



## DEPARTMENT OF CSE( DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### INTRODUCTION TO DATA SCIENCE

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

#### course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

#### Course Outcomes:

- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

### UNIT- I

#### Introduction

Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication

- Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model –Over fitting.

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

### UNIT- II Data Types & Statistical Description

**Types of Data:** Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

### UNIT- III

**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

**Factors and Data Frames:** Introduction to Factors: Factor Levels, summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

**Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

### UNIT- IV

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

### UNIT- V

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

**Regression:** Linear Regression Analysis, Multiple Linear regression

### TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly, 2014.
2. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.

**REFERENCE BOOKS:**

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
3. Brian S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.



**DEPARTMENT OF CSE( DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**DATA MINING**

**B.Tech. CSE - III Year, I Sem.**

L	T	P	C
3	0	0	3

**Pre-Requisites:**

- A course on “Database Management Systems”
- Knowledge of probability and statistics

**Course Objectives:**

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

**Course Outcomes:**

- Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

**UNIT - I**

**Data Mining:** Data–Types of Data–, Data Mining Functionalities– Interestingness

Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

## **UNIT - II**

**Association Rule Mining:** Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

## **UNIT - III**

**Classification:** Classification and Prediction – Basic concepts–Decision tree induction– Bayesian classification, Rule–based classification, Lazy learner.

## **UNIT - IV**

**Clustering and Applications:** Cluster analysis–Types of Data in Cluster Analysis– Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

## **UNIT - V**

**Advanced Concepts:** Basic concepts in Mining data streams–Mining Time–series data— Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

## **TEXT BOOKS:**

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3<sup>rd</sup> Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

## **REFERENCE BOOK:**

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.



## DEPARTMENT OF CSE( DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

## DESIGN AND ANALYSIS OF ALGORITHM

**B.Tech. III Year I Sem.**

L	T	P	C
3	1	0	3

**Prerequisites:** Programming for problem solving and Data Structures

### **Course Objectives:**

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst, average, and best- case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

### **Course Outcomes:**

1. Analyze the performance of algorithms
2. Choose appropriate data structures and algorithm design methods for a specified application
3. Understand the choice of data structures and the algorithm design methods

## UNIT - I

**Introduction:** Algorithm, Performance Analysis-Space complexity, Time

complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

#### UNIT - II

**Disjoint Sets:** Disjoint set operations, union and find algorithms, Priority Queue-Heaps, Heapsort **Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

#### UNIT - III

**Dynamic Programming:** General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

#### UNIT - IV

**Greedy method:** General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

#### UNIT - V

**Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

#### TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekaran, University Press.

#### REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiser son, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.



## DEPARTMENT OF CSE( DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### CLOUD COMPUTING (Professional Elective – I)

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

**Pre-requisites:** Courses on Computer Networks, Operating Systems, Distributed Systems.

#### Course Objectives:

1. This course provides an insight into cloud computing.
2. Topics covered include- distributed system models, different cloud service models, service- oriented architectures, cloud programming and software environments, resource management.

#### Course Outcomes:

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the ways in which the cloud can be programmed and deployed.
3. Understanding cloud service providers.

#### UNIT - I

**Computing Paradigms:** High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

#### UNIT - II

**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

### **UNIT - III**

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

### **UNIT - IV**

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

### **UNIT V**

**Cloud Service Providers:** EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

### **TEXT BOOK:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

### **REFERENCE BOOKS:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.



**DEPARTMENT OF CSE( DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**INFORMATION RETRIEVAL SYSTEMS (Professional Elective – I)**

**B.Tech. III Year I Sem.**

L	T	P	C
3	0	0	3

**Prerequisites:**

1. Data Structures

**Course Objectives:**

- To learn the concepts and algorithms in Information Retrieval Systems
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

**Course Outcomes:**

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

**UNIT - I**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

## **UNIT - II**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

## **UNIT - III**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages  
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

## **UNIT - IV**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext  
Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

## **UNIT - V**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems  
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

## **TEXT BOOK:**

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

## **REFERENCE BOOKS:**

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### PATTERN RECOGNITION (Professional Elective – I)

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

#### Prerequisites:

- Programming for problem solving
- Computer Oriented Statistical Methods

#### Course Objectives:

- Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.

#### Course Outcomes:

- Understand the importance of pattern recognition and its representation
- Analyza the variants of NN algorithm
- Understand the necessity of Hidden markov models, decision tree and SVM for classification
- Understand different types of clustering algorithms

#### UNIT - I

Introduction: Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

## **UNIT - II**

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

## **UNIT - III**

Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

## **UNIT - IV**

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

## **UNIT - V**

Clustering: Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

## **TEXT BOOK:**

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub, 1st Ed.

## **REFERENCE BOOKS:**

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing-Hwang Juang. Prentice Hall Pub.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**COMPUTER GRAPHICS (Professional Elective – I)**

**B.Tech. III Year I Sem.**

L	T	P	C
3	0	0	3

**Prerequisites**

1. Programming for problem solving and Data Structures

**Course Objectives**

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D, 3D objective transformations

**Course Outcomes**

- Explore applications of computer graphics
- Understand 2D, 3D geometric transformations and clipping algorithms
- Understand 3D object representations, curves, surfaces, polygon rendering methods, color models
- Analyze animation sequence and visible surface detection methods

**UNIT - I**

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices

**Output primitives:** Points and lines, line drawing algorithms (DDA and Bresenham’s Algorithm) circle- generating algorithms and ellipse - generating algorithms

**Polygon Filling:** Scan-line algorithm, boundary-fill and flood-fill algorithms

**UNIT - II**

**2-D geometric transformations:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

**2-D viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, clipping operations, point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping-Sutherland Hodgeman polygon clipping algorithm.

### UNIT - III

**3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Polygon rendering methods, color models and color applications.

### UNIT - IV

**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**3-D viewing:** Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

### UNIT - V

**Computer animation:** Design of animation sequence, general computer animation functions, raster animations, computer animation languages, key frame systems, motion specifications.

**Visible surface detection methods:** Classification, back-face detection, depth-buffer method, BSP- tree method, area sub-division method and octree method.

### TEXT BOOKS:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education

### REFERENCE BOOKS:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
5. Computer Graphics, Steven Harrington, TMH.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**IMAGE PROCESSING (Professional Elective – I)**

**B.Tech. III Year I Sem.**

L	T	P	C
3	0	0	3

**Prerequisites**

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of digital signal processing is desirable.
2. A course on “Computational Mathematics”
3. A course on “Computer Oriented Statistical Methods”

**Course Objectives**

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

**Course Outcomes**

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
- Demonstrate the knowledge of filtering techniques.
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

**UNIT - I**

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of

Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

## **UNIT - II**

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

## **UNIT - III**

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

## **UNIT - IV**

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

## **UNIT - V**

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

## **TEXT BOOK:**

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2<sup>nd</sup> Ed, 2004.

## **REFERENCE BOOKS:**

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wiley, 3rd Edition, 2004.



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### Data Science with R Programming Lab

B.Tech. III Year I Sem.

L	T	P	C
0	0	2	1

**Pre-requisites:** Any programming language.

#### Course Objectives:

- Familiarize with R basic programming concepts, various data structures for handling datasets, various graph representations and Exploratory Data Analysis concepts

#### Course Outcomes:

- Setup R programming environment.
- Understand and use R – Data types and R – Data Structures.
- Develop programming logic using R – Packages.
- Analyze data sets using R – programming capabilities

#### LIST OF EXPERIMENTS:

1. Download and install R-Programming environment and install basic packages using `install.packages()` command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc.,)
3. Write R command to
  - i) Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
  - ii) Enumerate multiplication and division operations between

matrices and vectors in R console

4. Write R command to
  - i) Illustrates the usage of Vector sub setting and Matrix sub setting
  - ii) Write a program to create an array of  $3 \times 3$  matrixes with 3 rows and 3 columns.
5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file
6. Create a CSV file having Speed and Distance attributes with 1000 records.  
Write R program to draw
  - i) Box plots
  - ii) Histogram
  - iii) Line Graph
  - iv) Multiple line graphs
  - v) Scatter plotto demonstrate the relation between the cars speed and the distance.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.
9. Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file

#### **TEXT BOOKS:**

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

#### **REFERENCE BOOKS:**

1. Hadley Wickham, Garrett Golemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**DATA MINING LAB**

**B.Tech. III Year I Sem.**

L	T	P	C
0	0	2	1

**Prerequisites:** A course on “Database Management System”.

**Course Objectives:**

1. The course is intended to obtain hands-on experience using data mining software.
2. Intended to provide practical exposure of the concepts in data mining algorithms.

**Course Outcomes:**

3. Apply preprocessing statistical methods for any given raw data.
4. Gain practical experience of constructing a data warehouse.
5. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
6. Apply OLAP operations on data cube construction.

**LIST OF EXPERIMENTS:**

Experiments using Weka & Pentaho Tools

1. Data Processing Techniques:
  - (i) Data cleaning (ii) Data transformation – Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm

7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

**TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw- Hill Edition, Tenth reprint 2007.

**REFERENCE BOOK:**

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining, Pearson Education.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**WEBPROGRAMMING LAB**

**B.Tech. III Year I Sem.**

L	T	P	C
0	0	2	1

**COURSE OBJECTIVE**

- Understand the importance of the web as a medium of communication.
- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Develop skills in analyzing the usability of a web site.
- Learn the language of the web: HTML and CSS.
- Be able to embed social media content into web pages.
- Implement and understand how to interpret basic web analytics.
- Use JavaScript to access and use web services for dynamic content

**COURSE OUTCOME**

- Use Javascript and XHTML to create web pages with advanced interactivity
- Program basic functions in Javascript and XHTML
- Use javascript to create functional forms
- Us Javasript to control browser frames and windows
- Use cascading style sheets to dsign web pages

**LIST OF EXPERIMENTS:**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:

a) Input: A number n obtained using prompt  
Output: The first n Fibonacci numbers

b) Input: A number n obtained using prompt

Output: A table of numbers from 1 to n and their squares using **alert**

2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN ( the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.

b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)

3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.

b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.

4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include 100 USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.

b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

7. Write a Perl program to display a digital clock which displays the current time of the server.

8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.

10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.

12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

#### TEXT BOOKS:

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.
3. Michael Morrison XML Unleashed Tech media SAMS.

#### REFERENCE BOOKS:

1. John Pollock, Javascript - A Beginners Guide, 3rd Edition — Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**ETL- KAFKA/TALEND LAB**

**B.Tech. III Year I Sem.**

L	T	P	C
0	0	2	1

**Course Objectives:**

- Develop a comprehensive understanding of Extract, Transform, Load (ETL) processes using Apache Kafka and Talend.
- Understand how to scale Kafka clusters seamlessly to handle growing data volumes, ensuring optimal performance for ETL operations.

**Course Outcomes:**

- Learn to design and deploy fault-tolerant Kafka clusters, ensuring data integrity and availability in real-world scenarios.
- Gain practical experience in cluster management, topic creation, and basic operations such as producing and consuming messages.

**LIST OF EXPERIMENTS:**

1. Install Apache Kafka on a single node.
2. Demonstrate setting up a single-node, single-broker Kafka cluster and show basic operations such as creating topics and producing/consuming messages.
3. Extend the cluster to multiple brokers on a single node.
4. Write a simple Java program to create a Kafka producer and Produce messages to a topic.
5. Implement sending messages both synchronously and asynchronously in the producer.
6. Develop a Java program to create a Kafka consumer and subscribe to a topic and consume messages.
7. Write a script to create a topic with specific partition and replication factor settings.
8. Simulate fault tolerance by shutting down one broker and observing the cluster

behavior.

9. Implement operations such as listing topics, modifying configurations, and deleting topics.
10. Introduce Kafka Connect and demonstrate how to use connectors to integrate with external systems.
11. Implement a simple word count stream processing application using Kafka Stream
12. Implement Kafka integration with the Hadoop ecosystem.

**TEXT BOOK:**

1. Neha Narkhede, Gwen Shapira, Todd Palino, Kafka – The Definitive Guide: Real-time data and stream processing at scale, O'Reilly



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**BIG DATA ANALYTICS**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objectives**

- Provide the knowledge of principles and techniques for Big data Analytics and give an exposure of the frontiers of Big data Analytics

**Courses Outcomes**

- Understand the importance of big data analytics and its types
- Perform analytics on big data
- Proficiency in big data storage and processing in Hadoop
- Data analytics through MongoDB
- Data analytics through R

**UNIT - I**

Types of Digital data: Classification of Digital Data,  
 Introduction to Big Data: Evolution of Big Data, definition of big data, Traditional Business Intelligence vs BigData, Coexistence of Big Data and Data Warehouse.  
 Big Data Analytics: introduction to Big Data Analytics, What Big Data Analytics Isn't, Sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Big Data Analytics Importance, Data Science, Terminologies used in Big Data Environments.

**UNIT - II**

Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions. Need of hadoop, RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview,HDFS

### **UNIT - III**

Processing data with hadoop, introduction to mapreduce programming, mapper, reducer, combiner, partitioner

NoSQL: Types of NoSQL Databases, advantages of NoSQL, Use of NoSQL in industry, SQL vs NoSQL, newSQL, comparison of Nosql, sql and newsql

### **UNIT - IV**

MongoDB, necessity of mongodb, terms used in mongodb and RDBMS, datatypes in mongoDB, mongodb query language

### **UNIT - V**

Introduction to R programming, operators, control statements and functions, interfacing with R, vectors, matrices, lists, data frames, factors and tables, accessing input and output, graphs in R, R apply family

### **TEXT BOOKS:**

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. R programming for beginners, sandhya arora, latesh malik, university press.

### **REFERENCE BOOKS:**

1. chandramouli subramanian, Asha A Geroge, C R Rene Robin, big data analytics, University press.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1<sup>st</sup> Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3<sup>rd</sup> Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1<sup>st</sup> Edition, IBM Corporation, 2012.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**MACHINE LEARNING**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Course 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

**Course Outcomes:**

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

**UNIT - I**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

## **UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

## **UNIT - III**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

## **UNIT - IV**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization  
Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

## **UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example  
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

## **TEXT BOOKS:**

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

## **REFERENCE BOOKS:**

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and

- Technical Professionals<sup>l</sup>, First Edition, Wiley, 2014
4. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**AUTOMATA THEORY AND COMPILER DESIGN**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objectives**

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

**Course Outcomes**

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

**UNIT - I**

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings,

Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

## UNIT - II

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages:**

Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

## UNIT - III

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

**Turing Machines:**

Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

**Undecidability:**

Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

## UNIT - IV

**Introduction:** The structure of a compiler

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering,

Recognition of Tokens, The Lexical- Analyzer Generator Lex

**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

## **UNIT - V**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax- Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

## **TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science- Automata languages and computation, Mishra and Chandrashekar, 2nd Edition, PHI.

## **REFERENCE BOOKS:**

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2<sup>nd</sup> Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
5. Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**SCRIPTING LANGUAGES (Professional Elective – II)**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Prerequisites:**

1. A course on “Computer Programming and Data Structures”.
2. A course on “Object Oriented Programming Concepts”.

**Course Objectives:**

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

**Course Outcomes:**

- Comprehend the differences between typical scripting languages and typical system and application programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
- Acquire programming skills in scripting language

**UNIT - I**

**Introduction:** Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies,

Choice of Webservers, SOAP and web services

RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

## **UNIT - II**

**Extending Ruby:** Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

## **UNIT - III**

### **Introduction to PERL and Scripting**

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

## **UNIT - IV**

### **Advanced perl**

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

## **UNIT -V**

### **TCL**

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

### **Tk**

Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

**TEXT BOOKS:**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second edition

**REFERENCE BOOKS:**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**MOBILE APPLICATION DEVELOPMENT (Professional Elective – II)**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Prerequisites**

1. Acquaintance with JAVA programming.
2. A Course on DBMS.

**Course Objectives**

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

**Course Outcomes**

- Understand the working of Android OS Practically.
- Develop Android user interfaces
- Develop, deploy and maintain the Android Applications.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, best practices in

Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

## **UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

## **UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

## **UNIT - IV**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

## **UNIT - V**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

## **TEXT BOOK:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

**REFERENCE BOOKS:**

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Prerequisites**

1. Software Engineering

**Course Objectives**

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

**Course Outcomes**

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic-based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

**UNIT - I**

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT - II**

Transaction Flow Testing: transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

### **UNIT - III**

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

### **UNIT - IV**

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

### **UNIT - V**

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

### **TEXT BOOKS:**

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

### **REFERENCE BOOKS:**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### FULL STACK DEVELOPMENT (Professional Elective – II)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

#### Pre-Requisites:

1. Object Oriented Programming
2. Web Technologies

#### Course Objectives:

- Students will become familiar to implement fast, efficient, interactive and scalable web applications using run time environment provided by the full stack components.

#### Course Outcomes:

- Understand Full stack components for developing web application.
- Apply packages of NodeJS to work with Data, Files, Http Requests and Responses.
- Use MongoDB data base for storing and processing huge data and connects with NodeJS application.
- Design faster and effective single page applications using Express and Angular.
- Create interactive user interfaces with react components.

### UNIT-I

#### Introduction to Full Stack Development:

Understanding the Basic Web Development Framework- User, Browser, Webserver,

Backend Services, Full Stack Components - Node.js, MongoDB, Express, React, Angular. Java Script Fundamentals, NodeJS- Understanding Node.js, Installing Node.js, Working with Node Packages, creating a Node.js Application, Understanding the Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks

## **UNIT-II**

### **Node.js:**

Working with JSON, Using the Buffer Module to Buffer Data, Using the Stream Module to Stream Data, Accessing the File System from Node.js- Opening, Closing, Writing, Reading Files and other File System Tasks. Implementing HTTP Services in Node.js- Processing URLs, Processing Query Strings and Form Parameters, Understanding Request, Response, and Server Objects, Implementing HTTP Clients and Servers in Node.js, Implementing HTTPS Servers and Clients. Using Additional Node.js Modules-Using the os Module, Using the util Module, Using the dns Module, Using the crypto Module.

## **UNIT-III**

### **MongoDB:**

Need of NoSQL, Understanding MongoDB, MongoDB Data Types, Planning Your Data Model, Building the MongoDB Environment, Administering User Accounts, Configuring Access Control, Administering Databases, Managing Collections, Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, Understanding the Objects Used in the MongoDB Node.js Driver, Accessing and Manipulating Databases, Accessing and Manipulating Collections

## **UNIT-IV**

### **Express and Angular:**

Getting Started with Express, Configuring Routes, Using Requests Objects, Using Response Objects. Angular: importance of Angular, Understanding Angular, creating a Basic Angular Application, Angular Components, Expressions, Data Binding, Built-in Directives, Custom Directives, Implementing Angular Services in Web Applications.

## **UNIT-V**

### **React:**

Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React, Rendering and Life Cycle Methods in React, Working with forms in React, integrating third party libraries, Routing in React.

### **TEXT BOOKS:**

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development, 2<sup>nd</sup> Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas, React in Action, 1<sup>st</sup> Edition, Manning Publications.

### **REFERENCE BOOKS:**

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2<sup>nd</sup> Edition, Apress, 2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', 1<sup>st</sup> edition, Apress, 2018.
3. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2<sup>nd</sup> edition, Addison-Wesley Professional, 2018.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**COMPUTER VISION AND ROBOTICS (Professional Elective – II)**

**B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Pre-Requisites:** Linear Algebra and Probability.

**Course Objectives:**

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

**Course Outcomes:**

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

**UNIT - I**

**CAMERAS:** Pinhole Cameras

**Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases

**Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models

**Color:** The Physics of Color, Human Color Perception, Representing Color, A

Model for Image Color, Surface Color from Image Color.

## UNIT - II

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

**Edge Detection:** Noise, Estimating Derivatives, Detecting Edges

**Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

## UNIT - III

**The Geometry of Multiple Views:** Two Views

**Stereopsis:** Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras  
**Segmentation by Clustering:** Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

## UNIT - IV

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

**Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

**Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

## UNIT - V

**Introduction to Robotics:** Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption

Architecture, Potential fields and Perception

**Common sensing techniques for Reactive Robots:** Logical sensors, Behavioural Sensor Fusion,

Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOKS:**

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

**REFERENCE BOOKS:**

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### MACHINE LEARNING LAB

**B.Tech. III Year II Sem.**

L	T	P	C
0	0	4	2

#### Course Objective:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

#### Course Outcomes:

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

#### List of Experiments

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning

7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**TEXT BOOK:**

1. Machine Learning – Tom M. Mitchell, - MGH

**REFERENCE BOOK:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

#### ADVANCED ENGLISH COMMUNICATION SKILLS LAB

**B.Tech. III Year II Sem.**

L	T	P	C
0	0	2	1

#### 1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

#### 2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by

educated English speakers

- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

### 3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application – Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills** - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with

Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.

5. **Interview Skills:** Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.
6. Minimum Requirement:
7. The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:
8. Spacious room with appropriate acoustics
9. Round Tables with movable chairs
10. Audio-visual aids
11. LCD Projector
12. Public Address system
13. One PC with latest configuration for the teacher
14. T. V, a digital stereo & Camcorder
15. Headphones of High quality
- 16.
17. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.
18. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
19. Oxford Advanced Learner's Dictionary, 10th Edition
20. Cambridge Advanced Learner's Dictionary
21. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
22. Lingua TOEFL CBT Insider, by Dreamtech
- 23.
24. Books Recommended:
25. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
26. Suresh Kumar, E. (2015). Engineering English. Orient BlackSwan Pvt. Ltd.
27. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5th Edition). Routledge.
28. Koneru, Aruna. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.
29. Raman, Meenakshi & Sharma, Sangeeta. (2022). Technical Communication, Principles and Practice. (4TH Edition) Oxford University Press.
30. Anderson, Paul V. (2007). Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
31. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). English

Vocabulary in Use

32. Series. Cambridge University Press
33. Sen, Leela. (2009). *Communication Skills*. PHI Learning Pvt Ltd., New Delhi.
34. Elbow, Peter. (1998 ). *Writing with Power*. Oxford University Press.
35. Goleman, Daniel. (2013). *Emotional Intelligence: Why it can matter more than IQ*. Bloomsbury Publishing.



**DEPARTMENT OF CSE(DATA SCIENCE)**

**B. Tech Course Structure (R23 Regulations)**

**BIG DATA ANALYTICS LAB**

**B.Tech. III Year II Sem.**

L	T	P	C
0	0	4	2

**Course Objectives**

- Provide knowledge of Big data Analytics principles and techniques.
- Designed to give an exposure of the frontiers of Big data Analytics

**Course Outcomes**

- Use Excel as an Analytical tool and visualization tool.
- Ability to program using HADOOP and Map reduce
- Ability to perform data analytics using ML in R.
- Use MongoDB to perform data analytics

**List of Experiments**

1. Create a Hadoop cluster
2. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
3. Process big data in HBase
4. Store and retrieve data in Pig
5. Perform data analysis using MongoDB
6. Using Power Pivot (Excel) Perform the following on any dataset
  - a. Big Data Analytics
  - b. Big Data Charting

**TEXT BOOKS:**

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1<sup>st</sup> Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3<sup>rd</sup> Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1<sup>st</sup> Edition, IBM Corporation, 2012.

**REFERENCE BOOKS:**

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1<sup>st</sup> Edition, Wiley and SAS Business Series, 2012.



## DEPARTMENT OF CSE(DATA SCIENCE)

### B. Tech Course Structure (R23 Regulations)

## INTELLECTUAL PROPERTY RIGHTS

**B.Tech. III Year II Sem.**

L	T	P	C
1	0	0	0

#### Course Objectives:

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

#### Course Outcomes:

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

### UNIT – I

**Introduction to Intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

### UNIT – II

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

### **UNIT – III**

**Law of copyrights:** Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer

### **UNIT – IV**

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

### **UNIT – V**

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

### **TEXT BOOK:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

### **REFERENCE BOOK:**

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

**IV B.Tech (I Sem)**
**Branch/Specialization: CSE(DS)**

S.No.	Course Code	Name of the Course	Contact Hours per Week			Credits
			L	T	P	
1	CS430	Web and Social Media Analytics	3	0	0	3
2	CS433	Predictive Analytics	3	0	0	3
3		Open Elective -3 (See Annexure – A)	3	0	0	3
4		Professional Elective – 3	3	0	0	3
	CS401	(a) Cryptography and Network Security				
	CS403	(b) Deep Learning				
	CS407	(c) Agile Software Development				
	CS415	(d) Introduction to Artificial Intelligence				
CS432	(e) Natural Language Processing					
5		Professional Elective – 4	3	0	0	3
	CS428	(a) Quantum Computing				
	CS476	(b) Data visualization Techniques				
	CS434	(c) Database Security				
	CS320	(d) Distributed Databases				
CS436	(e) Internet of Things					
6	CS431	Web and Social Media Analytics Lab	0	0	2	1
7	CS479	Predictive Analytics Lab	0	0	2	1
8	CS416	Project Work Stage – I	0	0	6	3
<b>Total</b>			<b>15</b>	<b>0</b>	<b>10</b>	<b>20</b>

**L: Lecture Hour**
**T: Tutorial Hour**
**P: Lab/Practice Hour**
**IV B.Tech (II Sem)**
**Branch/Specialization: CSE(DS)**

S.No.	Course Code	Name of the Course	Contact Hours per Week			Credits
			L	T	P	
1	CS417	<b>MOOCS ( Any subject which is not 70% same of previous subjects syllabus)</b>	2	0	0	2
2		Professional Elective – 5	3	0	0	3
	CS419	(a) Adhoc & Sensor Networks				
	CS453	(b) Privacy Preserving in Data Mining				
	CS454	(c) Exploratory Data Analysis				
	CS427	(d) Human computer Interaction				
CS456	(e) Mining Massive Datasets					
3		Professional Elective – 6	3	0	0	3
	CS408	(a) Block Chain Technology				
	CS429	(b) Parallel and Distributed Computing				
	CS457	(c) Data Stream Mining				
	CS458	(d) Web Security				
CS459	(e) Video Analytics					
4	CS478	Project Work Stage-II and Seminar	0	0	22	11
<b>Total</b>			<b>8</b>	<b>0</b>	<b>22</b>	<b>19</b>

**L: Lecture Hour**
**T: Tutorial Hour**
**P: Lab/Practice Hour**

**WEB AND SOCIAL MEDIA ANALYTICS**

**B.Tech. IV Year, I Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- Exposure to various web and social media analytic techniques.

**Course Outcomes:**

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on search engine optimization and web analytics

**UNIT-I**

**An Overview of Business Intelligence, Analytics, and Decision Support**

Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics

**UNIT- II**

**Text Analytics and Text Mining**

Machine Versus Men on Jeopardy: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools

**UNIT- III**

**Sentiment Analysis**

Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics

**UNIT-IV**

**Web Analytics ,Web Mining**

Security First Insurance Deepens Connection with Policy holders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools

## **UNIT-V**

### **Social Analytics and Social Network Analysis**

Social Analytics and Social Network Analysis, Social Media Definitions and Concepts,  
Social Media Analytics

### **Prescriptive Analytics-Optimization and Multi-Criteria Systems:**

Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

### **TEXTBOOK:**

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education

### **REFERENCEBOOKS:**

1. Rajiv Sabherwal, Irma Becerra Fernandez,” Business Intelligence– Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T .Moss, Shaku Atre,“ Business Intelligence Roadmap ”,Addison-Wesley It Service.
3. YuliVasiliev,“OracleBusinessIntelligence:TheCondensedGuidetoAnalysis and Reporting”, SPD Shroff, 2012.

## PREDICTIVE ANALYTICS

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

### Course Objectives:

- To learn the basics and applications of predictive analytics using different techniques.

### Course Outcomes:

- Understand the processing steps for predictive analytics.
- Construct and deploy prediction models with integrity.
- Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.
- Apply predictive analytics to real world examples.

### UNIT-I

**Introduction** – types of analytics, applications of predictive analytics, overview of predictive analytics. Setting up the problem - processing steps, business understanding, objectives, data for predictive modeling, columns as measures, target variables, measures of success for predictive models.

### UNIT-II

Prediction effect, deployment of prediction model, ethics and responsibilities The Data effect.

### UNIT-III

#### Machine Learning for prediction

Predictive modeling – decision trees, logistic regression, neural network, kNN, Bayesian method.

#### Regression model

Assessing Predictive models - Batch Approach to Model Assessment, Percent Correct Classification, Rank-Ordered Approach to Model Assessment, Assessing Regression Models.

### UNIT-IV

#### Ensemble effect

Model ensembles – motivation, wisdom of crowds, Bagging, Boosting, Random forests, stochastic gradient boosting, heterogeneous ensembles.

## **UNIT-V**

Case studies: Survey analysis, question answering– challenges in text mining, persuasion by the numbers.

### **TEXT BOOKS:**

1. Eric Siegel, Predictive analytics- the power to predict who will Click, buy, lie, or die, John Wiley & Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014.

### **REFERENCE BOOKS:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G. James, D. Witten, T. Hastie, R. Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013.
3. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010.

**CRYPTOGRAPHY AND NETWORK SECURITY  
(Professional Elective–III)**

**B.Tech. IVYear, I Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-Keycorp to system.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

**Course Outcomes:**

- Student will be able to understand basic cryptographic algorithms , message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

**UNIT-I**

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography Concepts and Techniques** :Introduction, plaintext and ciphertext, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT- II**

**Symmetric key Ciphers:** Block Cipher principles, DES,AES, Blow fish,RC5 IDEA,Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key crypto systems , RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT- III**

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public—Key Infrastructure

#### **UNIT-IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

#### **UNIT-V**

**E-Mail Security:** Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

#### **TEXTBOOKS:**

1. CryptographyandNetworkSecurity-PrinciplesandPractice:WilliamStallings,Pearson Education, 6th Edition
2. CryptographyandNetworkSecurity:AtulKahate,McGrawHill,3rdEdition

#### **REFERENCEBOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. CryptographyandNetworkSecurity:ForouzanMukhopadhyay,McGrawHill,3rdEdition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz,CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes,CENGAGE Learning

**DEEP LEARNING  
(Professional Elective–III)**

B.Tech. IVYear, I Sem.

L	T	P	C
3	0	0	3

**Course Objectives:**

- To understand deep Learning algorithms and their applications in real-world data

**Course Outcomes:**

- Understand machine learning basics and neural networks
- Understand optimal usage of data for training deep models
- Apply CNN and RNN models for real-world data
- Evaluate deep models
- Develop deep models for real-world problems

**UNIT-I**

**Machine Learning Basics**

Learning Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning

**Deep Feed forward Networks** Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

**UNIT-II**

**Regularization for Deep Learning**

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi- Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates

**UNIT-III**

## **Convolutional Networks**

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

## **UNIT-IV**

### **Recurrent and Recursive Nets**

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

## **UNIT-V**

**Practical Methodology:** Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition

**Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

## **TEXTBOOK:**

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

## **REFERENCEBOOKS:**

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

**Agile Software Development  
(Professional Elective–III)**

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

**Course Objectives:**

- Knowledge on concepts of agile development, releasing, planning and developing

**Course Outcomes:**

- Identify basic concepts of agile methodology and Extreme programming
- Analyze real customer involvement in collaboration
- Discuss risk management and iteration planning
- Understanding incremental requirements ,refactoring, incremental design and architecture

**UNIT-I**

**Introduction Extreme Programming(XP)-Agile Development**

Why Agile?, Understanding Success, Beyond Deadlines, Importance of Organizational Success, Introduction to Agility, Agile methods-Scrum and XP, Manifesto for Agile Software Development, Principles of Agile Process. Understanding XP (Extreme Programming) - XP life cycle, XP team, XP Concepts, Adopting XP - Knowing whether XP is suitable, Implementing XP, assessing Agility, Practicing XP - Thinking, Pair Programming, Energized work, Informative Workspace, Root cause Analysis, Retrospectives.

**UNIT- II**

**Collaborating**

Trust, Sittogether, Real customer involvement, Ubiquitous language, Stand- Upmeetings, coding standards, Iteration demo, Reporting.

**UNIT- III**

**Releasing**

Bug free Release, Version Control, Ten-Minute Build, continuous integration, Collective ownership and Documentation.

## **UNIT-IV**

### **Planning**

Version, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, and Estimating

## **UNIT-V**

### **Developing**

Incremental requirements, Customer tests, Test driven development, Refactoring, Incremental design and architecture, spike solutions, Performance optimization, Exploratory testing.

### **TEXTBOOK:**

1. Theart of Agile Development,James Shore and Shane Warden,11thIndian Reprint,O'Reilly, 2018.

### **REFERENCE BOOKS:**

1. Learning Agile,Andrew Stellman andJ ennifer Greene,O'Reilly,4thIndianReprint,2018
2. Practices of an Agile Developer, Venkat Subramaniam and Andy Hunt, SPD, 5th Indian Reprint, 201 Agile Project Management-Jim High smith,Pearson Lowprice Edition 2004

**INTRODUCTION TO ARTIFICIAL INTELLIGENCE  
(Professional Elective–III)**

**B.Tech. CSE – IV Year, I Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic
- Search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

**UNIT-I**

**Introduction to AI-Intelligent Agents, Problem-Solving Agents**

**Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, simulated an nearing search, Local Search in Continuous Spaces.

**UNIT-II**

**Games-Optimal Decisions in Games ,Alpha–Beta Pruning, Defining Constraint**

Satisfaction Problems, Constraint Propagation, Back tracking Search for CSPs, Knowledge-Based Agents, **Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**

**First-Order Logic** -Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First Order Logic: Propositional vs First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.  
**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

#### **UNIT-IV**

**Planning**-Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

#### **UNIT-V**

##### **Probabilistic Reasoning:**

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

##### **TEXTBOOK:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

##### **REFERENCEBOOKS:**

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pears on Education.

**NATURAL LANGUAGE PROCESSING**  
(Professional Elective–III)

L	T	P	C
3	0	0	3

**B.Tech. IV Year I Sem.**

**Course Objectives:**

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

**Course Outcomes:**

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Design, implement, and analyze NLP algorithms; and design different language modeling Techniques.

**UNIT-I**

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features.

**UNIT-II**

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms.

**UNIT-III**

**Syntax II:** Models for Ambiguity Resolution in Parsing, Multilingual Issues.

**Semantic Parsing I:** Introduction, Semantic Interpretation, System Paradigms, Word Sense.

**UNIT-IV**

**Semantic Parsing II:** Predicate-Argument Structure, Meaning Representation Systems.

## **UNIT-V**

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

### **TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

### **REFERENCE BOOKS:**

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvir Siddiqui, U.S. Tiwary.

## QUANTUM COMPUTING

(Professional Elective–IV)

L	T	P	C
3	0	0	3

B.Tech. IV Year, I Sem.

### Course Objectives

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

### Course Outcomes

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography

### UNIT-I

**History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

### UNIT- II

**Background Mathematics:** Basics of Linear Algebra, Hilbert space , Probabilities and measurements. **Background Physics:** Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. **Background Biology:** Basic concepts of Genomics and Proteomics (Central Dogma)

### UNIT- III

**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubitgates, designing the quantum circuits. Bellstates.

### UNIT-IV

**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

## **UNIT-V**

**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

### **TEXTBOOK:**

1. Nielsen M.A., Quantum Computation and Quantum Information, Cambridge.

### **REFERENCEBOOKS:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A.O., An Introduction to Quantum Computing Algorithms.

## Data Visualization Techniques

B.Tech.IV Year, I Sem.

L	T	P	C
3	0	0	3

### Course Objective:

1. To understand various data visualization techniques.

### Course Outcomes:

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Apply the virtualization techniques for research projects.(K1,K3).

### UNIT-I

**Introduction and Data Foundation:** Basics - Relationship between Visualization and Other Fields - The Visualization Process- Pseudo code Conventions- The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

### UNIT-II

**Foundations for Visualization:** Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables- Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

### UNIT-III

**Visualization Techniques: Spatial Data:** One-Dimensional Data - Two-Dimensional Data – Three-DimensionalData-DynamicData-CombiningTechniques.**GeospatialData:**VisualizingSpatialData - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial DataVisualization**MultivariateData:**Point-BasedTechniques-Line-BasedTechniques-Region-BasedTechniques-Combinationsof Techniques–TreesDisplayingHierarchicalStructures–Graphics and Networks- Displaying Arbitrary Graphs/Networks.

### UNIT-IV

**Interaction Concepts andTechniques:Text and Document Visualization:** Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document CollectionVisualizations-ExtendedTextVisualizations**InteractionConcepts:**InteractionOperators-Interaction Operands and Spaces - A Unified Framework. **Interaction Techniques:** Screen Space - Object-Space-DataSpace-AttributeSpace-DataStructureSpace-VisualizationStructure-Animating Transformations -Interaction Control

## **UNIT-V**

**Research Directions in Virtualizations:** Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

### **TEXTBOOKS:**

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010.
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Morgan Kaufmann Publishers, 2004.

### **REFERENCE BOOKS:**

1. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2<sup>nd</sup> Edition, 2007.
2. Alexandru C. Telea, “Data Visualization: Principles and Practice”, A.K. Peters Ltd, 2008.

## DATA BASE SECURITY

(Professional Elective–IV)

L	T	P	C
3	0	0	3

B.Tech. IVYear, I Sem.

### Course Objectives:

- To learn the security of data bases
- To learn the design techniques of data base security
- To learn the security software design

### Course Outcomes:

- Identify data base security problems
- Implement different security models
- Provide security for software design
- Protect object-oriented systems
- Handle security issues for active data bases

### UNIT-I

**Introduction:** Introduction to Databases Security, Problems in Databases Security, Controls, Conclusions

**Security Models-1:** Introduction Access Matrix Model, Take-Grant Model, Acten Model, PN Model.

### UNIT- II

**Security Models -2:** Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases, Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control.

### UNIT- III

**Security Mechanisms:** Introduction User Identification/Authentication ,Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

**Security Software Design:** Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

#### **UNIT-IV**

**Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

#### **UNIT-V**

**Models For the Protection of New Generation Database Systems:** Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Data bases, The Orion Model, Jajodia and Kogan's Model- A Model for the Protection of Active Databases Conclusions

#### **TEXT BOOKS:**

1. Database Security by Castano *Pearson Edition(1/e)*

#### **REFERENCE BOOK:**

1. Database security by alfredbasta,melissazgola,CENGAGElearning.
2. Database Security and Auditing: Protecting Data Integrity and Accessibility, 1st Edition, Hassan Afyouni, THOMSON Edition.

## INTERNET OF THINGS

### (Professional Elective–IV)

B.Tech. IVYear, I Sem.

#### Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M(machine to machine)with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry Pi platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

L	T	P	C
3	0	0	3

#### Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.

### UNIT-I

**Introduction to Internet of Things**–Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates

**Domain Specific IoTs**–Home automation, Environment ,Agriculture, Health and Lifestyle

### UNIT- II

**IoT and M2M**–M2M, Difference between IoT and M2M, SDN and NFV for IoT,

**IoT System Management with NETCONF, YANG**- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

### UNIT- III

**IoT Systems–Logical design using Python**–Introduction to Python—Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception ,Python packages of Interest for IoT

### UNIT-IV

**IoT Physical Devices and Endpoints**-Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

**IoT Physical Servers and Cloud Offerings** –Introduction to Cloud Storage models and communication APIs,WAMP-Auto Bahn for IoT, Xively Cloud for IoT, Python web

application frame work –Django, Designing a REST ful web API

**UNITV**

**Case studies**-Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

**TEXTBOOK:**

- 1.Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547.

**REFERENCEBOOK:**

- 1.Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

**WEB AND SOCIAL MEDIA ANALYTICS LAB**

L	T	P	C
0	0	2	1

**B.Tech. IV Year, I Sem.**

**Course Objectives:**

- Exposure to various web and social media analytic techniques.

**Course Outcomes:**

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on search engine optimization and web analytics

**List of Experiments**

1. Preprocessing text document using NLP of Python
  - a. Stop word elimination
  - b. Stemming
  - c. Lemmatization
  - d. POS tagging
  - e. Lexical analysis
2. Sentiment analysis on customer review on products
3. Web analytics
  - a. Web usage data(web server log data,click stream analysis)
  - b. Hyper link data
4. Search engine optimization-implement spam dexing
5. Use Google analytics tools to implement the following
  - a. Conversion Statistics
  - b. Visitor Profiles
6. Use Google analytics tools to implement the Traffic Sources.

**Resources:**

1. Stanford core NLP package
2. GOOGLE.COM/Analytics

**TEXTBOOK:**

1. RameshSharda,DursunDelen,EfrainTurban,BusinessIntelligenceandAnalytics:Systems for Decision Support, Pearson Education

**REFERENCEBOOKS:**

1. Rajiv Sabherwal, Irma Becerra-Fernandez, "Business Intelligence—Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, "Business Intelligence Roadmap", Addison-Wesley IT Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

### PREDICTIVEANALYTICS LAB

B.Tech. IV Year I Sem

L	T	P	C
0	0	2	1

#### Course Objectives:

- To learn the basics and applications of predictive analytics using different techniques.

#### Course outcomes:

- Understand the processing steps for predictive analytics.
- Construct and deploy prediction models with integrity.
- Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.
- Apply predictive analytics to real world examples.

**LIST OF EXPERIMENTS:** Following experiments to be carried out using Python/SPSS/SAS/R/Power BI

- Simple Linear regression
- Multiple Linear regression
- Logistic Regression
- CHAID
- CART
- ARIMA – stock market data
- Exponential Smoothing
- Hierarchical clustering
- Ward’s method of clustering
- Crowdsourc predictive analytics- Netflix data.

#### TEXT BOOK:

- Eric Siegel, Predictive analytics- the power to predict who will Click, buy, lie, or die, John Wiley & Sons, 2013.
- Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, 2014.

#### REFERENCE BOOKS:

- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning- Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
- G. James, D. Witten, T. Hastie, R. Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013.
- E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010.

**DEPARTMENT OF CSE (DATA SCIENCE)**

**B.Tech Course Structure (R23 Regulations)**

**IV B.Tech (II Sem)**

**Branch/Specialization: CSE(DS)**

S.No.	Course Code	Name of the Course	Contact Hours per Week			Credits
			L	T	P	
1	CS417	<b>MOOCS ( Any subject which is not 70% same of previous subjects syllabus)</b>	2	0	0	2
2		Professional Elective – 5	3	0	0	3
	CS418	(a ) Healthcare Data Analytics				
	CS453	(b) Privacy Preserving in Data Mining				
	CS454	(c) Exploratory Data Analysis				
	CS455	(d) Nature Inspired Computing for Data Science				
	CS456	(e) Mining Massive Datasets				
3		Professional Elective – 6	3	0	0	3
	CS408	(a) Block Chain Technology				
	CS429	(b) Parallel and Distributed Computing				
	CS457	(c) Data Stream Mining				
	CS458	(d) Web Security				
	CS459	(e) Video Analytics				
4	CS478	Project Work Stage-II and Seminar	0	0	22	11
<b>Total</b>			<b>8</b>	<b>0</b>	<b>22</b>	<b>19</b>

**L: Lecture Hour**

**T: Tutorial Hour**

**P: Lab/Practice Hour**

## AD-HOC&SENSORNETWORKS

(Professional Elective–V)

L	T	P	C
3	0	0	3

B.Tech.IVYearIISem.

### Course Objectives

- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, multicast and geocasting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

### Course Outcomes

- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for adhoc networks
- Understand the transport protocols of sensor networks

### UNIT-I

#### Introduction to AdHoc Networks

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

#### Routing in MANETs

Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms- Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; *Position-based* routing algorithms- Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

### UNIT- II

#### Data Transmission

Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area- based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

### UNIT- III

#### Geocasting

Data-transmission Oriented-LBM; Route Creation Oriented-Geo TORA, MGR.

TCPoverAdHocTCPprotocoloverview,TCPandMANETs,SolutionsforTCPoverAdhoc

#### **UNIT-IV**

**BasicsofWirelessSensorsandLowerLayerIssues**-Applications,Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

#### **UNIT-V**

##### **Upper Layer Issues of WSN**

Transportlayer,High-levelapplicationlayersupport,AdaptingtotheinherentdynamicnatureofWSNs.

#### **TEXT BOOKS**

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P.Aggarwal*, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. WirelessSensorNetworks:AnInformationProcessingApproach,FengZhao,LeonidasGuibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

#### **REFERENCE BOOKS:**

1. C.SivaRamMurthy,B.S.ManojAdHocWirelessNetworks:ArchitecturesandProtocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

## PRIVACY PRESERVING DATA PUBLISHING

(Professional Elective–V)

B.Tech. - IV Year, I Sem.

L	T	P	C
3	0	0	3

### Course Objectives

- The aim of the course is to introduce the fundamentals of Privacy Preserving Data Mining Methods
- The course gives an overview of-Anonymity and its Measures, Multiplicative Perturbation for Privacy-Preserving Data Mining, techniques for Utility-based Privacy Preserving Data

### Course Outcomes

- Understand the concepts of Privacy Preserving Data Mining Models and Algorithms
- Demonstrate a comprehensive understanding of different tasks associated in Inference Control Methods for Privacy-Preserving Data Mining
- Understand the concepts of Data Anonymization Methods and its Measures
- Evaluate and Appraise the solution designed for Multiplicative Perturbation
- Formulate ,Design and Implement the solutions for Utility-based Privacy Preserving Data

### UNIT-I

Introduction, Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization, Distributed Privacy-Preserving Data Mining

### UNIT-II

#### Interface Control Methods

Introduction, A Classification of Microdata Protection Methods, Perturbative Masking Methods, Non- Perturbative Masking Methods, Synthetic Microdata Generation, Trading off Information Loss and Disclosure Risk.

### UNIT-III

#### Measure of Anonymity

Data Anonymization Methods, A Classification of Methods, Statistical Measure of Anonymity, Probabilistic Measure of Anonymity ,Computational Measure of Anonymity, reconstruction Methods for Randomization, Application of Randomization

### UNIT-IV

#### Multiplicative Perturbation

Definition of Multiplicative Perturbation, Transformation Invariant Data Mining Models, Privacy Evaluation for Multiplicative Perturbation, Attack Resilient Multiplicative Perturbation, Metrics for Quantifying Privacy Level, Metrics for Quantifying Hiding

Failure, Metrics for Quantifying Data Quality.

## **UNIT-V**

### **Utility-Based Privacy-Preserving Data**

Types of Utility-Based Privacy Preserving Methods, Utility-Based Anonymization Using Local Recording, the Utility-Based Privacy Preserving Methods in Classification Problems, Anonymization Merginal: Injection Utility into Anonymization Data Sets.

#### **Text Book:**

- 1 .Privacy–Preserving DataMining:Models and AlgorithmsEditedbyCharuC.Aggarwaland S.Yu, Springer

#### **Reference Books:**

1. CharuC.Agarwal, DataMining:TheTextbook,1stEdition,Springer.
2. Hanand M. Kamber, DataMining :Concepts and Techniques,3rdEdition,Elsevier.
3. Privacy Preserving Data Mining by Jaideep Vaidya, YuMichaelZhu andChirstopherW. Clifton, Springer

**EXPLORATORY DATA ANALYSIS**  
(Professional Elective–V)

B.Tech. IV Year, II Sem.

L	T	P	C
3	0	0	3

**Course Objectives:**

- Analysis of data, exploring various models in exploratory data analysis, question answering and predictive analysis

**Course Outcomes:**

- Apply the Epicycle of Analysis process effectively.
- Articulate and refine data-related questions using the Epicycle approach.
- Conduct Exploratory Data Analysis(EDA).
- Develop the skills necessary to use formal modeling techniques for data inference.

**UNIT-I**

Epicycles of Analysis: Setting the Scene, Epicycle of Analysis, Setting Expectations, Collecting Information, Comparing Expectations to Data, Applying the Epicycle of Analysis process.

**UNIT-II**

Stating and Refining the Question: Types of Questions, Applying the Epicycle to stating and Refining Your Question, Characteristics of good Question, Translating a Question into a Data Problem, Case Study.

**UNIT-III**

Exploratory Data Analysis: Formulate your question,read in your data,Checking Packaging ,look at the top and a bottom of the data, always be checking, validate with at least one External Source ,make a plot, Try the Easy Solution First.

**UNIT-IV**

Using Models to Explore your data: Models as Expectations, Reacting to Data Refining Our Expectations, Examining Linear Relationships, Stopping Criteria.  
Inference: Identify the population, Describe the sampling process, Describe the Model for the population, Factors Affecting the Quality of Inference, Case Study.

**UNIT-V**

Formal Modeling: Goals of Formal Modeling, General Frame work, Associational Analysis, Prediction Analysis, and Summary

**TEXTBOOK:**

1. "The Art of Data Science: A Guide for Anyone Who Works with Data" by Roger D. Peng and Elizabeth Matsui.

**REFERENCEBOOKS:**

1. "Exploratory Data Analytics" by John Tukey.
2. "Python for Data Analysis" by Wes McKinney

## HUMAN COMPUTER INTERACTION

(Professional Elective–V)

B.Tech.IVYearIISem.

L	T	P	C
3	0	0	3

### Course Objectives:

- To gain an overview of Human-Computer Interaction(HCI)
- Understanding the alternatives to traditional "keyboard and mouse" computing.
- Getting familiarity with the vocabulary associated with sensory and cognitive systems
- Be able to apply models from cognitive psychology to predicting user performance
- Working in small group on a product design with in valuable team-work experience.

### Course Outcomes:

- Apply HCI and principles to interaction design.
- Design certain tools for blind or PH people
- Understand the social implications of technology and ethical responsibilities as engineers.
- Understand the importance of a design and evaluation methodology

### UNIT-I

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

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

### UNIT- II

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

Screen Designing: Design goals–

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

### UNIT-III

**Windows**–

New and Navigation schemes selection of window, selection of devices based and screen- based

controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

#### **UNIT-IV**

**HCI in the software process**-The software life cycle, Usability engineering, Iterative design and prototyping, Design Focus: Prototyping in practice, Design rationale, Design rules, Principles to support usability Standards, Golden rules and heuristics, HCI patterns, Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method, Universal design, Universal design principles Multimodal interaction

#### **UNIT-V**

**Cognitive models Goal and task hierarchies Design Focus:** GOMS saves money, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures, Ubiquitous computing and augmented realities, Ubiquitous computing applications research, Design Focus: Ambient Wood – augmenting the physical, Virtual and augmented reality, Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization

#### **TEXTBOOKS:**

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech.
2. Human-Computer Interaction. Alan Dix, Janet Finck, Gregory's, Abowd, Russell Beag, Pearson Education.

## MINING MASSIVE DATA SETS

(Professional Elective–V)

B.Tech. IV Year, I Sem.

L	T	P	C
3	0	0	3

### Pre requisites:

1. Students should be familiar with Data mining, algorithms ,basic probability theory and Discrete math.

### Course Objectives:

1. This course will cover practical algorithms for solving key problems in mining of massive datasets.
2. This course focuses on parallel algorithmic techniques that are used for large data sets.
3. This course will cover stream processing algorithms for data streams that arrive constantly, page ranking algorithms for web search,and online advertisement systems that are studied in detail.

### Course Outcomes:

1. Handle massive data using Map Reduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large data sets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

### UNIT-I

**Data Mining**-Introduction-Definition of Data Mining-Statistical Limits on Data Mining,  
**Map Reduce and the New Software Stack**-Distributed File Systems, Map Reduce, Algorithms Using Map Reduce.

### UNIT- II

**Similarity Search:** Finding Similar Items-Applications of Near-Neighbor Search,Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.

**Streaming Data:** Mining Data Streams-The Stream Data Model ,Sampling Data in a Stream, Filtering Streams

### **UNIT- III**

**Link Analysis**-Page Rank ,Efficient Computation of Page Rank,Link Spam

**Frequent Item sets**-Handling Larger Datasets in Main Memory,Limited-Pass Algorithms, Counting Frequent Items in a Stream.

**Clustering**-The CURE Algorithm, Clustering in Non-Euclidean Spaces,Clustering for Streams and Parallelism

### **UNIT-IV**

**Advertising on the Web**-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation.

**Recommendation Systems**-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The Netflix Challenge.

### **UNIT- V:**

**Mining Social-Network Graphs**-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles

### **TEXT BOOKS:**

1. Jure Leskovec, An and Rajaraman ,Jeff Ullman,Mining of Massive Data sets,3<sup>rd</sup>Edition.

### **Reference Books:**

1. JiaweiHan& Micheline Kamber,Data Mining–Concepts and Techniques 3<sup>rd</sup> Edition Elsevier.
2. Margaret H Dunham,Data Mining Introductory and Advanced topics, PEA.
3. IanH. Witten and Eibe Frank,Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.



## BLOCK CHAIN TECHNOLOGY

(Professional Elective–VI)

B.Tech. IV Year, I Sem.

L	T	P	C
3	0	0	3

### Prerequisites

1. Knowledge in information security and applied cryptography.
2. Knowledge in Computer Networks.

### Course Objectives:

- To learn the fundamentals of Block chain and various types of block chain and consensus mechanisms.
- To understand the public block chain system, Private block chain system and consortium block chain.
- Able to know the security issues of block chain technology.

### Course Outcomes:

- Understanding concepts behind crypto currency
- Applications of smart contracts in decentralized application development
- Understand frame works related to public, private and hybrid block chain
- Create block chain for different application case studies

### UNIT-I

**Fundamentals of Block chain:** Introduction, Origin of Block chain, Block chain Solution, Components of Block chain, Block in a Block chain, The Technology and the Future.

**Block chain Types and Consensus Mechanism:** Introduction, Decentralization and Distribution, Types of Block chain, Consensus Protocol.

**Crypto currency— Bit coin, Altcoin and Token:** Introduction, Bit coin and the Crypto currency, Crypto currency Basics, Types of Crypto currencies, Crypto currency Usage.

### UNIT- II

**Public Block chain System:** Introduction, Public Block chain, Popular Public Block chains, The Bit coin Block chain, Ethereum Block chain.

**Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

### **UNIT- III**

**Private Block chain System:** Introduction, Key Characteristics of Private Block chain, Need of Private Block chain, Private Block chain Examples, Private Block chain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Block chain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Block chain, Byzantine Fault, Multi chain.

**Consortium Block chain:** Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Block chain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

**Initial Coin Offering:** Introduction, Block chain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

### **UNIT-IV**

**Security in Block chain:** Introduction, Security Aspects in Bit coin, Security and Privacy Challenges of Block chain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Block chain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

**Applications of Block chain:** Introduction, Block chain in Banking and Finance, Block chain in Education, Block chain in Energy, Block chain in Healthcare, Block chain in Real-estate, Block chain In Supply Chain, The Block chain and IoT. Limitations and Challenges of Block chain.

### **UNIT-V**

**Block chain Case Studies:** Case Study1–Retail, Case Study2–Banking and Financial Services, Case Study3–Healthcare, Case Study4–Energy and Utilities.

**Block chain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Block chain.

**Block chain platform using Hyper ledger Fabric:** Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Block chain Application Using Fabric Java SDK.

### **TEXTBOOK:**

1. Block chain Technology, Chandramouli Subramanian, Asha A. George, Abhilas j K A and Meena Karthikeyan, Universities Press.

### **REFERENCEBOOKS:**

1. Michael J untao Yuan ,Building Block chain Apps,Pearson,India.
2. Block chain Blueprint for Economy,Melanie Swan,SPDO'reilly.
3. Block chain for Business,Jai Singh Arun,JerryCuomo,Nitin Gaur,Pearson.

**PARALLEL AND DISTRIBUTED COMPUTING**  
(Professional Elective–VI)

B.Tech. IV Year, II Sem.

L	T	P	C
3	0	0	3

**Course Objectives:**

- To learn core ideas behind parallel and distributed computing.
- To explore the methodologies adopted for parallel and distributed environments.
- To understand the networking aspects of parallel and distributed computing.
- To provide an over view of the computational aspects of parallel and distributed computing.
- To learn parallel and distributed computing models.

**Course Outcomes:**

- Explore the methodologies adopted for parallel and distributed environments.
- Analyze the networking aspects of Distributed and Parallel Computing.
- Explore the different performance issues and tasks in parallel and distributed computing.
- Tools usage for parallel and distributed computing.
- Understand high performance computing techniques.

**UNIT-I**

Parallel and Distributed Computing— Introduction- Benefits and Needs- Parallel and Distributed Systems- Programming Environment- Theoretical Foundations- Parallel Algorithms—Introduction- Parallel Models and Algorithms- Sorting- Matrix Multiplication

**UNIT- II**

Architecture of Parallel and Distributed Systems, Parallel Operating Systems.

**UNIT- III**

Management of Resources in Parallel Systems-Parallel Database Systems and Multimedia Object Servers.

**UNIT-IV**

Networking Aspects of Distributed and Parallel Computing-Process-Parallel and Distributed Scientific Computing.

**UNIT-V**

Multimedia Applications for Parallel and Distributed Systems

**TEXTBOOK:**

1. Jacek Błażewicz, et al., "Handbook on parallel and distributed processing", Springer Science & Business Media, 2013.

**REFERENCE BOOKS:**

1. George F. Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems: concepts and design", Pearson Education, 2005.
2. Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory, Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015.
3. Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles and Paradigms". Prentice-Hall, 2007.



**R23 B.Tech. CSE (DS) Syllabus**

**AVNIET**

**DATA STREAMMING**

**(Professional Elective–VI)**

**B.Tech. IV Year, I Sem.**

L	T	P	C
3	0	0	3

**Pre requisites**

- A basic knowledge of “Data Mining”

**Course Objectives**

- The aim of the course is to introduce the fundamentals of Data Stream Mining.
- The course gives an overview of– Mining Strategies ,methods and algorithms for data stream mining.

**Course Outcomes**

- Understand how to formulate acknowledge extraction problem from datastreams.
- Ability to apply methods/algorithms to new data stream analysis problems.
- Evaluate the results and understand the functioning of the methods studied.
- Demonstrate decision tree and adaptive Hoeffding Tree concepts

**UNIT-I**

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments,Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

**UNIT-II**

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

**UNIT-III**

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

**UNIT-IV**

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, Maintaining Updated Windows of Varying Length.

**UNIT-V**

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

**TEXT BOOK:**

1. DATA STREAMMINING: A Practical Approach by Albert Bifet and Richard Kirk by.

**REFERENCE BOOKS:**

1. Knowledge discovery from data streams by Gama João. ISBN: 978-1-4398-2611-9
2. Machine Learning for Data Streams by Albert Bifet, Ricard Gavalda; MIT Press, 2017

**WEB SECURITY**

**(Professional Elective–VI)**

L	T	P	C
3	0	0	3

**B.Tech. IV Year, I Sem**

**Course Objectives:**

1. Give an Overview of information security
2. Give an overview of Access control of relational data bases

**Course Outcomes:**

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand how common mistakes can be by passed and exploit the application
4. Identify common application vulnerabilities

**UNIT-I**

The Web Security, The Web Security Problem, Risk Analysis and Best Practices  
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic  
Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

**UNIT- II**

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft,  
Web Server Security, Physical Security for Servers, Host Security for Servers, Securing  
Web Applications

**UNIT- III**

Database Security: Recent Advances in Access Control, Access Control Models for XML,  
Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses  
and OLAP Systems

**UNIT-IV**

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking  
for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and  
Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities

**UNIT-V**

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

**TEXT BOOKS:**

1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

**VIDEO ANALYTICS**

**(Professional Elective–VI)**

**B.Tech. IV Year, I Sem**

L	T	P	C
3	0	0	3

**Course 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.

**Course Outcomes:**

- Understand the basics of video-signals and systems.
- Estimate motion in a video
- Detect the objects and track them
- Recognize activity and analyze behavior
- Evaluate face recognition technologies

**UNIT-I**

**Introduction**

**Multi-dimensional signals and systems:** signals, transforms, systems, sampling theorem. Digital Images and Video: human visual system and color, digital video, 3D video, digital-video applications, image and video quality.

**UNIT- II**

**Motion Estimation**

Image formation, motion models, 2D apparent motion estimation, differential methods, matching methods, non-linear optimization methods, transform domain methods, 3D motion and structure estimation.

### **UNIT- III**

#### **Video Analytics**

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.

### **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 Frame work for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition

#### **TEXT BOOKS:**

1. A.MuratTekalp,“DigitalVideoProcessing”,secondedition,Pearson,2015
2. Rama Chellappa, Amit K. Roy-Chowdhury, Kevin Zhou. S, “Recognition of Humans and their Activities using Video”, Morgan & Claypool Publishers, 2005.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.

#### **REFERENCE BOOKS:**

1. RichardSzeliski,“ComputerVision:AlgorithmsandApplications”,Springer,2011.
2. Yao Wang, Jorn Ostermann and Ya-Qin Zhang, “Video Processing and Communications”, Prentice Hall, 2001.
3. Thierry Bouwmans, Fatih Porikli, Benjamin Höferlin and Antoine Vacavant, “Background Modeling and Foreground Detection for Video Surveillance: Traditional and Recent Approaches,Implementations,Benchmarking and Evaluation”, CRCPress, TaylorandFrancis Group, 2014.
4. Md. Atiqur Rahman Ahad, “Computer Vision and Action Recognition-A Guide for Image Processing and ComputerVisionCommunityforActionUnderstanding”,Atlantis Press,2011.