### M.Tech. (CSE), R17 Course Structure (Choice Based Credit System)

#### I SEMESTER

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Contact hours/week</th>
<th>Credits</th>
<th>Scheme of Valuation</th>
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<tr>
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*With inclusion of Add on course

#### II SEMESTER

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*With inclusion of Add on course
## III SEMESTER

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## IV SEMESTER

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### LIST OF COURSES FOR PROGRAMME ELECTIVE- I & II

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<td>2</td>
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**Note:** Students are required to choose any two courses as Programme Elective- I & II.

### List of courses for Programme Elective- III & IV

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<td>2</td>
<td>17CO14</td>
<td>TCP/IP Networking</td>
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<td>3</td>
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**Note:** Students are required to choose any two courses as Programme Elective- III & IV.

### List of courses for Programme Elective-V & VI

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<td>6</td>
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**Note:** Students are required to choose two/one courses as Programme Elective- III & IV, depending on the add-on-courses opted in Semester I & II.

***************
Prerequisites: Fundamentals of Java programming and Linux

Course Objectives:
- To demonstrate their understanding of the fundamentals of Android operating systems
- To demonstrate 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:
- CO1 To express their understanding of the fundamentals of Android Platform
- CO2 To apply their skills of User Interface Components to develop basic UI for Android Apps
- CO3 To distinguish important components of Android Platform
- CO4 To develop android applications that interacts with SQLite Database
- CO5 To understand the advanced concepts in Android Platform

UNIT - I
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, 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 units Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialogs 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 BroadcastReceiver – 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 PreferenceDatabase – Introduction to SQLite database, creating and opening a database, creating tables, inserting, retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

UNIT - V
Advanced Topics: Alarms – Creating and using alarmsUsing Internet Resources – Connecting to internet resource, using download manager, Location Based Services – Finding Current Location and showing location on the Map, updating location

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

REFERENCE
Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.
Prerequisites: Fundamentals of statistics and probability

Course Outcomes
CO1: Students will apply data science concepts and methods to solve problems in real world contexts.
CO2: Students will demonstrate proficiency with statistical analysis of data.
CO3: Students will demonstrate skill in Data Modeling.
CO4: Students will have a good understanding of the relationship between a specific problem and the methods used to solve the problem.
CO5: Students will demonstrate the ability to translate time series data into clear, actionable insights.

UNIT-I
Introduction: What is Data Science? What roles exist in Data Science? Current landscape of perspectives. Define the workflow, tools and approaches data scientists use to analyze data. Define a problem and identify appropriate data sets using the data science workflow. Walk through the data science workflow using a case study.

UNIT-II

UNIT-III
Foundations of Data Modelling: Introduction Regression – data modelling and linear regression. Categorical variables versus Continuous variables. Build the linear regression/logistic regression model using a dataset. Fit model – regularization, bias and error metrics. Evaluate model fit using loss functions – MSE(Mean Square Error), RMSE (Root MSE), Mean Absolute Error(MAE). Apply different regression models based on fit and complexity. Evaluate model using metrics such as accuracy/error, Confusion matrix, ROC curve and Cross Validation.

UNIT-IV
Data Science in the real world
Dimensionality Reduction – perform dimensionality reduction using topic models such as PCA and SVD. Refine and extract data/information from sample datasets. Introduction to Classification - define classification model, apply k-NN, Naïve Classifier and Decision trees. Build the classification model using a dataset and evaluate.

UNIT - V
Working with Time Series Data – Introduction, observations, sub setting data and selecting observations, Time series periodicity and Time Intervals, Plotting Time series,
TEXT BOOKS
3. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking, Foster Provost and Tom Fawcett. 2013

REFERENCES
Prerequisites: Fundamentals of Data Mining

Course Objectives

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms.
- To understand the Bayesian techniques.
- To understand the instant based learning.
- To understand the analytical learning and reinforced learning.

Course Outcomes:

CO1: Identify various approaches in learning like concept learning and decision tree learning etc.

CO2: Analyse different types of neural networks as multi-layer and back propagation networks and genetic algorithms

CO3: Identify different topics in Bayesian and computational learning as Bayes theorem, Gibbs algorithm and Bayesian belief networks

CO4: Analyse different types of learning and learning set of rules such as case based reasoning and learning first order rules

CO5: Summarize various concepts of analytical learning and reinforcement learning in terms of FOCL algorithm and Q learning

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

TEXT BOOK

REFERENCES
Prerequisites: Foundations in design and analysis of algorithms and data structures

Course Objectives: Upon completion of this course, students will be able to do the following:
- Analyze the asymptotic performance of algorithms.
- Ability to analyze asymptotic runtime complexity of algorithms including formulating recurrence relations.
- Ability to understand and design algorithms using greedy strategy, divide and conquer approach, dynamic programming, Demonstrate a familiarity with major algorithms and data structures.

Course Outcomes
CO1: Graduates will be able to evaluate and analyze complexity of algorithm
CO2: Graduates will be able to understand divide and conquer techniques of algorithm design
CO3: Graduates will be able to understand greedy and dynamic programming in algorithm design
CO4: Graduates will be able to understand how backtracking and branch and bound technique can be used in algorithms
CO5: Graduates will be able to adopt best algorithm design techniques to solve the given problem

UNIT - I

UNIT - II
Divide and Conquer Method: General Method, Applications: Binary search, Quick sort, Merge sort and Analysis of divide and conquer runtime recurrence relations.

UNIT - III
Greedy Method: General method, Applications: Minimum cost spanning tree (Prim’s and Kruskal’s algorithm), Dijkstra’s algorithm.

UNIT - IV
Dynamic programming: General Method, Applications: Floyd’s algorithm, Optimal Binary Search Tree, 0/1 knapsack problem

UNIT - V
Back tracking: General Method, Applications: Sum of Subsets, Hamiltonian Cycles.
Branch and bound: The Method–Assignment problem, Travelling Salesman Problem - Introduction to NP-Hard and NP-Complete Problems.

TEXT BOOK

REFERENCES
Prerequisites: Fundamentals of computer networks

Course Objectives:
- To enable student to understand fundamentals of networks, types and challenges of adhoc networks.
- To understand various adhoc routing protocols
- To understand multicast routing in adhoc networks
- To understand the transport layer issues and security protocols
- To understand issues in providing QoS.

Course Outcomes:
CO1: To understand the state-of-the-art in network protocols, architectures and applications
CO2: Analyze existing network protocols and networks.
CO3: Develop new protocols in networking
CO4: To understand how networking research is done
CO5: To investigate novel ideas in the area of Networking via term-long research projects

UNIT - I
FUNDAMENTALS

UNIT - II
ADHOC ROUTING PROTOCOLS

UNIT - III
MULTICAST ROUTING IN ADHOC NETWORKS
UNIT - IV

TRANSPORT LAYER - SECURITY PROTOCOLS

UNIT - V

QoS AND ENERGY MANAGEMENT

TEXTBOOK

REFERENCES
Prerequisites: Software Engineering, Fundamental concepts of OOAD

Course Objectives
1. As Software development is the expensive process, proper measures are required
2. So that the resources can be used efficiently and effectively.
3. Thus this course is to provide the students with the concepts of organized methodology for implementing medium-large software systems like Team programming, Common design and coding methodologies, including Object-Oriented Design (OOD).
4. Design Patterns, Refactoring, and the Unified Modeling Language (UML) and standard software Engineering tools.

Course Outcomes:
CO1 To learn the fundamentals of OO Software Engineering
CO2 To learn about software prototyping, analysis and design
CO3 To learn the various OO Design models
CO4 Understand the object-oriented process from requirements through testing
CO5 Case studies to apply the principles

UNIT - I
INTRODUCTION

UNIT - II
PLANNING & SCHEDULING

UNIT - III
ANALYSIS & DESIGN

UNIT - IV
IMPLEMENTATION & TESTING
Top-Down, Bottom-Up, object oriented product Implementation & Integration. Software testing methods-White Box, Basis Path-Control Structure-Black Box-Unit Testing-Integration testing-Validation & System testing. Testing OOA & OOD models-Object oriented testing strategies.
UNIT - V
MAINTENANCE
Maintenance process-System documentation-program evolution dynamics-Maintenance costs-
Maintainability measurement--Case studies

TEXTBOOK
Bernd Bruegge and Alan H Dutoit, “Object-Oriented Software Engineering”, 2nd edition,
Pearson Education.

REFERENCE
“Object Oriented and Classical software Engineering”, 7/e StephenR.Schach,TMH
Prerequisites: Concepts of Computer Graphics

Course Objectives
- To introduce basic principles of digital image processing.
- To provide knowledge on Image data structures
- To demonstrate different image encoding techniques.
- To explain segmentation and restoration techniques.

Course Outcomes:
CO1: To study the image fundamentals and mathematical transforms necessary for image processing
CO2: To study the image enhancement techniques
CO3: To study Color Image Processing procedures
CO4: To study the image compression procedures
CO5: To study the image segmentation and representation techniques

UNIT-I
Introduction: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels

UNIT-II
Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods

UNIT-III
Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation

UNIT-IV
Image Compression: Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards.

UNIT-V
Image Segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation
Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms
TEXT BOOK

REFERENCES
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
Prerequisites: Foundations of Computer Networks and Mobile Computing

Course Objectives
- To provide knowledge on Cloud Computing concepts, technologies and architecture.
- To introduce the concepts of Cloud Computing fundamentals, applications and implementations.
- To identify various areas of information systems in managing the cloud environment.

Course Outcomes:
CO1 Analyze various delivery and deployment models.
CO2 Analyze the virtual machine provisioning and virtualized storage strategies.
CO3 Explore the PAAS and SAAS Services.
CO4 Identify the issues in monitoring and management in cloud environment for achieving Quality of Service (QOS).
CO5 Identify the components necessary for deployment of applications on the cloud.

UNIT -I

UNIT -II

UNIT -III

UNIT- IV
Understanding Scientific Applications for Cloud Environments: A Classification of Scientific Applications and Services in the Cloud, SAGA-based Scientific Applications that Utilize Clouds. The MapReduce Programming Model and Implementations: MapReduce Programming Model, Major MapReduce Implementations for the Cloud, MapReduce Impacts and Research Directions.

UNIT- V
TEXT BOOKS

REFERENCES
4. Haley Beard Cloud computing best practices

e-Learning Resources:
2. http://nptel.ac.in/courses/106105033/41
3. https://www.youtube.com/watch?v=r8Lu_BjxlZc

HEAD
Dept. of Computer Science and Engineering
Lakireddy Bali Reddy College of Engg.
MYLAVARAM - 521 230, Krishna Dr, A.P.
Prerequisites: Foundations of design and analysis of algorithms

Course Objectives
- To understand parallel processing terminology, organizational features of processor Arrays and mapping & scheduling aspects of algorithms.
- To study and analyse the parallel algorithms on SIMD and MIMD models. Implement fastFourier transform algorithms on Hyper-Cube architectures.
- To study parallel sorting methods such as Odd Even transposition and bitonic merge sort on various types of processor arrays and multiprocessors.
- To know about parallel search operations like Ellis algorithms and Manber & Ladner's algorithms for dictionary operations.
- To examine parallel algorithms developed to solve problems in graph theory which are related to search graph and finding connected components, minimum spanning trees and shortest paths in graphs.

Course Outcomes:
CO1: Know the concept of parallel processing in terms of its background, models, performance and analysis.
CO2: Compare balanced trees, pointer jumping, divide and conquer methods and study parallel RAM models.
CO3: Analyse parallel sorting algorithms for processor arrays and multiprocessors includes odd-even transposition sort for linear arrays, merge sort for mesh, cube connected and perfect shuffle networks.
CO4: Solve the problems in graph theory related to searching graphs, minimum cost spanning tree using parallel algorithms.
CO5: Classify realistic models of parallel computation methods includes bulk synchronous parallel, LogP and shared memory.

UNIT - I

UNIT - II
Elementary parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms. Matrix multiplication algorithms on SIMD and MIMD models. Fast Fourier Transform algorithms – Implementation on Hyper-Cube architectures, solving linear system of equations, parallelizing aspects of sequential methods of back substitution and Tridiagonal.

UNIT - III
UNIT - IV
Parallel Quick-sort on Multiprocessors - Hyper Quick sort on Hyper Cube Multicomputers. Parallel search operations - Ellis algorithm and Manber & Ladner’s algorithms for dictionary operations.

UNIT - V
Parallel algorithms for graph searching - P-Depth search, Breadth-Depth search and Breadth-First search. All pairs of shortest paths and Minimum Cost Spanning tree. Parallelization aspects of combinatorial search algorithm with focus on branch and bound methods and Alpha-Beta search methods.

TEXT BOOK

REFERENCES
Prerequisites: Java Programming Skills

Course Objectives:
- Know the components and structure of mobile application development frameworks for Android
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices.

Course Outcomes:
CO1 To develop basic android applications
CO2 To develop moderate android applications
CO3 To develop android applications that interact with SQLite database

LIST OF EXPERIMENTS:
1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock
Prerequisites: Fundamentals of statistics

Course Outcomes:
CO1 Students will develop relevant programming abilities
CO2 Students will develop the ability to build and assess data-based models
CO3 Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

Experiment – I: Introduction to R

Purpose: This Cycle introduces you to the use of the R statistical package within the Data Science and Big Data Analytics environment. After completing the tasks in This Cycle you should be able to:
- Read data sets into R, save them, and examine the contents
- Tasks you will complete in This Cycle include:
  - Invoke the R environment and examine the R workspace
  - Created table and data sets in R
  - Examine, manipulate and save data sets
  - Exit the R environment

Experiment – II: Basic Statistics and Visualization

Purpose: This Cycle introduces you to the analysis of data using the R statistical package within the Data Science and Big Data Analytics environment. After completing the tasks in This Cycle you should be able to:
- Perform summary (descriptive) statistics on the data sets
- Create basic visualizations using R both to support investigation of the data as well as exploration of the data
- Create plot visualizations of the data using a graphics package
- Tasks you will complete in This Cycle include:
  - Reload data sets into the R statistical package
  - Perform summary statistics on the data
  - Remove outliers from the data
  - Plot the data using R
  - Plot the data using lattice and ggplot

Experiment - III: K-means Clustering

Purpose: This Cycle is designed to investigate and practice K-means Clustering. After completing the tasks in This Cycle you should be able to:
- Use R functions to create K-means Clustering models
- Use ODBC connection to the database and execute SQL statements and load datasets from the database in an R environment
- Visualize the effectiveness of the K-means Clustering algorithm using graphic capabilities in R
- Tasks you will complete in This Cycle include:
  - Use the R -Studio environment to code K-means Clustering models
b. Use the ODBC connection in the R environment to create the average household income from the census database as test data for K-means Clustering

c. Use R graphics functions to visualize the effectiveness of the K-means Clustering algorithm

**Experiment - IV: Association Rules**

**Purpose:** This Cycle is designed to investigate and practice Association Rules. After completing the tasks in This Cycle you should able to:

a. Use R functions for Association Rule based models

Tasks you will complete in This Cycle include:

a. Use the R -Studio environment to code Association Rule models

b. Apply constraints in the Market Basket Analysis methods such as minimum thresholds on support and confidence measures that can be used to select interesting rules from the set of all possible rules

c. Use R graphics "arules" to execute and inspect the models and the effect of the various thresholds

**Experiment - V: Linear Regression**

**Purpose:** This Cycle is designed to investigate and practice the Linear Regression method. After completing the tasks in This Cycle you should able to:

a. Use R functions for Linear Regression (Ordinary Least Squares - OLS)

b. Predict the dependent variables based on the model

c. Investigate different statistical parameter tests that measure the effectiveness of the model

Tasks you will complete in This Cycle include:

a. Use the R -Studio environment to code OLS models

b. Review the methodology to validate the model and predict the dependent variable for a set of given independent variables

c. Use R graphics functions to visualize the results generated with the model

**Experiment - VI: Logistic Regression**

**Purpose:** This Cycle is designed to investigate and practice the Logistic Regression method. After completing the tasks in This Cycle you should able to:

a. Use R functions for Logistic Regression (also known as Logit)

b. Predict the dependent variables based on the model

c. Investigate different statistical parameter tests that measure the effectiveness of the model

Tasks you will complete in This Cycle include:

a. Use R -Studio environment to code Logit models

b. Review the methodology to validate the model and predict the dependent variable for a set of given independent variables

c. Use R graphics functions to visualize the results generated with the model
Experiment – VII : Naive Bayesian Classifier

**Purpose:** This Cycle is designed to investigate and practice the Naïve Bayesian Classifier analytic technique. After completing the tasks in This Cycle you should be able to:

a. Use R functions for Naïve Bayesian Classification  
b. Apply the requirements for generating appropriate training data  
c. Validate the effectiveness of the Naïve Bayesian Classifier with the big data  

**Tasks you will complete in This Cycle include:**  
a. Use R-Studio environment to code the Naïve Bayesian Classifier  
b. Use the ODBC connection to the "census" database to create a training data set for Naïve Bayesian Classifier from the big data  
c. Use the Naïve Bayesian Classifier program and evaluate how well it predicts the results using the training data and then compare the results with original data

Experiment - VIII: Decision Trees

**Purpose:** This Cycle is designed to investigate and practice Decision Tree (DT) models covered in the course work. After completing the tasks in This Cycle you should able to:

a. Use R functions for Decision Tree models  
b. Predict the outcome of an attribute based on the model  

**Tasks you will complete in This Cycle include:**  
a. Use the R -Studio environment to code Decision Tree Models  
b. Build a Decision Tree Model based on data whose schema is composed of attributes  
c. Predict the outcome of one attribute based on the model

Experiment - IX:  
Simulate Principal component analysis

Experiment - X  
Simulate Singular Value Decomposition

REFERENCES
2. “R and Data Mining: Examples and Case Studies” -Yanchang Zhao- 2012 Elsevier
Prerequisites: Fundamentals of Data Mining

Course Objectives:
- To introduce students to high performance computing systems in science and engineering
- Expose students to the features of modern processors that affect performance and be able to use these features in the design and optimization of high-performance software.
- To utilize techniques to automatically implement, optimize, and adapt programs to different platforms.
- To provide the concepts of parallel processing and develop the skills required to implement high performance software
- Learn techniques for analyzing the performance of programs and their interaction with the underlying hardware.

Course Outcomes:
CO1 Demonstrate memory hierarchies, processor types and techniques in high performance computing
CO2 Analyze the execution of parallel programs on high performance computing resources using parallel programming paradigms such as MPI
CO3 Outline the fundamentals of Internet of Things (IoT), Big Data and Analytics and the High Performance approaches like Cluster computing, Grid computing, Cloud computing and Heterogeneous computing
CO4 Design the network infrastructure for High-Performance Big Data Analytics Storage and Storage Area Networks
CO5 Analyze the techniques for Real-time Analytics, General Parallel File System (GPFS) and High-performance Computing (HPC) Paradigms

UNIT - 1

UNIT - II
Parallel Computers: Taxonomy of parallel computing paradigms, Shared-memory Computers, Distributed-memory computers, Hierarchical (hybrid) systems Networks Basics of parallelization: Why parallelize? Parallelism, Parallel scalability Shared-Memory Parallel Programming with OpenMP: Short introduction to OpenMP.

UNIT - III
UNIT - IV

UNIT - V

TEXT BOOKS

REFERENCE BOOKS:
1. CUDA by Example, “An Introduction to General-Purpose GPU Programming “
Prerequisites: Fundamentals of Cloud Computing, Data Mining

Course Objectives:
- To understand big data analytics as the next wave for businesses looking for competitive advantage
- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component
- To understand how to mine the data
- To learn about stream computing
- To know about the research that requires the integration of large amount of data.

Course Outcomes:
CO1 Analyze the big data for useful business applications
CO2 To impart theoretical knowledge related to Data Analytics
CO3 To impart theoretical knowledge related to Stream Computing
CO4 Students will apply data science concepts and methods to solve problems in Predictive Analytics
CO5 Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop

UNIT - I
INTRODUCTION TO BIG DATA Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics.

UNIT - II

UNIT - III

UNIT - IV
UNIT - V

TEXT BOOKS

REFERENCES
6. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition,
Prerequisites: Fundamentals of ad-hoc networks and computer networks

Course Objectives:
- Understand the vision of IoT from a global context.
- Understand the application of IoT.
- Determine the Market perspective of IoT.
- Use of Devices, Gateways and Data Management in IoT.
- Building state of the art architecture in IoT.
- Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Course Outcomes:
CO1: Vision and Introduction to IoT
CO2: Understand IoT Market perspective
CO4: Data and Knowledge Management and use of Devices in IoT Technology
CO5: Real World IoT Design with Privacy and Security

UNIT - I

UNIT - II
M2M to IoT – A Basic Perspective – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, M2M to IoT – An Architectural Overview – Building an architecture, Main design principles, An IoT architecture outline, standards considerations.

UNIT - III

UNIT - IV

UNIT - V
TEXT BOOKS

REFERENCE
Prerequisites: Fundamentals of Information Security

Course Objectives:
- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.

Course Outcomes:
CO1 Analyze the basic concepts of cryptography and network security and classify attacks on a network
CO2 Analyze the different process for hiding the information with conventional cryptographic algorithms
CO3 Understand the working of various block cipher cryptosystems
CO4 Analyze public cryptosystems and disseminate from conventional systems for the security
CO5 Apply authentication techniques to provide secure communication.

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

TEXT BOOK

REFERENCE:
Prerequisites: Fundamentals of Data mining

Course Objectives:
- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies for data mining.
- To understand the strengths and limitations of various data mining models.

Course Outcomes:
- CO1 To introduce students to the basic concepts and techniques of Data Mining
- CO2 Understand the Advance Classification techniques
- CO3 Analyze advance clustering methods
- CO4 Understand Web and Text Mining
- CO5 Learn Temporal and Spatial Data Mining

UNIT - I
Data mining Overview and Advanced Pattern Mining
Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis, outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

UNIT - II
Advance Classification
Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzz>set approach;

UNIT - III
Advance Clustering
Density - based methods –DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High-Dimensional Data; Clustering Graph and Network Data.

UNIT - IV
Web and Text Mining
Introduction, web mining, web content mining, web structure mining, web usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

UNIT - V
Temporal and Spatial Data Mining
Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.
TEXT BOOKS
1. Data Mining Concepts and Techniques, Jiawei Hang MichelineKamber, Jianpei, Morgan Kaufmannn.
2. Data Mining Techniques – Arun K pujari, Universities Press.

REFERENCES
1. Introduction to Data Mining – Pang-Ning Tan, Vipinkumar, Michael Steinbach, Pearson.
Prerequisites: Fundamentals of Networks

Course Objectives:
- TCP/IP is arguably the single most important computer networking technology.
- The Internet and most home networks support TCP/IP as communication protocol.
- This course provides a foundation to understand various principles, protocols and design aspects of Computer Network and also helps to achieve the fundamental purpose of computer networks in the form of providing access to shared resources.

Course Outcomes:
- CO1 Will have knowledge and understanding of TCP/IP, OSI
- CO2 Will develop their skills Network Layer Protocols
- CO3 Understand Transport Layer Protocols
- CO4 Learn Concurrent Processing in Client-Server environment
- CO5 To impart theoretical knowledge Next Generation Internet Protocol

UNIT I
INTRODUCTION TO COMPUTER NETWORKS
Introduction to Layered Architecture (TCP/IP, OSI), Networking Devices, IP addressing, Subnetting, VLSM, CIDR.

UNIT II
NETWORK LAYER PROTOCOLS

UNIT III
TRANSPORT LAYER PROTOCOLS

UNIT IV
SOCKET PROGRAMMING
Introduction to socket programming- Concurrent Processing in Client-Server Software-Byte ordering and address conversion functions – Socket Interface - System calls used with sockets - Iterative server and concurrent server- Multi protocol and Multi service server- TCP/UDP Client server programs – Thread Creation and Termination – TCP Echo Server using threads- Remote Procedure Call.

UNIT V
NEXT GENERATION INTERNET PROTOCOL
TEXT BOOK

REFERENCE
Prerequisites: Fundamentals of Software Engineering

Course Objectives:
- To understand software quality assurance framework and standards.
- To understand various software quality assurance metrics and measurements.
- To apply software quality assurance metrics.
- To understand software testing environment.
- To understand various software testing techniques.

Course Outcomes:
CO1 An ability to understand the quality management in software
CO2 To analyse the different types of models for quality assurance
CO3 To measure various business process reengineering
CO4 To know how to prevent the defects
CO5 To learn risk management in software process

UNIT I

UNIT II

UNIT III
Software Quality metrics methodology: Establish quality requirements, Identify Software quality metrics, Implement the software quality metrics, analyse software metrics results, validate the software quality metrics – Software quality indicators – Fundamentals in Measurement theory.

UNIT IV
Software Testing Strategy and Environment: Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing, Software Testing Methodology- Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist.

UNIT V
Software Testing Techniques
Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured Walkthroughs, Thread Testing, Performance Testing, White-Box Testing
TEXT BOOKS

REFERENCES
Prerequisites: Fundamentals of artificial intelligence

COURSE OBJECTIVES:
- To understand the basic concepts of neurons, perceptron’s and back propagation networks.
- To understand feed forward and recurrent networks.
- To understand Support Vector Machines and Linear regression.
- To understand different types of unsupervised neural networks.
- To understand adaptive resonance theory and its applications.

Course Outcomes:
CO1: Describe models of the brain and neuron function with mathematical methods.
CO2: Design and develop artificial neural networks in software.
CO3: Describe more complex neural networks and the training methods for the same.
CO4: The Student Learn Unsupervised Learning Networks
CO5: The student will have a broad knowledge in developing the different algorithms for neural networks

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Building Blocks of Adaptive Resonance – Substrate of Resonance Structural Details of Resonance Model – Adaptive Resonance Theory – Applications.
TEXT BOOKS

REFERENCES

HEAD
Dept. of Computer Science and Engineering
Lakireddy Bali Reddy College of Engg.
MYLAVARAM - 521 230, Krishna Dr., A.P.
Prerequisites: Web technologies and Information security

Course Objective:
- To have a wide understanding of the various threats in the internet.
- To gain knowledge about security threats at user and server level, transaction level.
- To know about commerce and legal issues in the web.

Course Outcomes:
CO1: Understand security-related issues in Web-based systems and applications
CO2: Be able to evaluate a Web-based system with respect to its security requirements
CO3: Understand the fundamental mechanisms of securing a Web-based system
CO4: Be able to implement security mechanisms to secure a Web-based application
CO5: Understand security issues and common controls in electronic commerce systems

UNIT I

UNIT II
Web-User level security: Privacy-protection Techniques and Technologies, Backup and Antitheft, Plugins, JavaScript, Flash, Digital Certificates – Server and Client, Code Signing-
Server level security: Physical security, Host security, SSL certificates,

UNIT III

UNIT IV
Security infrastructure: SSL/TLS protocol, Secure Authentication and Messaging, Public Key Infrastructure, Firewall solutions, Intrusion Detection System, Disaster Recovery and Backups-
Commerce

UNIT V

TEXT BOOKS

REFERENCES
Prerequisites: Fundamentals Data Mining, Data Structures

Course Objectives
1. To understand Matching concepts and algorithms relevant to that.
2. Able to solve extremal problems and chromatic numbers.
3. To identify different models of directed and random graphs.
4. To understand Hamiltonian paths and cycles.

Course Outcomes
- CO1: Explore the graph analytic techniques and its applications
- CO2: Model a problem into a graph database and perform analytical tasks over the graph in a scalable manner
- CO3: Understand the External problems in graph theory
- CO4: Learn the fundamentals of Directed Graphs
- CO5: To impart theoretical knowledge of Random graphs

UNIT I

UNIT II
Matchings-Matchings: Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, algorithms for matching and weighted matching (in both bipartite and general graphs), factors of graphs (decompositions of the complete graph).

UNIT III
Extremal problems- Independent sets and covering numbers, Turan's theorem, Ramsey theorems; Colorings: Brooks theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number.

UNIT IV
Directed Graphs - Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branching.

UNIT V
Random Graphs:-The basic models - use of expectations, simple properties of almost all graphs, almost determined variables – use of variance, Hamiltonian cycles, the phase transition.

TEXT BOOKS

REFERENCES
1. Bollobas, Bela, Modern Graph Theory, Springer.
2. Diestel, R. Graph Theory, Springer.
Prerequisites: Programming Fundamentals Java and R

Course Outcomes:

CO1 Set up single and multi-node Hadoop Clusters
CO2 Apply Map Reduce algorithms for various algorithms
CO3 Design new algorithms that uses Map Reduce to apply on Unstructured and structured data

Week 1
- Downloading and installing Hadoop
- Understanding different Hadoop modes
- Startup scripts & Configuration files

Week: 2
- Setting up Hadoop pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.

Week: 3
- After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves)

Week: 4
Implement the following file management tasks in Hadoop:
- Adding files and directories
- Retrieving files & Deleting files

Week: 5
- Implement Matrix Multiplication with Hadoop Map Reduce

Week: 6
- Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Week: 7
- Running Word Counting on a Remote Cluster

Week: 8
- K-means clustering using map reduce

Week 8
- Understanding Hive
- Installing Hive & Setting up Hive configurations
- Practice Hive with example

Week 9:
- Installing HBase & thrift
- Practice HBase with example

Week 10:
- Practice Importing and Exporting Data from Various DBs

Reference text
Big Data Analytics with R and Hadoop--VigneshPrajapati--2013 Packt Publishing
Prerequisites: Programming Skills of Java

Course Objectives
- Understand the Eclipse IoT Project.
- Understand the architecture of IoT Toolkit.
- Understand the gateway-as-a-service deployment in IoT toolkit.
- Understand the working principle of Raspberry Pi.
- Understand the API gateway service reference implementation in IoT toolkit.

Course Outcomes
CO1: Set up eclipse IoT Project
CO2: Design projects on Raspberry Pi
CO3: Implement API gateway service on IoT Tool Kit

Syllabus:
1. Exercise on Eclipse IoT Project.
2. Experiments on few Eclipse IoT Projects.
3. Any experiment of architecture of IoT Toolkit.
4. Exercise on smart object API gateway service reference implementation in IoT toolkit.
5. Experiment on HTTP-to-CoAP semantic mapping proxy in IoT toolkit.
6. Experiment on gateway-as-a-service deployment in IoT toolkit.
7. Experiment on application framework and embedded software agents for IoT toolkit.
8. Exercise on working principle of Raspberry Pi.
9. Experiment on Connectivity of Raspberry Pi with existing system components.

REFERENCES
2. https://www.arduino.cc/
4. Contiki (Open source IoT operating system).
5. Arduino (open source IoT project).
7. Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and Sensors)
Prerequisites: Fundamentals databases

Course Objectives:
• To use different information retrieval techniques in various application areas
• To apply IR principles to locate relevant information large collections of data
• To analyze performance of retrieval systems when dealing with unmanaged data sources
• To implement retrieval systems for web search tasks.

Course Outcomes:
CO1: Understand the underlined problems related to IR
CO2: Learn vector space model
CO3: Understand XML retrieval systems
CO4: Understand and deploy efficient techniques for the indexing of document objects that are to be retrieved
CO5: Implement features of retrieval systems for web-based and other search tasks

UNIT I

UNIT II
Scoring, term weighting and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion.

UNIT III

UNIT IV
Support vector machines and machine learning on documents, Flat clustering, Hierarchical clustering, Matrix decompositions and latent semantic indexing.

UNIT V
Web search basics. Web crawling and indexes, Link analysis.

TEXT BOOK
Introduction to Information Retrieval, Christopher D. Manning and PrabhakarRaghavan and HinrichSchütze, Cambridge University Press, 2008.

REFERENCES
5. Information Storage &Retrieval, Robert Korfhage, John Wiley & Sons.
Prerequisites: Fundamentals of Data Mining

Course Objective
- To understand the characteristics of the Internet and data mining
- To know about the web crawling algorithm implementation
- To study the web data collection and analysis of web data for new patterns

Course Outcomes:
CO1: Build a sample search engine using available open source tools
CO2: Analyze social media data using appropriate data/web mining techniques
CO3: Understand Structured Data Extraction
CO4: Design a system to harvest information available on the web to build recommender systems
CO5: Identify the different components of a web page that can be used for mining

UNIT I

UNIT II
Social Network Analysis: Introduction, Co-Citation and Bibliographic Coupling, PageRank, HITS Algorithm, Community Discovery. Web Crawling: A Basic Crawler Algorithm, Implementation Issues, Universal Crawlers, Focused Crawlers, Topical Crawlers, Evaluation, Crawler Ethics and Conflicts.

UNIT III

UNIT IV

UNIT V
Web Usage Mining: Data Collection and Pre-Processing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web Usage Patterns, Recommender Systems and Collaborative Filtering, Query Log Mining, Computational Advertising.
TEXT BOOK

REFERENCE
Prerequisites: Fundamentals of Networks

Course Objectives
- To understand Storage Area Networks characteristics and components.
- To become familiar with the SAN vendors and their products.
- To learn Fibre Channel protocols and how SAN components use them to communicate with each other.
- To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches.
- Thoroughly learn Cisco SAN-OS features.
- To understand the use of all SAN-OS commands. Practice variations of SANOS features.

Course Outcomes:
- CO1 Identify and describe the functions to build data center networking for switch network.
- CO2 Describe the different types of RAID implementations and their benefits.
- CO3 Describe the benefits of the different network storage options for different application environments.
- CO4 Identify single points of failure in a storage infrastructure and list solutions.
- CO5 Identify and analyzes the common threats in each domain.

UNIT I
Introduction to Storage Technology. Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management. Solutions available for data storage, Core elements of a data centre infrastructure, role of each element in supporting business activities.

UNIT II
Storage Systems Architecture. Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6. Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system.

UNIT III
Introduction to Networked Storage. Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IPSAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfils the need, understand the appropriateness of the different networked storage options for different application environments.
UNIT IV
Information Availability & Monitoring & Managing Data centre , List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) , RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures , Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities Identify key areas to monitor in a data centre, Industry standards for data centre monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data centre.

UNIT V
Securing Storage and Storage Virtualization Information security, Critical security attributes for information systems, Storage security domains, List and analyses the common threats in each domain, Virtualization technologies, block-level and file level virtualization technologies and processes.

TEXT BOOK
EMC Corporation, Information Storage and Management, Wiley

REFERENCES
Prerequisites: Fundamentals of Software Engineering

Course Objectives:
- To develop skills in software project management
- The topics include-software economics; software development life cycle; artifacts of the process; workflows; checkpoints; project organization and responsibilities; project control and process instrumentation;

Course Outcomes:
CO1: Identify the basic concepts and issues of software project management, Parameters to be considered to improve the software economics.
CO2: Apply SDLC methodology for development and identification of artifacts for each lifecycle phases.
CO3: Apply activities necessary to successfully complete and close the software projects using all the checkpoints in development process.
CO4: Apply the metrics for assessing the quality and cost; Acquire knowledge about automation building blocks and organization structure.
CO5: Identify the elements of tailoring process and future software project management along with case study (CCPDS).

UNIT I
Conventional Software Management: The waterfall model, conventional software Management performance.

UNIT II
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, Peer inspections. The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT III
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT IV
Checkpoints of the process: Major milestone, Minor Milestones, Periodic status assessments.
Iterative Process Planning: work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.
UNIT V

TEXT BOOK

REFERENCES
2. Software Project Management, Joel Henry, Pearson Education.
Prerequisites: Fundamentals of Image Processing

Course Objectives:
- Understand the concept of patterns and the basic approach to the development of pattern recognition algorithms.
- Understand and apply methods for data pre-processing, feature extraction, and feature selection to multivariate data.
- Understand and apply supervised and unsupervised classification methods to detect and characterize patterns in real-world data.
- To develop prototype for pattern recognition algorithms that can be used to study.

Course Outcomes:
- CO1 Understand and apply various algorithms for pattern recognition
- CO2 Bring out structural pattern recognition and feature extraction techniques
- CO3 Learn about Supervised and unsupervised Learning
- CO4 Realize the clustering concepts and algorithms
- CO5 Understand the process of Hidden Markov Models

UNIT I
Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.
Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT II
Normal density: Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.
Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT III

UNIT IV
Similarity measures, criteria function for clustering. Component analyses: Principal component analysis, non-linear component analysis; Low dimensional representations and multi-dimensional scaling.

UNIT V
Discrete Hidden Markov Models: Introduction, Discrete–time markov process, extensions to hidden Markov models, three basic problems for HMMs
Continuous hidden Markov models: Observation densities, training and testing with continuous HMMs, types of HMMs.
TEXT BOOKS
1. Richard O. Duda, Peter E. Hart and David G. Stroke Pattern Classifications. 2 ed Wiley Student Edition

REFERENCE
Prerequisites: Foundations of Information Security

Course objectives

- To get the Knowledge on basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- To identify the procedure for High tech Investigations, data recovery workstations.
- To examine digital evidences such as the data acquisition, identification analysis.
- To apply forensic analysis tools to recover important evidence for identifying computer crime.
- Used for well-trained as next-generation computer crime investigators.

Course Outcomes:

CO1 Understand the definition of computer forensics fundamentals
CO2 Describe the types of computer forensics technology
CO3 Analyze various computer forensics systems.
CO4 Illustrate the methods for data recovery, evidence collection and data seizure.
CO5 Summarize duplication and preservation of digital evidence.

Prerequisites: Foundations of Information Security

UNIT I
Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

UNIT II
Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

UNIT III
Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

UNIT IV
Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case

UNIT V
Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.
TEXT BOOKS

REFERENCE
Prerequisites: Foundations Neural Networks

Course Objectives
- Used to formalize tasks in terms of computational Complexity via Deep Learning Architectures.
- Used to design deep learning models via Statistical approaches to solve data-rich tasks
- Helpful to Build datasets, tune and train deep learning models with advanced deep learning libraries
- To understand the inner mechanisms of Deep learning Neural techniques during training
- To analyze the performance of Optimization techniques on tasks of interest

Course Outcomes:
- CO1: Design deep architectures and algorithms for pattern recognition
- CO2: Analyse classification problems probabilistically and estimate classifier performance
- CO3: Explore the essentials of Deep Learning and Deep Network architectures
- CO4: Define, train and use a Deep Neural Network for solving real world problems that require artificial Intelligence based solutions
- CO5: Explore the essentials of Optimization for Training Deep Models

UNIT-I

UNIT-II

UNIT-III
Neural Networks for Deep Architectures: Learning Algorithms, Generalization, Capacity, over fitting and under fitting, Generalization Error, Estimators, Bias and variance, Maximum Likelihood Estimation. Learning Mechanisms: Supervised Vs Unsupervised Learning,

UNIT-IV

UNIT-V
Challenges in Optimization: Local Minima, III- Conditions, Plateaus, Saddle Points and Other flat regions.
Optimization Algorithms: Gradient Descent, Stochastic Gradient Descent, Momentum.
TEXT BOOKS
1. Learning Deep Architectures for AI", Foundations and Trends® in Machine Learning,
   YoshuaBengio, 2009, Now Publishers

REFERENCES
2. Deep Learning and Neural Networks, Jeff Heaton, Heaton Research, Inc 2015 Statistical