value - The Case for Big Data - The Rise of Big Data Options - Beyond Hadoop - Big Data Sources Growing

UNIT II SECURITY, COMPLIANCE, AUDITING & PROTECTION

UNIT III INTEGRATING BIG DATA ANALYTICS INTO THE ENTERPRISE
The Strategic Plan for Technology Adoption - Standardize Practices for Soliciting Business User Expectations - Acceptability for Adoption: Clarify Go/No-Go Criteria - Prepare the Data Environment for Massive Scalability - Promote Data Reuse - Institute Proper Levels of Oversight and Governance - Provide a Governed Process for Mainstreaming Technology - Considerations for Enterprise Integration

UNIT IV SECURITY ANALYTICS I

UNIT V SECURITY ANALYTICS II

TOTAL: 45 PERIODS

OUTCOMES
- Design algorithms in a secure manner for Big data applications
- Use available security practices in big data analytics.
REFERENCES:

IF5161 DATABASES LABORATORY L T P C
0 0 4 2

OBJECTIVES:
The student should be able:
- To understand the concepts of DBMS.
- To familiarize with SQL queries.
- To write stored procedures in DBMS.
- To learn front end tools to integrate with databases.

EXPERIMENTS IN THE FOLLOWING TOPICS:
1. Data Definition, Manipulation of Tables and Views, Database Querying – Simple queries, Nested queries, Sub queries and Joins.
2. Triggers, Transaction Control.
3. Embedded SQL, Database Connectivity with Front End Tools High level language extensions - PL/SQL Basics, Procedures and Functions.
4. Active Databases, Deductive Databases.
5. Distributed and Parallel Transactions and Query Processing.
7. Object Oriented Database Design.
10. XML Databases and No SQL Database Storage and Retrieval.

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to:
- Design and Implement databases.
- Formulate complex queries using SQL.
- Design and Implement applications that have GUI and access databases for backend connectivity.

CP5281 TERM PAPERWRITING AND SEMINAR L T P C
23
In this course, students will develop the scientific and technical reading and writing skills they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation

Please keep a file where the work carried out by you is maintained.

Activities to be carried out

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<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
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<tr>
<td>Selection of area of interest and Topic</td>
<td>You are requested to select an area of interest, topic and state an objective</td>
<td>2nd week</td>
<td>3% Based on clarity of thought, current relevance and clarity in writing</td>
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<td>Stating an Objective</td>
<td>1. List 1 Special Interest Groups or professional society</td>
<td>3rd week</td>
<td>3% (the selected information must be area specific and of international and national standard)</td>
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<td>2. List 2 journals</td>
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<td>3. List 2 conferences, symposia or workshops</td>
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<td>4. List 1 thesis title</td>
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<td>5. List 3 web presences (mailing lists, forums, news sites)</td>
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<td>6. List 3 authors who publish regularly in your area</td>
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<td>7. Attach a call for papers (CFP) from your area.</td>
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| Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter | **You have to provide a complete list of references you will be using** - Based on your objective - Search various digital libraries and Google Scholar  
**When picking papers to read** - try to:  
- Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them,  
- Favour papers from well-known journals and conferences,  
- Favour “first” or “foundational” papers in the field (as indicated in other people’s survey paper),  
- Favour more recent papers,  
- Pick a recent survey of the field so you can quickly gain an overview,  
- Find relationships with respect to each other and to your topic area (classification scheme/categorization)  
- Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered | **4th week** | **6%**  
( the list of standard papers and reason for selection) |
| Reading and notes for first 5 papers | **Reading Paper Process**  
- For each paper form a Table answering the following questions:  
  - What is the main topic of the article?  
  - What was/were the main issue(s) the author said they want to discuss?  
  - Why did the author claim it was important?  
  - How does the work build on other’s work, in the author’s opinion?  
  - What simplifying assumptions does the author claim to be making?  
  - What did the author do?  
  - How did the author claim they were going to evaluate their work and compare it to others?  
  - What did the author say were the limitations of their research? | **5th week** | **8%**  
( the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper) |
<table>
<thead>
<tr>
<th>Task</th>
<th>Process Details</th>
<th>Week</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>What did the author say were the important directions for future</td>
<td>Repeat Reading Paper Process</td>
<td>6th</td>
<td>8%</td>
<td>(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
</tr>
<tr>
<td>research? Conclude with limitations/issues not addressed by the</td>
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<td>paper (from the perspective of your survey)</td>
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</tr>
<tr>
<td>Draft outline 1 and Linking papers</td>
<td>Prepare a draft Outline, your survey goals, along with a classification /</td>
<td>8th</td>
<td>8%</td>
<td>(this component will be evaluated based on the linking and classification among the papers)</td>
</tr>
<tr>
<td></td>
<td>categorization diagram</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Abstract</td>
<td>Prepare a draft abstract and give a presentation</td>
<td>9th</td>
<td>6%</td>
<td>(Clarity, purpose and conclusion)</td>
</tr>
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<td></td>
<td>6% Presentation &amp; Viva Voce</td>
</tr>
<tr>
<td>Introduction Background</td>
<td>Write an introduction and background sections</td>
<td>10th</td>
<td>5%</td>
<td>(clarity)</td>
</tr>
<tr>
<td>Sections of the paper</td>
<td>Write the sections of your paper based on the classification / categorization</td>
<td>11th</td>
<td>10%</td>
<td>(this component will be evaluated based on the linking and classification among the papers)</td>
</tr>
<tr>
<td></td>
<td>diagram in keeping with the goals of your survey</td>
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</tr>
</tbody>
</table>
Your conclusions | Write your conclusions and future work | 12th week | 5% (conclusions – clarity and your ideas)
---|---|---|---
Final Draft | Complete the final draft of your paper | 13th week | 10% (formatting, English, Clarity and linking)
| | | | 4% Plagiarism Check Report
Seminar | A brief 15 slides on your paper | 14th & 15th week | 10%
| | | | (based on presentation and Viva-voce)

**TOTAL : 30 PERIODS**

**ELECTIVES**

**BD5001**
**HIGH PERFORMANCE COMPUTING FOR BIG DATA**

**OBJECTIVES:**
- To learn the fundamental concepts of High Performance Computing.
- To learn the network & software infrastructure for high performance computing.
- To understand the real time analytics using high performance computing.
- To learn the different ways of security perspectives and technologies used in HPC.
- To understand the emerging big data applications.

**UNIT I**
**INTRODUCTION**


**UNIT II**
**NETWORK & SOFTWARE INFRASTRUCTURE FOR HIGH PERFORMANCE BDA**


**UNIT III**
**REAL TIME ANALYTICS USING HIGH PERFORMANCE COMPUTING**

UNIT IV SECURITY AND TECHNOLOGIES
Security, Privacy and trust for user – generated content: The challenges and solutions – Role of real time big data processing in the IOT’s – End to end security framework for big sensing data streams – clustering in big data.

UNIT V EMERGING BIG DATA APPLICATIONS
Deep learning Accelerators – Accelerators for clustering applications in machine learning - Accelerators for classification algorithms in machine learning – Accelerators for Big data Genome Sequencing.

OUTCOMES:
- Understand the basics concepts of high performance computing systems.
- Apply the concepts of network and software infrastructure for high performance computing.
- Use the real time analytics using high performance computing.
- Apply the security models and big data applications in high performance computing.

REFERENCES:

SE5091 SERVICE ORIENTED ARCHITECTURE AND DESIGN

OBJECTIVES
- To understand the SOA architecture
- To understand the service oriented analysis and design
- To understand the development of deployment of web services
- To understand the security issues of SOA

UNIT I SOA FUNDAMENTALS

UNIT II SOA AND WEB SERVICES

UNIT III SERVICE ORIENTED ANALYSIS AND DESIGN
Design principles - Business Centric SOA - Deriving Business services - Service Modeling - Coordination - Atomic Transaction - Business activities - Web Service Orchestration Business Process Execution Language (BPEL) - Choreography - Metadata Management - Entity centric business service design - Application Service design - Task centric business service design

UNIT IV WEB SERVICES DEVELOPMENT AND DEPLOYMENT
XML and Web Services - WSDL basics - SOA support in J2EE - Java API for XML-based Web Services (JAX-WS) - Java Architecture for XML Binding (JAXB) - Java API for XML Registries (JAXR) - Web Services Interoperability Technologies - SOA support in .NET - Common Language Runtime - ASP.NET - Web forms - ASP.NET Web Services - Web Services Enhancements

UNIT V SOA APPLICATIONS AND SECURITY

TOTAL : 45 PERIODS

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

• Develop and deploy simple and composite web services with SOA design principles considering the security issues
• Use the standards and technologies of modern web service implementations
• Efficiently use leading development tools to create and consume web services
• Implement a service oriented application

REFERENCES:
OBJECTIVES:
- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To 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

TOTAL : 45 PERIODS

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.
- 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:
CP5009 DATA VISUALIZATION TECHNIQUES   L   T   P   C
3  0  0  3

OBJECTIVES:

- To develop skills to both design and critique visualizations.
- To introduce visual perception and core skills for visual analysis.
- To understand visualization for time-series analysis.
- To understand visualization for ranking analysis.
- To understand visualization for deviation analysis.
- To understand visualization for distribution analysis.
- To understand visualization for correlation analysis.
- To understand visualization for multivariate analysis.
- To understand issues and best practices in information dashboard design.

UNIT I  CORE SKILLS FOR VISUAL ANALYSIS


UNIT II  TIME-SERIES, RANKING, AND DEVIATION ANALYSIS


UNIT III  DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS


UNIT IV  INFORMATION DASHBOARD DESIGN

31

UNIT V INFORMATION DASHBOARD DESIGN


TOTAL: 45 PERIODS

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

- Explain principles of visual perception
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Design information dashboard

REFERENCES:


SE5014 PRINCIPLES OF SUPPLY CHAIN MANAGEMENT

OBJECTIVES

The student should be able to

- Learn about the E-business environment driven by the Automation Software in quick movement of supply of products
- Study the fundamentals of supply chain management comprising of Inventory management and warehousing etc as co parts of entire business
- Learn the cost management for the supply of products
- Improve the overall organization performance and customer satisfaction by improving product or service delivery to consumer.
Supply chain networks, Integrated supply chain planning, Decision phases in supply chain, process view of a supply chain, supply chain flows, Overview of supply chain models and modeling systems, Supply chain planning: Strategic, operational and tactical, Understanding supply chain through process mapping and process flow chart.

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

UNIT III PLANNING AND MANAGING INVENTORIES
Introduction to Supply Chain Inventory Management. Inventory theory models: Economic Order Quantity Models, Reorder Point Models and Multi echelon Inventory Systems, Relevant deterministic and stochastic inventory models and Vendor managed inventory models.

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

UNIT V STRATEGIC COST MANAGEMENT IN SUPPLY CHAIN
The financial impacts, Volume leveraging and cross docking, global logistics and material positioning, global supplier development, target pricing, cost management enablers, Measuring service levels in supply chains, Customer Satisfaction/Value/Profitability/Differential Advantage.

TOTAL : 45 PERIODS

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

- Learn about the e- business for supply of products managed with the appropriate methodologies and management techniques
- Know Supply Chain Management consisting of all parties (Including Manufacturer, Marketer, Suppliers, transporters, Warehouses, Retailers and even customers) directly or indirectly involved in fulfilment of a customer
- Ensure that the supply chains deliver varying degrees of six outcomes — the traditional cost-related benefit plus responsiveness, security, sustainability, resilience and innovation — depending on key customers' needs
- Know automated back office software systems
- Know basic business process.

REFERENCES:

IF5002 DEEP LEARNING L T P C 3 0 0 3

OBJECTIVES:

This course covers the basics of machine learning, neural networks and deep learning. Model for deep learning technique and the various optimization and generalization mechanisms are included. Major topics in deep learning and dimensionality reduction techniques are covered. The objective of this course is:

- To present the mathematical, statistical and computational challenges of building neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

UNIT I INTRODUCTION

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT II DEEP NETWORKS


UNIT III DIMENTIONALITY REDUCTION

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

UNIT IV OPTIMIZATION AND GENERALIZATION

UNIT V \hspace{1cm} CASE STUDY AND APPLICATIONS

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection- BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand basics of deep learning
- Implement various deep learning models
- Realign high dimensional data using reduction techniques
- Analyze optimization and generalization in deep learning
- Explore the deep learning applications

REFERENCES:


MU5251 \hspace{1cm} MULTIMEDIA COMMUNICATION NETWORKS

OBJECTIVES:

- To understand the multimedia communication models
- To analyze the guaranteed service model
- To study the multimedia transport in wireless networks
- To explore real-time multimedia network applications

UNIT I \hspace{1cm} MULTIMEDIA COMMUNICATION MODELS


UNIT II \hspace{1cm} BEST EFFORT AND GUARANTEED SERVICE MODEL


UNIT III \hspace{1cm} MULTIMEDIA ON IP NETWORKS

QoS aware routing-RSVP-Integrated and Differentiated services-MPLS-Multicasting-IGMP-PIM-DVMRP

UNIT IV \hspace{1cm} TRANSPORT LAYER SUPPORT FOR MULTIMEDIA

Multimedia over TCP-Significance of UDP- Multimedia Streaming- Audio and Video Streaming-
Interactive and non Interactive Multimedia-RTP/RTCP-SIP-RTSP.

UNIT V  MULTIMEDIA QOS ON WIRELESS NETWORKS  9

IEEE 802.11e, IEEE 802.16, 3G networks-UMTS, 3GPP, 4G networks-LTE-IMS.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Deploy the right Multimedia Communication models
- Apply QoS to multimedia network applications with efficient routing techniques
- Develop the real-time multimedia network applications

REFERENCES:


BD5002    AGILE SOFTWARE DEVELOPMENT    L    T    P    C

3    0    0    3

OBJECTIVES:

- To understand the basic concepts of Agile Software Process.
- To gain knowledge in the area of various Agile Methodologies.
- To develop Agile Software Process
- To know the principles of Agile Testing
- Assess product quality risks within an Agile project

UNIT I    INTRODUCTION  9

Software is new product development – Iterative development – Risk (Driven and Client (Driven iterative planning – Time boxed iterative development – During the Iteration, No changes from external stakeholders –Evolutionary and adaptive Development (Evolutionary requirements analysis – Early “Top Ten” high (level requirements and skilful analysis Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

UNIT II    AGILE AND ITS SIGNIFICANCE  9


UNIT III AGILE METHODOLOGY


UNIT IV SCRUM


UNIT V AGILE PRACTICING AND TESTING


TOTAL :45 PERIODS

OUTCOMES:

- Demonstrate a systematic understanding of current agile techniques and practices used in industry.
- Apply industry standard agile techniques in developing software in a team.
- Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
- Apply concepts of XP and EVE in developing software.
- Managing the changes applying different testing techniques

TOTAL :30 PERIODS

REFERENCES:

OBJECTIVES:
- To understand the terms and terminologies of predictive modeling.
- To study the various predictive models, their merits, demerits and application.
- To get exposure to various analytical tools available for predictive modeling.

UNIT I  INTRODUCTION TO PREDICTIVE MODELING  9
Core ideas in data mining - Supervised and unsupervised learning Classification vs Prediction - Steps in data mining - SEMMA Approach - Sampling - Pre-processing - Data cleaning - Data Partitioning - Building a model Statistical models - Statistical models for predictive analytics.

UNIT II  PREDICTIVE MODELING BASICS  9

UNIT III  PREDICTIVE MODELS  9

UNIT IV  PREDICTIVE MODELING MARKUP LANGUAGE  9

UNIT V  TECHNOLOGIES AND CASE STUDIES  9

OUTCOMES:
- Students who complete this course will be able to design and analyze appropriate predictive models.
- define the predictive models using PMML.
- apply statistical tools for analysis.

REFERENCES:

IF5091 VIDEO ANALYTICS L T P C
3 0 0 3

OBJECTIVES:
- To know the fundamental concepts of big data and analytics
- To learn various techniques for mining data streams
- To acquire the knowledge of extracting information from surveillance videos.
- To learn Event Modelling for different applications.
- To understand the models used for recognition of objects in videos.

UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS

UNIT II MINING DATA STREAMS

UNIT III VIDEO ANALYTICS

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION
Event Modelling- Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition- Activity modelling using 3D shape, Video summarization, shape based activity models- Suspicious Activity Detection

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS
Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition
OUTCOMES:

On successful completion of this course, students will be able to:
- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Work with surveillance videos for analytics.
- Design of optimization algorithms for better analysis and recognition of objects in a scene.
- Model a framework for Human Activity Recognition

REFERENCES:


BD5004 NOSQL DATABASE

OUTCOMES:
Define, compare and use the four types of NoSQL Databases
Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

UNIT I INTRODUCTION TO NOSQL DATABASES
Overview of NoSQL Databases - Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Aggregate-Oriented Databases.

UNIT II DATABASE FOR MODERN WEB
Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication Document Databases, Scaling, Suitable Use Cases, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

UNIT III COLUMN- ORIENTED NOSQL DATABASES
UNIT IV KEYVALUE DATABASE DESIGNS 9
NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

UNIT V GRAPH DATABASE DESIGN 9
Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines.

TOTAL: 45 PERIODS

OUTCOMES:
- Demonstrate an understanding of installing MongoDB.
- Explain the techniques used to create, insert, update and delete data/documents.
- Demonstrate the various techniques used to query the database.
- Explain techniques to optimize querying using indexing.
- Explain the technique of splitting data across machines via sharding

REFERENCES:

MP5007 COGNITIVE COMPUTING L T P C
3 0 0 3

OBJECTIVES:
- To learn about design of cognitive systems
- To be familiar with techniques to support cognitive systems
- Able to analyze the effectiveness of a cognitive system
- Understand the deployment of cognitive applications
- Understand the development process of cognitive systems

UNIT I INTRODUCTION TO COGNITIVE COMPUTING 9
UNIT II   NATURAL LANGUAGE PROCESSING IN COGNITIVE SYSTEMS


UNIT III  ADVANCED ANALYTICS IN COGNITIVE COMPUTING


UNIT IV   COGNITIVE SYSTEMS APPROACHES


UNIT V   BUILDING A COGNITIVE APPLICATION


OUTCOMES:
- Clear understanding of the elements and principles in designing a cognitive system
- Appreciate the role of Natural language processing and knowledge representation in Cognitive systems
- Analyze a cognitive computing system through case studies
- Able to select an appropriate approach to build a cognitive system
- Provide a system flow to deploy a cognitive application

REFERENCES:
1. Developing Cognitive Applications
   https://www.ibm.com/developerworks/learn/cognitive/
OBJECTIVES:
- To understand the components of the social network.
- To model and visualize the social network.
- To mine the users in the social network.
- To understand the evolution of the social network.
- To know the applications in real time systems.

UNIT I  INTRODUCTION

UNIT II  MODELING AND VISUALIZATION

UNIT III  MINING COMMUNITIES
Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV  EVOLUTION

UNIT V  APPLICATIONS
A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to
- Work on the internals components of the social network
- Model and visualize the social network
- Mine the behaviour of the users in the social network
- Predict the possible next outcome of the social network
- Apply social network in real time applications

REFERENCES:


SE5006 VIRTUALIZATION TECHNIQUES AND APPLICATIONS

OBJECTIVES

- To understand the concepts of virtualization and virtual machines
- To understand the implementation of process and system virtual machines
- To explore the aspects of high level language virtual machines
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions

UNIT I OVERVIEW OF VIRTUALIZATION


UNIT II PROCESS VIRTUAL MACHINES


UNIT III HIGH LEVEL LANGUAGE VIRTUAL MACHINES AND SERVER VIRTUALIZATION

HLL virtual machines: Pascal P-Code – Object Oriented HLLVMs - Java VM architecture - Java Native Interface - Common Language Infrastructure. Server virtualization: Partitioning techniques - virtual hardware - uses of virtual servers - server virtualization platforms
UNIT IV NETWORK AND STORAGE VIRTUALIZATION

UNIT V APPLYING VIRTUALIZATION

TOTAL : 45 PERIODS

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

• Deploy legacy OS on virtual machines.
• Analyze the intricacies of server, storage and network virtualizations
• Design and develop applications on virtual machine platforms

REFERENCES:

BD5005 NATURAL LANGUAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:
• Learn the techniques in natural language processing.
• Be familiar with the natural language generation.
• To understand the use of CFG and PCFG in NLP
• Be familiar with the natural language generation
• To understand the role of semantics of sentences and pragmatics
• To apply the NLP techniques to IR applications
UNIT I INTRODUCTION


UNIT II WORD LEVEL ANALYSIS


UNIT III SYNTACTIC ANALYSIS


UNIT IV SEMANTICS AND PRAGMATICS


UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES


TOTAL: 45 PERIODS

OUTCOMES:

- Analyze and generate the natural language text
- 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 compare and contrast the use of different statistical approaches for different types of NLP applications.

REFERENCES:

3. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.

SE5002         BUSINESS INTELLIGENCE        L T P C
                             3 0 0 3

OBJECTIVES:
The student should be able to
- Identify the enormous opportunities that currently exists in providing business intelligence services
- Gain a practical understanding of the key data mining methods of classification, prediction, data reduction and exploration
- Understand and help develop the strategies of modern enterprise decision makers
- Acquire knowledge in many scientific and technological fields including data warehouses, data mining, content analytics, business process management, visual analytics
- Gain competences in information systems, web science, decision science, software engineering, and innovation and entrepreneurship.

UNIT I      INTRODUCTION

UNIT II     BI BIG PICTURE

UNIT III    BI ARCHITECTURE

UNIT IV    BI TECHNOLOGIES
Successful BI – LOFT Effect – Importance of BI Tools – BI standardization - Creating business value through location based intelligence – Technologies enabling BI – technologies for information integration - Building effective BI Systems – Strategic, Tactical,
Operational and Financial Intelligence.

UNIT V  FUTURE OF BI

Knowledge Discovery for BI – Markov Logic Networks – BI Search and Text Analytics –
Advanced Visualisation – Semantic Web Technologies for building BI - Service oriented BI –
Collaborative BI - Evaluating BI – Stakeholder model of BI.

TOTAL : 45 PERIODS

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

- Assess the business intelligence potential of today's data rich environment
- Plan how to decide when to use which technique
- Outline how to implement major techniques using Excel add-ins
- Gain the intellectual capital required to provide business analytics services.

REFERENCES:
3. Elizabeth Vitt, Michael Lukevich, Stacia Misner, “Business Intelligence”, O'Reilly Media,
   Inc., 2010.
4. Larissa Terpeluk Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project
   Lifecycle for Decision-Support Applications, Addison-Wesley Information Technology
5. Marie - Aude Auffaure, Esteban Zimány, “Business Intelligence”, First European Summer
   School eBISS, 2011.
   Intelligence Techniques: A Perspective from Accounting and Finance”, illustrated Springer,
   2003
   John Wiley & Sons, 2010

BD5006  R LANGUAGE  L T P C
3 0 0 3

UNIT I  INTRODUCTION TO DATA ANALYSIS
Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data:
Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data
Analytics

UNIT II  HADOOP -HIVE and HIVEQL, HBASE
Hive Architecture and Installation, Comparison with Traditional Database, HiveQL -
Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries,
HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper
- how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build
Applications with Zookeeper
UNIT III R PROGRAMMING BASICS
Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, R packages

UNIT IV DATA VISUALIZATION USING R
Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatter plots, Pie Charts

UNIT V STATISTICS WITH R
Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression, Survival Analysis, Prescriptive Analytics: Creating data for analytics through designed experiments, Creating data for analytics through active learning, Creating data for analytics through reinforcement learning

REFERENCES:

BD5007 WEB ANALYTICS L P T C 3 0 0 3

OBJECTIVES:
- To know the importance of qualitative data, get insights and techniques.
- To develop customer-centric approach in dealing with data.
- To know the principles, tools and methods of web intelligence.
- To apply analytics for business situations.

UNIT I INTRODUCTION

UNIT II STRATEGIES FOR ANALYTICS
Qualitative Analysis — Customer Centricity — Site Visits — Surveys — Questionnaires — Website Surveys — Post visits — Creating and Running Benefits of surveys — Critical components of successful strategy.
UNIT III  CONCEPTS OF WEB ANALYTICS  [9]
Web Analytic concepts — URLS — Cookies — Time on site — Page views —
Understand standard reports — Website content quality — Navigation reports (top
pages, top destinations, site overlay). — Search Analytics — Internal search, SEO and PPC
— Measuring Email and Multichannel Marketing - Competitive intelligence and Web 2.0
Analytics — Segmentation — Connectable reports.

UNIT IV  GOOGLE ANALYTICS  [9]
Analytics - Cookies - Accounts vs Property - Tracking Code - Tracking Unique Visitors -
Demographics - Page Views & Bounce Rate Acquisitions - Custom Reporting.

UNIT V  ADVERTISING AND PROMOTION  [9]
Goals & Funnels — Filters - Ecommerce Tracking - Real Time Reports - Customer Data
Alert - Adwords Linking - Adsense Linking - Attribution Modeling - Segmentation -
Campaign Tracking - Multi-Channel Attribution.

TOTAL:45 PERIODS

OUTCOMES:
• Know the concepts and terminologies related to web analytics.
• Explore various parameters used for web analytics and their impact.
• Explore the use of tools and techniques of web analytics.
• Get experience on websites, web data insights and conversions

REFERENCES:
1. Avinash Kaushik, ‘Web Analytics 2.0: The Art of Online Accountability and
can help you understand your Users’, Morgan Kaufmann, 2013.
Wiley & sons, 2016.

CP5075  BIO INFORMATICS  L  T  P  C
3 0 0 3

OBJECTIVES:
• To get exposed to the fundamentals of bioinformatics.
• To learn bio-informatics algorithm and phylogenetic concept.
• To understand open problems and issues in replication and molecular clocks.
• To learn assemble genomes and corresponding theorem.
• To study and exposed to the domain of human genomics.

UNIT I  INTRODUCTION AND FUNDAMENTALS  9
Fundamentals of genes, genomics, molecular evolution — genomic technologies —
beginning of bioinformatics - genetic data —sequence data formats — secondary database —
examples — data retrieval systems — genome browsers.
UNIT II  BIOINFORMATICS ALGORITHM AND ANALYSIS

Sequence alignment and similarity searching in genomic databases: BLAST and FASTA – additional bioinformatics analysis involving nucleic acid sequences-additional bioinformatics analysis involving protein sequences – Phylogenetic Analysis.

UNIT III  DNA REPLICATION AND MOLECULAR CLOCKS


UNIT IV  ASSEMBLE GENOMES AND SEQUENCES


UNIT V  HUMAN GENOME


TOTAL: 45 PERIODS

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

- Deploy the genomics technologies in Bioinformatics.
- Able to distinct efficient algorithm and issues.
- Deploy the replication and molecular clocks in bioinformatics.
- Work on assemble genomes and sequences.
- Use the Microarray technologies for genome expression.

REFERENCES:

2. Istvan Miklos,Renyi Institute, “Introduction to algorithms in bioinformatics”, Springer 2016
Objectives:

- To explore the various forms of electronic health care information.
- To learn the techniques adopted to analyze health care data.
- To understand the predictive models for clinical data
- To understand the applications of data analytics in healthcare

UNIT 1 INTRODUCTION

UNIT II ANALYSIS
Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine.

UNIT III BASIC ANALYTICS
Natural Language Processing and Data Mining for Clinical Text- Mining the Biomedical-Social Media Analytics for Healthcare.

UNIT IV ADVANCED DATA ANALYTICS

UNIT V APPLICATIONS

TOTAL PERIODS: 45

REFERENCES


OUTCOMES:

Students will be able to:

- Analyze health care data using appropriate analytical techniques.
- Apply analytics for decision making in healthcare services.
- Apply data mining to integrate health data from multiple sources and develop efficient clinical decision support systems.