M.Tech. Computer Science and Engineering

Course Structure and Syllabus (R20)

Applicable From 2020-2021 Admitted Batch

I YEAR - I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2015801	Machine Learning	PC	3	0	0	3	30	70	100
2	2015802	Advanced Data Structures	PC	3	0	0	3	30	70	100
3	2015803	Research Methodology & IPR	PC	2	0	0	2	30	70	100
4		Professional Elective –I	PE	3	0	0	3	30	70	100
5		Professional Elective –II	PE	3	0	0	3	30	70	100
6	2015831	Machine Learning Lab	PC	0	0	4	2	30	70	100
7	2015832	Advanced Data Structures Lab	PC	0	0	4	2	30	70	100
8		Audit Course - I	AC	2	0	0	0	30	70	100
Total Credits				**16**	**0**	**8**	**18**	**240**	**560**	**800**

2015801: MACHINE LEARNING

L	T/P	C
3	0/0	3

Course Objectives

- To learn the concept of how to learn patterns and concepts from data
- To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Course Outcomes: After completion of course, students would be able to:

- Understand the concepts of computational intelligence like machine learning
- Get the skill to apply machine learning techniques to address the real time problems in different areas.
- Understand the Neural Networks and its usage in machine learning application.

UNIT – I

Introduction -Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning.

Concept learning and the general to specific ordering –introduction, a concept learning task, concept learning as search, find-S, the candidate elimination algorithm, inductive bias.

Supervised Learning (Classification and Regression)

Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression and Generalized Linear Models.

UNIT – II

Unsupervised Learning:

Clustering: K-means/Kernel K-means. Dimensionality Reduction: PCA and kernel PCA. Matrix Factorization and Matrix Completion. Generative Models (mixture models and latent factor models).

UNIT - III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT - IV

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning, feature representation learning. Neural network representation, perceptions, multilayer networks and the back-propagation algorithm.

UNIT - V

Scalable Machine Learning, Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Bayesian Learning and Inference. Recent trends in various learning techniques of machine learning.

Text Book:

1. Machine Learning –Tom M. Mitchell, -MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

References:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,2012
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer,2007

2015802: ADVANCED DATA STRUCTURES

L	T/P	C
3	0/0	3

Pre-Requisites: UG level course in Data Structures

Course Objectives:

- The student should be able to choose appropriate data structures, understandthe ADT/libraries, and use it to design algorithms for a specific problem.
- Students should be able to understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
- Student should be able to come up with analysis of efficiency and proofs ofcorrectness.

Course Outcomes: After completion of course, students should be able to:

- Select the data structures that efficiently model the information in a problem.
- Design programs using a variety of data structures, including hash tables, search structures and digital search structures
- Identify suitable data structures and develop algorithms for computational geometry problems.
- Implement and know the application of algorithms for sorting and pattern matching

UNIT - I

Dictionaries:

Definition, Implementation of Dictionaries- (Insertion, search, retrieve, updation, Deletion)

Searching: Linear Search, Binary Search, Multiway Search and its applications.

Sorting: Merge Sort, Quick Sort, Heap Sort and its applications.

Hashing:

Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing and its Applications.

UNIT –II

Heap Structures & Skip Lists

Heap Structures- Introduction, Min-Max Heap, Leftist tree, Binomial Heap, Fibonacci Heap, and its applications.

Skip List- Definition and operations of skip list and its applications.

UNIT - III

Trees & Graphs:

Binary Search Tree, AVL Tree, Red Black Tree, 2-3 Tree, B-Tree, Splay Tree, and its Applications

Graphs : Introduction of graph, Representation of graph , Graph traversals and its Applications

UNIT – IV

Text Processing:

String Operations, Brute-Force Pattern Matching, Boyer- Moore Algorithm, Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, Huffman Coding Algorithm, Longest Common Subsequence Problem (LCS) and its applications

UNIT - V

Computational Geometry:

One Dimensional Range Searching, Two-Dimensional Range Searching, Priority Search Tree and its operations, Priority Range Trees, Quadtrees, k-D Trees, Recent Trends in computational geometry methods and its applications.

TEXT BOOKS:

1. Fundamentals of Data structures in C, E.Horowitz, S.Sahniand Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

REFERENCES:

1. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni
2. Sanguthevar Rajasekaran, Universities Press.C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press

2015803: RESEARCH METHODOLOGY & IPR

L	T/P	C
2	0/0	2

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

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

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R &D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I:

Introduction to research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT-II:

Effective literature studies approaches, Analysis, Plagiarism, Research ethics.

UNIT-III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, Presentation and Assessment by a review committee.

UNIT-IV:

Intellectual Property Rights: Patents, Designs, Trademark and Copyright. Process of Patenting and Development: Technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under Patent Cooperation Treaty(PCT)

UNIT-V:

Patent Rights: Scope of Patent Rights, Filing for patent, Licensing and transfer of technology,

Patent information and databases, Geographical Indications, New Developments in IPR: Administration of Patent System. IPR of Biological Systems, Computer Software etc.

TEXT BOOKS:

1.. C R Kothari "Research and Methodologies" New Age Publications

2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. http://www.ipindia.nic.in/

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.
3. Mayall, "Industrial Design", McGraw Hill,1992.
4. Niebel, "Product Design", McGraw Hill,1974.
5. Asimov, "Introduction to Design", Prentice Hall,1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age",2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand,2008

2015811: Information Security

L	T/P	C
3	0/0	3

Pre-Requisites: Cryptography and Network Security

Course Outcomes

At the end of the course, student will able to

- Understand the fundamentals of information security
- Ability to identify and investigate security threats
- Ability to apply security technologies using cryptographic mechanisms
- Demonstrate the knowledge of cryptography, network security concepts and applications.
- Understand physical security, digital forensic methodology

Unit I Introduction

History of information security, CNSS security model, Approaches to Information Security Implementation, security systems development life cycle.

Need for Security

Threats, Attacks, Secure software development, Laws and ethics in information security

Unit II Risk Management & Planning for Security

Introduction, overview of Risk Management, Risk Identification, Risk Assessment, Risk control strategies

Panning for Security

Information Security Planning and governance, Information security policy, standards and practices.

Unit III Security Technology: Firewalls, VPNs & IDS

Introduction, Access control, Firewalls, Protecting Remote Connections, Virtual Private Networks, Intrusion Detection and prevention systems, Honeypots, hone nets, biometric access control

Unit III Cryptography

Introduction, cipher methods, Cryptographic Algorithms, Cryptographic Tools- Public key infrastructure, digital signatures, Protocol for secure communication- HTTP, SSL, S/SMIME, securing TCP/IP with IPsec and PGP, attacks on cryptosystems.

Unit IV Physical Security

Physical access control, fire security and safety, interception of data, remote computing security, implementing information security- information security project management, technical aspects of implementation.

Unit V Security and Personnel

Positioning and staffing the security function, credentials of information security professionals, employment policies and practices

Information security maintenance – security management maintenance models, digital forensic, digital forensics methodology

Text Book :

1. Principles of Information Security: Michael E. Whitman, Herbert J. Mattord, *4th edition* , Cengage Learning- publisher

Reference book

1. Cryptography and Network Security Principles and Practices, Fourth Edition By William Stallings
2. Fundamentals of Digital Forensics, **Kavrestad,** Joakim , springer

2015812 : ADVANCED OPERATING SYSTEMS

L	T/P	C
3	0/0	3

Course Objectives

1. To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
2. Hardware and software features that support these systems.

Course Outcomes

1. Understand the design approaches of advanced operating systems
2. Analyze the design issues of distributed operating systems.
3. Evaluate design issues of multi processor operating systems.
4. Identify the requirements Distributed File System and Distributed Shared Memory.
5. Formulate the solutions to schedule the real time applications.

UNIT - I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. **Theoretical Foundations:** Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT - II

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, **Non-Token – Based Algorithms:** Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, **Token-Based Algorithms:** Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

UNIT - III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized-Deadlock–Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT - IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures

Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT - V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issue

TEXT BOOK

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition2001

REFERENCES:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007-R1

2015813: ADVANCED COMPUTER NETWORKS

L	T/P	C
3	0/0	3

Prerequisites: Data Communication and Computer Networks

Course Objective:

- This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

Course Outcomes:

- Understanding of holistic approach to computer networking
- Able to understand & perform Routing protocols
- Able to understand the computer networks and their application
- Able to design simulation concepts related to packet forwarding innetworks.
- Able to implement emerging trends in networks-wireless &Mobile networks
- Able to implement live streaming using UDP & HTTP

UNIT – I Introduction

Review of Computer Networks, Internet, OSI Model, TCP/IP protocol suite, Addressing. Data Link control - Error Detection and Error Correction techniques, Multiple Access Protocols, Wired LAN, HDLC, Point- to-Point Protocol, Channelization.

UNIT- II Internetworking and Routing

Logical Addressing, IPv4, IPv6, Unicast routing: Intra-domain Routing Protocols, Inter-domain Routing Protocols, Multicast Routing: MOSPF, DVMRP, PIM, CBT Protocols.

UNIT III Transport and Application Layer

UDP, TCP, TCP Congestion Control, QOS, Techniques to Improve QOS, Soct Programming, DNS, FTP, TelNet, WWW , HTTP **and** SNMP.

Unit IV Wireless and Mobile Networks

Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs , Cellular Internet Access, Mobility Management: Mobile IP, Managing Mobility in Cellular Networks, Wireless and Mobility: Impact on Higher-Layer Protocols , Wireless Security.

Unit V Multimedia Networking

Digitizing audio and video, audio and video compression, streaming live audio and video Streaming Stored Video, UDP Streaming, HTTP Streaming, Voice-over-IP, Protocols for Real-Time Interactive Applications, **Case Studies: Netflix, YouTube**

Text books:

1. Data communications and networking 5th edition Behrouz A Fourzan,TMH
2. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W.

Ross, Pearson, 6th Edition,2012.

References:

1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and PiyasatNilkaew, Pearson, 3rd Edition,2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, PrenticeHall.

2015814: IMAGE AND VIDEO PROCESSING

L	T/P	C
3	0/0	3

Pre-Requisites: Computer Graphics

Course Objectives:

- provides the fundamentals for studying images and videos
- learn fundamental tools and techniques for processing images and videos, and will learn to apply them to a range of practical applications
- Introduces the principles of digital image and video processing, discusses current image and video processing technology, and provides hands-on experience with image/video processing and communication methods.

Course Outcomes:

- Understand the fundamentals of image and video processing and their applications
- Develop familiarity and implement basic image and video processing algorithms.
- Select and apply appropriate technique to real problems in image and video analysis.

UNIT I

Fundamentals of Image processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms

UNIT II

Image Processing Techniques: Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters Frequency **Domain methods**: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering

UNIT III

Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation Image Compression Image compression fundamentals – coding Redundancy, spatial and temporal redundancy.

Compression models : Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards

UNIT IV

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, Surveillance, Sampling of video signals, filtering operations

UNIT V

2-D Motion Estimation: Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TEXT BOOKS

1. Gonzaleze and Woods ,”Digital Image Processing “, 3rd edition , Pearson
2. Yao wang, Joem Ostarmann and Ya – quin Zhang, ”Video processing and communication “,1st edition , PHI

REFERENCE TEXT BOOK

1. M. Tekalp ,”Digital video Processing”, Prentice Hall International
1. Chris Solomon, Toby Breckon ,"Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons,

2015815: CLOUD COMPUTING

L	T/P	C
3	0/0	3

Course Objectives:

- The student will also learn how to apply trust-based security model to real-world security problems.
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
- Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Course Outcomes: After completion of course, students would be able to:

- Identify security aspects of each cloud model
- Develop a risk-management strategy for moving to the Cloud
- Implement a public cloud instance using a public cloud service provider
- Apply trust-based security model to different layer

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,

TEXT BOOKS:

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, rp2011.

2015816: INTERNET OF THINGS

L	T/P	C
3	0/0	3

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.

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.
- Elaborate the need for Data Analytics and Security in IoT.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.

UNIT – IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI,I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins. **Case studies: Home automation, Garbage collection, Fire alarm.**

UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and

communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API.

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

2015831: MACHINE LEARNING LAB
M. Tech - CSE/ I Year – I Semester

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 able to demonstrate using python.

Course Outcomes: After the completion of the "**Machine Learning**" lab, the student can able to:

- Understand complexity of Machine Learning algorithms and their limitations;
- Understand modern notions in data analysis-oriented computing;
- Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Implement linear regression using python.
4. Implement Logistic regression using python.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. Use Python ML library classes/API.
7. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Use Python ML library classes/API.
8. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
9. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
10. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
11. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease

Data Set. Use Python ML library classes/API.

Text Books:

1. Machine Learning – Tom M. Mitchell, MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

2015832: ADVANCED DATA STRUCTURES LAB

L	T/P	C
0	0/4	2

Prerequisites: A course on Computer Programming & Data Structures

Course Objectives:

- Introduces the basic concepts of Abstract Data Types.
- Reviews basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
- Introduces sorting and pattern matching algorithms.

Course Outcomes:

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

List of Programs

1. Write a program to perform the following operations:
   a. Insert an element into a binary search tree.
   b. Delete an element from a binary search tree.
   c. Search for a key element in a binary search tree.
2. Write a program for implementing the following sorting methods:
   a. Mergesort b)Heapsort c) Quicksort
3. Write a program to perform the following operations:
   a. Insert an element into a B-tree.
   b. Delete an element from a B-tree.
   c. Search for a key element in a B-tree.
4. Write a program to perform the following operations:
   a. Insert an element into a Min-Maxheap
   b. Delete an element from a Min-Maxheap
   c. Search for a key element in a Min-Maxheap
5. Write a program to perform the following operations:
   a. Insert an element into a Leftist tree
   b. Delete an element from a Leftisttree
   c. Search for a key element in a Leftisttree

6. Write a program to perform the following operations:
    a. Insert an element into a binomial heap
    b. Delete an element from a binomial heap.
    c. Search for a key element in a binomial heap
7. Write a program to perform the following operations:
    a. Insert an element into a AVLtree.
    b. Delete an element from a AVL tree.
    c. Search for a key element in a AVL tree.
8. Write a program to perform the following operations:
    a. Insert an element into a Red-Blacktree.
    b. Delete an element from a Red-Blacktree.
    c. Search for a key element in a Red-Blacktree.
9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer moore pattern matching algorithm.

TEXT BOOKS:

1. Fundamentals of Data structures in C, E. Horowitz, S.Sahniand Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

REFERENCES:

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press

2010001: ENGLISH FOR RESEARCH PAPER WRITING
(Audit Course – I)

M. Tech - CSE/ I Year – I Semester	L	T/P	C
	2	0/0	0

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

UNIT-I:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT-II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

UNIT-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNIT-V:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge UniversityPress
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011.

2010002: DISASTER MANAGEMENT
(Audit Course - I)

L	T/P	C
2	0/0	0

Prerequisite: None

Course Objectives: Students will be able to

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- Planning and programming in different countries, particularly their home country or the countries they working.

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment, Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal bookCompany.
2. Sahni, PardeepEt. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, NewDelhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., NewDelhi.

2010003: SANSKRIT FOR TECHNICAL KNOWLEDGE
(Audit Course - I)

L	T/P	C
2	0/0	0

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:

Alphabets in Sanskrit.

UNIT-II:

Past/Present/Future Tense, Simple Sentences.

UNIT-III:

Order, Introduction of roots.

UNIT-IV:

Technical information about Sanskrit Literature.

UNIT-V:

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, NewDelhi
2. "Teach Yourself Sanskrit" PrathamaDeeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New DelhiPublication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., NewDelhi.

2010004: VALUE EDUCATION
(Audit Course - I)

L	T/P	C
2	0/0	0

Prerequisite: None
Course Objectives: Students will be able to

- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge ofs elf-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles. Value judgments

UNIT-II:
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship. Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith, Self-management and Good health' Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, Allreligions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, NewDelhi