CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech. - 1st** Branch: **Computer Science & Engineering**
Subject: **Mathematical Foundation for AI & ML** Code: **5109111(014)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**:** 02

COURSE OBJECTIVES:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Introduces the basic concepts and techniques of Machine Learning.
3. To use mathematically correct language and notation for Linear Algebra.
4. Introduces sets and functions, forming and solving recurrence relations.
5. To provide the basic concepts of automata theory and theory of computation.

UNIT 1:
Basics of Artificial Intelligence and Machine Learning:
Introduction to AI and ML, use cases in business and its scope, importance of linear algebra, statistics and optimization from an artificial intelligence perspective, structured thinking for solving artificial intelligence and Machine learning problems, CRIPS – DM methods,

UNIT 2:
Linear Algebra:
Matrices and their properties (determinants, traces, rank, nullity, etc.), eigenvalues and eigenvectors, Matrix factorizations, inner products, distance measures, projections, notion of hyper planes, half-planes;

UNIT 3:
Probability, Statistics and Random Processes:
Probability theory and axioms, random variables, probability distributions and density functions (Uni-variate and multivariate), expectations and moments, covariance and correlation, statistics and sampling distributions, hypothesis testing of means, proportions, variances and correlations, confidence (statistical) intervals, correlation functions, white-noise process;

UNIT 4:
Descriptive Statistics
Recurrence Relations: Solving Recurrence Relations, Divided conquer Relations, Inclusion and Exclusion, Applications Set, Set operations, Functions, Sequence and Summations, The Growth of Functions.

UNIT 5:
Automata Theory and Formal Languages
Finite Automata: Basic concepts of strings, alphabets, languages, Principles of mathematical induction, finite automation, deterministic, non-deterministic and equivalence, transition diagrams, epsilon transition, equivalence of regular expressions and FA, Moore and Mealy machines. Regular languages: Pumping Lemma of regular sets, Myhill nerode theorem, Minimization of finite automata. Chomsky Hierarchy of languages. Context free languages: Relations between classes of languages, Context free grammar, Derivation trees, and ambiguity simplification.

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

1. Gain knowledge about basic concepts of Machine Learning
2. Use different machine learning techniques to design AI machine.
3. Define basic terms and concepts of matrices, vectors and complex numbers
4. Study about recurrence relations, generating function and operations on them.
5. Acquire a fundamental understanding of the core concepts in automata theory and formal languages.

Text Books:

1. G. Strang Introduction to Linear Algebra, (5e), Wellesley-Cambridge Press, 2016.
2. Bendat, J. S. and A. G. Piersol, Random Data: Analysis and Measurement Procedures, (4e), John Wiley & Sons, 2010.
3. Montgomery, D. C. and G. C. Runger, Applied Statistics and Probability for Engineers, (5e), John Wiley & Sons, 2011.
4. Introduction to Automata theory. Language and Computation, John E. Hopcropt & Jeffery D. Ullman, Narosa Publishing House.
5. Theory of Computer Science (Automata Language & Computation), K.L.P. Mishra and N. Chandrasekran, PHI.

Reference Books:

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, (4e), O'Reilly Media, Fourth Edition, 2016.
2. An Introduction and finite automata theory, Adesh K. Pandey, TMH.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech. - 1st** Branch: **Computer Science & Engg**
Subject: **Advance Python and R Programming for AI & ML** Code: **5109112(022)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

COURSE OBJECTIVES:

1. To acquire programming skills in core Python.
2. To acquire Object Oriented Skills in Python
3. To develop the ability to write database applications in Python
4. Implementing Exceptional Handling.
5. Introduce the Basic concept of R and R data types

Unit 1: Introduction

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types, Operators, and Expressions: Types – Number, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if…else, if-elif-else, nested if, for loop, while loop, break and continue statement.

UNIT 2: Python Data Structures and functions

Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences; Functions – Defining Functions and Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages.

UNIT 3: Object Oriented Programming and Exceptional Handling

Object Oriented Programming -Introduction, Attributes and Class Keyword, Class Object Attributes and Methods, Inheritance and Polymorphism, Special (Magic / Dunder) Methods; Exceptional handling: try, catch and throw.

UNIT 4: Introduction to Data Science

Functional Programming: Lambda, Iterator, Generators, List Comprehensions; **NumPy with python**: NumPy array creation, integer indexing, Array indexing, Boolean Indexing, Slicing and Iterating in array, Arithmetic operations on NumPy arrays, mathematical functions in NumPy, Changing the Shape of an Array, Stacking and Splitting of Arrays.
Pandas: Panda basics, Pandas series, Pandas Data frames.

UNIT 5: Introduction to R

Overview of R & Basics, How to Download & Install R, RStudio for Windows, R Data Types, Arithmetic & Logical Operators with Example, IF, ELSE, ELSE IF Statement in R, R Matrix Tutorial: Create, Print, add Column, Slice, Factor in R: Categorical & Continuous Variables, For and while Loop in R, Data Structures in R - Vectors, Matrices, Arrays, Lists, Factors, Data Frames. Introducing Machine Learning: Import Data into R: Read CSV, Excel, txt, SPSS Files, How to Replace Missing Values NA in R; Machine Learning with R, Managing and Understanding Data, Loading and Handling Data in R.

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

1. Apply basic concept of Python language for solving problems
2. Understand the use of Python data structure concepts for problem solving.
3. Implement object oriented concepts.
4. Understand and Implement NumPy and Pandas for data analysis.
5. Understand and apply the R concepts for analyzing data.

Text Books:

1. Introduction to Python Programming, Gowrishankar S. Veena A., CRC Press.
2. The R Book, Michael J. Crawley, Wiley.

Reference Books:

1. Classic computer science problems in Python, David Kopec, Manning Publications Co.
2. R in Action, Robert I. Kabacoff, Manning Publications Co.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech.-1st** Branch: **Computer Science & Engg**
Subject: **Advanced Data Structures & Algorithms** Code: **5109113(022)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

COURSE OBJECTIVES:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification of advanced Heaps
3. Principles for good program design, especially the uses of Hashing
4. To understand the concepts of Text Processing
5. Effectiveness of Genetic Algorithms

UNIT 1: Advanced Search Trees:
Review of Binary Search Trees, AVL Tree, R-B Trees and Splay Trees, Advanced Search Data Structures Like- Treaps, Skip Lists, Finger Search Trees, Biased Search Trees; Data Structures for External Storage: Review of 2-3-4 Trees and 2-3 Trees, B-Tree, B+ Trees, Priority Queues and Concatenable Queues Using 2-3 Trees;

UNIT 2: Advanced Heaps:
Review of Heaps, Binomial Trees, Implementing Binomial Heaps and its Operations, Structure of Fibonacci Heaps, Mergeable Heap Operations, Decreasing Key and Deleting a Node, Bounding the Maximum Degree, Amortized Analysis of Fibonacci Heaps;

UNIT 3: Dictionaries and Hashing
Review of Dictionaries and Implementation, Review of Hashing- The Bucket Approach, Index File Approach, Universal Hashing, Perfect Hashing, Locality Sensitive Hashing, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing, Synopses, Fingerprints, Fault Tolerant Data Structures;

UNIT 4: Text Processing:
Brute-Force Pattern Matching, Rabin-Karp Algorithm, Boyer-Moore Algorithm, Knuth-Morris-Pratt Algorithm, Huffman Coding Algorithm, Tries- Standard Tries, Compressed Tries, Suffix Tries

UNIT 5: Genetic Algorithm:
Introduction to GA, implementation in Python, problem solving using GA such as subset problem, TSP, Knapsack

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

1. Identify suitable data structures and develop algorithms for Multidimensional Searching
2. Develop and analyze algorithms for various variations of Heaps
3. Develop and analyze algorithms for various variations of Hashing Techniques
4. Able to select a proper pattern matching algorithm for given problem
5. Apply Genetic Algorithms in different problem domains

Text Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest, MIT Press and McGraw Hill.
2. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft and Jeffrey D.Ullman, Addison Wesley.

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz and Satarj Shani, Computer Science Press
2. Introduction to Algorithms: A Creative Approach, Udi Manber Addision Wesley.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech-1st** Branch: **Computer Science & Engg.**
Subject: **Data Preparation and Analysis** Code: **5109114(022)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

COURSE OBJECTIVES:

1. Understand the Basic of queries for accessing data
2. Understand the Data transformations through EDA
3. Understand the working of Web APIs.
4. Describe exploratory data analysis and visualization concepts
5. Understand how to represent dataset as a Matrix

Unit 1: Data Acquisition

Gather information from different sources, internal systems and External systems, Web APIs, Open Data Sources, Data APIs, Web Scrapping, Relational Database access (queries) to process/access data.

UNIT 2: Data Preprocessing

Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process; Data Integration: Redundancy and Correlation Analysis; Data Reduction: Overview of Data Reduction Strategies, Principal Components Analysis; Data Transformation and Data Discretization: Data Transformation Strategies Overview, Data Transformation by Normalization, and Discretization by Histogram Analysis.

UNIT 3: Exploratory Data Analysis

Exploratory Analysis: Descriptive and comparative statistics, EDA explained using sample Data set; Exploratory Graphs: 3D scatter plot, Pair plot and limitations, Histogram and introduction to PDF, Univariate analysis using PDF, Mean, variance, standard deviation, Box-plot with whiskers.

UNIT 4: Dimensionality Reduction

Dimensionality Reduction and visualization introduction Row Vector, Column Vector, Represent a Data Set, Represent a dataset as a Matrix, explanation dimensionality reduction with a data set.

UNIT 5: Data Visualization

Visualization: Designing Visualizations, Time Series, Geo-location Data, Correlations and Connections, Hierarchies and Networks, Interactivity.

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

1. Implement the Web APIs and Data APIs
2. Able to understand the various steps of data cleaning
3. Implement the sample data set for Exploratory Analysis
4. Able to understand the uses of Geo-location data
5. Able to solve mean, variance problem

Text Books

1. Glenn J. Myatt., Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, (2e), Wiley Press, 2006.
2. Hands-On Exploratory Data Analysis with Python, Suresh Kumar Mukhiya, Usman Ahmed, Packt Publishing, 2020.
3. Data Mining Concepts and Techniques. Jiawei Han, Micheline Kamber and Jian Pei. Morgan Kaufmann, Publishers is an imprint of Elsevier.

Reference Books

1.Interactive Data Visualization with Python (2e), Abha Belorkar, Sharath Chandra Guntuku, Packt Publishing, 2020.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech.-1st** Branch: **Computer Science & Engg.**
Subject: **Introduction to Machine Learning** Code: **5109131(022)**
Total Theory Periods: 40 Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

COURSE OBJECTIVES:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods
3. To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms
4. To understand the various categories of Ensembles methods
5. Understand how to construct confidence intervals on the regression coefficients.

UNIT1: Foundation for ML:
Defining ML Techniques overview; Principal components analysis (Eigen values, Eigen vectors); Validation Techniques: Need for Cross-Validations, K-fold cross validation, validation and test datasets; Feature importance & Forward Feature Selection, Handling categorical and numerical features.

UNIT 2: Linear and Multiple Regression
Simple Linear Regression: Linear Regression Model, Least Squares Method, Coefficient of determination, Test statistical hypotheses and construct confidence intervals on regression model parameters; Multiple Regression: Multiple Regression Model, Least Square Method, Multiple Coefficient of Determination, Model assumptions, Categorical Variables in Regression.

UNIT 3: Logistic Regression
Building Logistic regression Model, Implementation of Logistic Regression on Python, Testing the significance of Logistic regression coefficients, Python Demo on Logistic Regression, Confusion matrix and ROC, Performance of Logistic Model.

UNIT 4: Supervised Learning: Classification Algorithms
Classification: Basic Concepts, Decision Tree Induction, Naive Bayes Classification, K-nearest neighbors, Rule-Based Classification, Support Vector Machines, SVM kernels, Bayesian Belief Networks, Classification by Back propagation, , Model Evaluation and Selection: Metrics for Evaluating Classifier Performance.

UNIT 5: Case Studies
Case Study - 1 -Based on Linear Regression; Case Study - 2 - Based on Logistic Regression,
Case Study - 3 -Based on Supervised Learning: Classification Techniques.

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

1. Implement and apply machine learning algorithms.
2. Select appropriate algorithms for solving a particular group of real-world Problems
3. Implement regression models.
4. Design and implement machine learning solutions to classification related problems.
5. Evaluate and interpret the results of the algorithms.

Text Books

1. Data Mining Concepts and Techniques. Jiawei Han, Micheline Kamber and Jian Pei. Morgan Kaufmann Publishers is an imprint of Elsevier.
2. Machine Learning in Action. Peter Harrington, Manning Publications, 2012.
3. Introduction to Machine Learning (3e), Ethem Alpaydin, MIT Press.

Reference Books

1. Python Machine Learning Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow. Sebastian Raschka, Vahid Mirjalili,Packt Publishing, 2017.
2. Foundations of Machine Learning(2e), Mohri Mehryar, Afshin Rostamizadeh, and Ameet Talwalkar,MIT Press.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech-1st** Branch: **Computer Science & Engg.**
Subject: **Knowledge Discovery** Code: **5109132(022)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

COURSE OBJECTIVES:

1. To understand the basics about knowledge discovery concepts
2. Identify the appropriate knowledge discovery steps for a given problem.
3. To be familiar with the Delphi methods
4. To understand the working principle of classification tools
5. To understand the basic difference between supervised and unsupervised methods.

Unit-1 Introduction to Knowledge Management: Data, Information and Knowledge, Types of Knowledge, Knowledge Management Models, Organizational Memory, Knowledge Creation and Organizational Learning, Knowledge Codification, Knowledge Sharing and Transfer, Business and Competitive Intelligence, Ethical Issues in Knowledge Management, the Role of Culture in Knowledge Management, Business Process and Knowledge Management, Alignment of Business and Knowledge Management Strategies, Intellectual Capital and Knowledge Management, Measurement of Impact of Knowledge management programs;

Unit-2 Technologies for Knowledge Management: Artificial Intelligence, Digital Libraries, Repositories, ECM, Knowledge - Based Systems, Information/Knowledge Audit; An Architecture for Knowledge Discovery: KM Cycle its Vision and Search, Generation, Acquisition, Capture, Transformation, Transfer, Application;

Unit-3 Knowledge Capture Systems: Systems that Preserve and Formalize Knowledge; Concept Maps, Process Modeling, RSS, Wikis, Delphi Method;

Unit-4 Knowledge Sharing Systems: Systems that Organize and Distribute Knowledge; Ontology Development Systems, Categorization and Classification Tools, XML-Based Tools;

Unit-5 Knowledge Discovery Methods: Correlation, Class, Novelty, Association, Preprocessing Methods, Supervised Methods, Unsupervised Methods, Soft Computing Methods, Supporting Methods, Advanced Methods.

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

1. Understand the key theories, concepts, and models of Knowledge Management
2. Learn how to lead knowledge workers in a knowledge-based organization.
3. Identifying the best practices of primary and secondary activities in KM processes
4. Implement XML-Based Tools
5. Implement classification Tools.

Text Books

1. Wesley, W Chu, Data Mining and Knowledge Discovery for Big Data: Methodologies, Challenge and Opportunities, (1e), Springer, 2013.
2. Dalkir, K, Knowledge Management in Theory and Practice, (2e), MIT Press, 2011.
3. Oded, M and Lior, R, The Data Mining and Knowledge Discovery Handbook, (2e), Springer, 2010.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech – 1st** Branch: **Computer Science & Engg.**
Subject: **Distributed Systems** Code: **5109133(022)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : 1**00**
Minimum number of class to be conducted: 0**2**

COURSE OBJECTIVES:

1. Provides an introduction to fundamentals of Distributed system
2. To understand the principle of clock synchronization algorithm.
3. To be familiar with working principle of mutual exclusion.
4. To understand the importance of Election algorithms
5. To understand the basic features of Distributed File system

Unit-1 Introduction: Definition, Goals, Types of Distributed Systems and Architectural Styles. Communication: Remote Procedure Call, Message-Oriented/Stream-Oriented and Multicast; Naming: Names, Identifiers and Addresses, Flat, Structured and Attribute-Based;

Unit-2 Synchronization: Physical Clocks, Global Positioning System, Clock Synchronization Algorithms, Logical Clocks, Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion**:** A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm;

Unit-3 Election Algorithms: Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large-Scale Systems; Consistency and Replication: Data-Centric/Client Centric Consistency Models;

Unit-4 Fault Tolerance: Reliable Client-Server and Group Communication, Distributed Commit, Recovery; Security**:** Security Threats and Policies, Secure Channels, Security Management; k

Unit-5 Distributed File Systems: Architecture, Processes, Communication, Naming, Consistency and Replication, Fault Tolerance and Security, Sun NFS and Google FS (Case Studies).

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

1. Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion.
2. Analyze the working principle of centralized and decentralized algorithm.
3. Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.
4. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design
5. Understand the importance of security in distributed systems

Text Books:

1. Steen, M V and Tanenbaum, A S, Distributed Systems: Principles and Paradigms, (2e), Pearson Education India, ISBN-10: 933254980X, ISBN-13: 978-9332549807, 2015.
2. Burns, B, Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services, (1e), ISBN-10: 1491983647, ISBN-13: 978-1491983645, 2018.

References Books:

1. Ghosh, S, Distributed Systems: An Algorithmic Approach, (2e), Chapman and Hall / CRC Computer and Information Science Series, ISBN-10: 1466552972, ISBN-13: 978-1466552975, 2014.
2. Sinha, P K, Distributed Operating Systems: Concepts and Design, (1e), Prentice Hall India, ISBN-10: 9788120313804, ISBN-13: 978-8120313804, 1998.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech-1st** Branch: **Computer Science & Engg.**
Subject: **Python & R Lab – I** Code: **5109121(022)**
Total Marks in End Semester Exam. : **75** Total Lab Periods: **40**

COURSE OBJECTIVES:

1. The fundamental design, analysis, and implementation of basic python programs.
2. Basic concepts in the specification of set operations.
3. Principles for program design, especially the uses of Python Data Structures.
4. To understand the NumPy, Pandas
5. To learn about the R Data Structure.

List of Experiments (to be performed at least 10 experiments)

1. Write a program in python to find hcf and lcm.
2. Write a program in python to convert decimal to binary, octal and hexadecimal.
3. Write a python program to print all prime numbers in an interval.
4. Write a python program to count even and odd numbers in a list.
5. Write a program in python to illustrate different set operations.
6. Write a program for python dictionary to find mirror characters in a string.
7. Write a python class named rectangle constructed by a length and width and a method which will compute the area of a rectangle.
8. Write a python class to reverse a string word by word.
9. Write a python program to handle simple runtime error.
10. Write a program in python to explain how lambdas and regular functions are executed.
11. Write a python program to demonstrate basic operations on single array using NumPy.
12. Explain through program how data analysis is performed using pandas.
13. Write a R program to make a simple calculator.
14. Write a program in R to find sum, mean and product of vector.
15. Write a program in R to import and process the data.

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

1. Apply basic python programs for a specific problem
2. Understand the necessary mathematical abstraction to solve set operations problems
3. Familiarize with advanced paradigms and Python Data Structures used to solve algorithmic problems.
4. Apply NumPy and Pandas concept to solve real-world problems.
5. Implement different R Data Structure for analytics.

List of equipment's:

1: Pentium computer with latest configuration, like Core i5 and above Pentium having 4/8/16 GB RAM and 128/256 SSD and 1-TB HDD.

2: Anaconda Python 3.7, Spyder for Python, R -4.0 or above, RStudio for R.

Recommended books: "Introduction to Python and The R Book".

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. Tech. – 1st** Branch: **Computer Science & Engg.**
Subject: **Advance Data Structure Lab – I** Code: **5109122(022)**
Total Marks in End Semester Exam. : **75** Total Lab Periods: **40**

COURSE OBJECTIVES:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. To understand the sorting techniques
5. To learn about the pattern matching

List of Experiments (to be performed at least 10 experiments)

1. Write a program to insert, delete and traverse elements in sorted singly linked list
2. Write a program to implement Binary Search tree
3. Write a program to implement AVL tree
4. Write a program to implement Red-Black tree
5. Write a program to implement Splay tree
6. Write a program to implement Binary heap structure
7. Write a program to implement Fibonacci heap sort
8. Write a program to implement static hashing using linear probing as overflow technique
9. Write a program to implement static hashing using chaining as overflow technique
10. Write a program to implement Directory based dynamic hashing technique
11. Write a program to insertion and updating in skip lists
12. Write a program to implement Boyer-Moore algorithm for String matching
13. Write a program to implement Knuth-Morris-Pratt algorithm for String matching
14. Write a program to compress text using Huffman coding algorithm
15. Write a program to implement Tries to perform pattern matching

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

1. Choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem
2. Understand the necessary mathematical abstraction to solve problems
3. Familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Come up with analysis of efficiency and proofs of correctness
5. Implement different algorithm design techniques on Brute- force and Genetic Algorithm

List of equipment's:

1: Pentium computer with latest configuration, like Core i5 and above Pentium having 4/8/16 GB RAM and 128/256 SSD and 1-TB HDD

2: Code block, Dev C++.

Recommended books: "Data Structure using C and C++".