



# ACE Engineering College

**An AUTONOMOUS Institution**



Ghatkesar, Medchal (Dist), Hyderabad, Telangana State – 501 301  
(NBA Accredited B.Tech Courses Accredited NAAC with A Grade 3.20 CGPA)  
Phone: 9133308533, 468, website: [www.aceec.ac.in](http://www.aceec.ac.in)

## DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

### COURSE STRUCTURE (R-20)

III Year			I Semester			
S.No.	Course Code	Course Title	Periods Per Week			Credits
			L	T	P	
1	CM403PC	Design and Analysis of Algorithms	3	0	0	3
2	CM502PC	Machine Learning	3	0	0	3
3	CS503PC	Computer Networks	3	0	0	3
4	CM503PC	Compiler Design	3	0	0	3
5		<b>Professional Elective - I</b>	3	0	0	3
6		<b>Professional Elective - II</b>	3	0	0	3
7	CM504PC	Machine Learning Lab	0	0	3	1.5
8	CM505PC	Computer Networks Lab	0	0	3	1.5
9	EN508HS	Advanced Communication Skills Lab	0	0	2	1
10	MC509	Intellectual Property Rights	0	0	0	0
11	MC512	Essence of Indian Knowledge Tradition Part-1	3	0	0	0
<b>Total Credits</b>			<b>21</b>	<b>0</b>	<b>8</b>	<b>22</b>

#### Professional Elective - I

S.No	Course Code	Course Title
1		Computer Graphics
2		Graph Theory
3		Image Processing
4		Introduction To Data Science
5		Web Programming

#### Professional Elective - II

S.No	Course Code	Course Title
1		Computer Vision And Robotics
2		Data Warehousing And Business Intelligence
3		Information Retrieval Systems
4		Pattern Recognition
5		Software Testing Methodologies

## MA101BS: DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CE, EEE, ME, ECE, CSE, IT, IOT, AI&ML, DSE)

### B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
				3	-	-	3	30
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** A course on “Computer Programming and Data Structures”

#### Course Objectives:

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

#### Course Outcomes:

1. Ability to analyze the performance of algorithms
2. Ability to choose appropriate data structures and algorithm design methods for a specified application
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

<b>Unit: I</b>	<b>Algorithm</b>
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Introduction: Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.  
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen’s matrix multiplication.

<b>Unit: II</b>	<b>Disjoint Sets</b>
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Disjoint Sets: Disjoint set operations, union and find algorithms  
Backtracking: General method, applications, n-queen’s problem, sum of subsets problem, graph Coloring

<b>Unit: III</b>	<b>Dynamic Programming</b>
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Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

<b>Unit: IV</b>	<b>Greedy method</b>
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Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

<b>Unit: V</b>	<b>Branch and Bound</b>
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**Branch and Bound:** General method, applications - Travelling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

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

**Text Books:**

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

**Reference Books:**

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

# Machine Learning

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

## B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1.Data Structures  
2. Knowledge on statistical methods

### Course Objectives:

- 1.This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

### Course Outcomes:

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

#### Unit: I

#### Introduction

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: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

**Decision Tree Learning** - Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

#### Unit: II

#### Artificial Neural Networks-1

**Artificial Neural Networks-1**- Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

**Artificial Neural Networks-2**- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

**Evaluation Hypotheses** - Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

#### Unit: III

#### Bayesian learning

**Bayesian learning** - Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

**Computational learning theory** - Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

**Instance-Based Learning**- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

**Unit: IV****Genetic Algorithms**

**Genetic Algorithms** - Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

**Learning Sets of Rules** - Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

**Reinforcement Learning** - Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

**Unit: V****Analytical Learning-1**

**Analytical Learning-1**- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

**Analytical Learning-2**-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning - Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

**Text Books:**

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

**REFERENCE BOOK:**

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

## COMPUTER NETWORKS

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

### B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1. A course on "Programming for problem solving"  
2. A course on "Data Structures"

#### Course Objectives:

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

#### Course Outcomes:

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

<b>Unit: I</b>	<b>Network hardware, Network software</b>
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Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

<b>Unit: II</b>	<b>Data link layer</b>
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Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

<b>Unit: III</b>	<b>Network Layer</b>
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Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

<b>Unit: IV</b>	<b>Transport Layer</b>
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Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

<b>Unit: V</b>	<b>Application Layer</b>
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Application Layer -Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

**Text Books:**

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**REFERENCE BOOK:**

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking - Behrouz A. Forouzan. Third Edition TMH.

## COMPILER DESIGN

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

### B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1. A course on "Formal Languages and Automata Theory"  
 2. A course on "Computer Organization and architecture"  
 3. A course on "Computer Programming and Data Structures"

#### Course Objectives:

1. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
2. Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

#### Course Outcomes:

1. Demonstrate the ability to design a compiler given a set of language features.
2. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
3. Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
4. Design and implement LL and LR parsers
5. Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
6. Design algorithms to generate machine code.

<b>Unit: I</b>	<b>Lexical Analysis</b>
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**Introduction:** The structure of a compiler, the science of building a compiler, programming language basics

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

<b>Unit: II</b>	<b>Syntax Analysis</b>
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**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

<b>Unit: III</b>	<b>Syntax-Directed Translation</b>
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**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

<b>Unit: IV</b>	<b>Run-Time Environments</b>
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**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

**Code Generation:** Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation

**Unit: V**

**Machine-Independent Optimization**

**Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

**Text Books:**

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman.

**REFERENCE BOOK:**

1. 1 Lex & Yacc - John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Loudon, Thomson.

## PROFESSIONAL ELECTIVE -I GRAPH THEORY

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1. An understanding of Mathematics in general is sufficient.

**Course Objectives:** NIL

### **Course Outcomes:**

1. Know some important classes of graph theoretic problems;
2. Be able to formulate and prove central theorems about trees, matching, connectivity, coloring and planar graphs;
3. Be able to describe and apply some basic algorithms for graphs;
4. Be able to use graph theory as a modeling tool.

<b>Unit: I</b>	<b>Introduction</b>
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**Introduction-**Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

<b>Unit: II</b>	<b>Connected graphs and shortest paths</b>
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**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

<b>Unit: III</b>	<b>Trees</b>
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**Trees-** Definitions and characterizations, Number of trees, Cayley's formula, Kirchoff's matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

<b>Unit: IV</b>	<b>Independent sets coverings and matchings</b>
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**Independent sets coverings and matchings-** Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, Konig's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

<b>Unit: V</b>	<b>Vertex Colorings</b>
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**Vertex Colorings-** Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**Text Books:**

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

**REFERENCE BOOK:**

1. Lecture Videos: <http://nptel.ac.in/courses/111106050/13>
2. Introduction to Graph Theory, Douglas B. West, Pearson.

## PROFESSIONAL ELECTIVE -I INTRODUCTION TO DATA SCIENCE

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:**

**Course Objectives:**

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

**Course Outcomes:** After completion of the course, the student should be able to

1. Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling.
2. Fit a model to data
3. describe the data using various statistical measures
4. utilize R elements for data handling
5. perform data reduction and apply visualization techniques.

**Unit: I**

**Introduction**

Definition of Data Science- Big Data and Data Science hype - and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Over fitting.

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

**Unit: II**

**Data Types & Statistical Description**

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

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

**Unit: III**

**Vectors**

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

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

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

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

<b>Unit: IV</b>	<b>Conditionals and Control Flow</b>
<p><b>Conditionals and Control Flow:</b> Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.</p> <p><b>Iterative Programming in R:</b> Introduction, While Loop, For Loop, Looping Over List.</p> <p><b>Functions in R:</b> Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.</p>	
<b>Unit: V</b>	<b>Data Reduction</b>
<p><b>Data Reduction:</b> Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.</p> <p><b>Data Visualization:</b> Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Doing Data Science, Straight Talk from The Frontline. Cathy O’Neil and Rachel Schutt, ‘Reilly, 2014</li> <li>2. <b>Jiawei Han</b>, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.</li> <li>3. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.</li> </ol>	
<p><b>REFERENCE BOOK:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.</li> <li>2. Brain S. Everitt, “A Handbook of Statistical Analysis Using R”, Second Edition, 4 LLC, 2014.</li> <li>3. Dalgaard, Peter, “Introductory statistics with R”, Springer Science &amp; Business Media, 2008.</li> <li>4. Paul Teetor, “R Cookbook”, O’Reilly, 2011.</li> </ol>	

## PROFESSIONAL ELECTIVE -I WEB PROGRAMMING

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** NIL

### **Course Objectives:**

1. Understand the technologies used in Web Programming.
2. Know the importance of object-oriented aspects of Scripting.
3. Understand creating database connectivity using JDBC.
4. Learn the concepts of web-based application using sockets.

**Course Outcomes:** Upon Completion of the course, the students will be able to

1. Design web pages.
2. Use technologies of Web Programming.
3. Apply object-oriented aspects to Scripting.
4. Create databases with connectivity using JDBC.
5. Build web-based application using sockets.

<b>Unit: I</b>	<b>SCRIPTING.</b>
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Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java ScriptObject, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5- CSS3- HTML 5 canvas - Web site creation using tools.

<b>Unit: II</b>	<b>JAVA</b>
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Introduction to object-oriented programming-Features of Java – Data types, variables and arrays –Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/Output – Files – Utility Classes – String Handling

<b>Unit: III</b>	<b>JDBC</b>
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**JDBC**  
JDBC Overview – JDBC implementation – Connection class – Statements – Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets – UDP sockets, Java Beans –RMI.

<b>Unit: IV</b>	<b>APPLETS</b>
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Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

<b>Unit: V</b>	<b>XML AND WEB SERVICES</b>
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## **XML AND WEB SERVICES**

Xml - Introduction-Form Navigation-XML Documents- XSL - XSLT- Web services-UDDI-WSDL-Java web services - Web resources.

### **Text Books:**

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

### **REFERENCE BOOK:**

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

## PROFESSIONAL ELECTIVE -I IMAGE PROCESSING

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

### Prerequisite:

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

### Course Objectives:

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

### Course Outcomes:

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

<b>Unit: I</b>	<b>Digital Image Fundamentals</b>
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Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels.

Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels.

Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

<b>Unit: II</b>	<b>Image Enhancement in Spatial Domain Point Processing</b>
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Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

<b>Unit: III</b>	<b>Image Restoration Degradation Model</b>
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Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

<b>Unit: IV</b>	<b>Image Segmentation Detection of Discontinuities</b>
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Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

<b>Unit: V</b>	<b>Image Compression Redundancies and their Removal Methods</b>
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Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

**Text Books:**

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

**REFERENCE BOOK:**

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

## PROFESSIONAL ELECTIVE -I: Computer Graphics

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

### B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.  
2. A course on "Computer Programming and Data Structures"

#### Course Objectives:

1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

#### Course Outcomes:

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Be able to design basic graphics application programs, including animation
3. Be able to design applications that display graphic images to given specifications time complexity.

<b>Unit: I</b>	<b>Output primitives</b>
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**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

**Output primitives:** Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), midpoint circle and ellipse algorithms

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

<b>Unit: II</b>	<b>2-D geometrical transforms</b>
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**2-D geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

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

<b>Unit: III</b>	<b>3-D object representation</b>
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**3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

<b>Unit: IV</b>	<b>Run-Time Environments</b>
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**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.

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

**Unit: V**

**Computer animation**

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

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

**Text Books:**

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

**REFERENCE BOOK:**

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

## PROFESSIONAL ELECTIVE -II COMPUTER VISION AND ROBOTICS

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>Prerequisite:</b> UG level Course in Linear Algebra and Probability.								
<b>Course Objectives:</b>								
<ol style="list-style-type: none"> <li>1. To understand the Fundamental Concepts Related To sources, shadows and shading</li> <li>2. To understand the The Geometry of Multiple Views</li> </ol>								
<b>Course Outcomes:</b>								
<ol style="list-style-type: none"> <li>1. Implement fundamental image processing techniques required for computer vision</li> <li>2. Implement boundary tracking techniques</li> <li>3. Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.</li> <li>4. Apply 3D vision techniques and Implement motion related techniques.</li> <li>5. Develop applications using computer vision techniques.</li> </ol>								
<b>Unit: I</b>	<b>CAMERAS: Pinhole Cameras</b>							
<b>CAMERAS: Pinhole Cameras</b> <b>Radiometry – Measuring Light:</b> Light in Space, Light Surfaces, Important Special Cases <b>Sources, Shadows, And Shading:</b> Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models <b>Color:</b> The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.								
<b>Unit: II</b>	<b>Linear Filters</b>							
<b>Linear Filters:</b> Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, <b>Edge Detection:</b> Noise, Estimating Derivatives, Detecting Edges <b>Texture:</b> Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.								
<b>Unit: III</b>	<b>The Geometry of Multiple Views: Two Views</b>							
<b>The Geometry of Multiple Views: Two Views</b> <b>Stereopsis:</b> Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras <b>Segmentation by Clustering:</b> What Is Segmentation?, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,								
<b>Unit: IV</b>	<b>Segmentation by Fitting a Model:</b>							

**Segmentation by Fitting a Model:**

The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

**Segmentation and Fitting Using Probabilistic Methods:**

Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice,

**Tracking With Linear Dynamic Models:**

Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

**Unit: V****Geometric Camera Models**

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

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

**Model- Based Vision:** Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

**Text Books:**

1. David A. Forsyth and Jean Ponce: Computer Vision - A Modern Approach, PHI Learning (Indian Edition), 2009.

**REFERENCE BOOK:**

1. E. R. Davies: Computer and Machine Vision - Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

## PROFESSIONAL ELECTIVE -II Data Warehousing and Business Intelligence

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
				3	-	-	3	30
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** UG level Course in Linear Algebra and Probability.

### Course Objectives:

1. This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
2. students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

### Course Outcomes:

1. Understand architecture of data warehouse and OLAP operations.
2. Understand Fundamental concepts of BI and Analytics
3. Application of BI Key Performance indicators
4. Design of Dashboards , Implementation of Web Analytics
5. Understand Utilization of Advanced BI Tools and their Implementation.
6. Implementation of BI Techniques and BI Ethics.

<b>Unit: I</b>	<b>DATA WAREHOUSE</b>
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Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model-Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

<b>Unit: II</b>	<b>Business Intelligence</b>
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**Business Intelligence** Introduction - Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

<b>Unit: III</b>	<b>BI Implementation</b>
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**BI Implementation** - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence-Value driven and Information use.

<b>Unit: IV</b>	<b>Advanced BI</b>
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**Advanced BI** - Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools(Pentaho, KNIME)

<b>Unit: V</b>	<b>Geometric Camera Models</b>
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Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

**Text Books:**

1. Data Mining - Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

**REFERENCE BOOK:**

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence .Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007
6. Building the DataWarehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd..
7. Data Mining Introductory and Advanced topics -MARGARET H DUNHAM, PEA

## PROFESSIONAL ELECTIVE -II Information Retrieval Systems

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>									
Course Code	Category	Hours/Week			Credits	Maximum Marks			
		L	T	P	C	CIA	SEE	Total	
		3	-	-	3	30	70	100	
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>			

**Prerequisite:** 1. Data Structures

**Course Objectives:**

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

**Course Outcomes:**

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

**Unit: I**

**Introduction to Information Retrieval Systems**

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

**Unit: II**

**Cataloging and Indexing**

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

**Unit: III**

**Automatic Indexing**

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

**Unit: IV**

**User Search Techniques**

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

**Unit: V**

**Text Search Algorithms**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

**Text Books:**

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

**REFERENCE BOOK:**

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.

2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.

3. Modern Information Retrieval By Yates and Neto Pearson Education.

## PROFESSIONAL ELECTIVE -II PATTERN RECOGNITION

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** Students are expected to have knowledge basic linear algebra, basic probability theory and basic programming techniques;  
 A course on “Computational Mathematics”  
 A course on “Computer Oriented Statistical Methods”

### **Course Objectives:**

1. This course introduces fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
2. Topics include: Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering, and an application of hand-written digit recognition.

### **Course Outcomes:**

1. Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
2. Identify and employ suitable machine learning techniques in classification, pattern recognition, clustering and decision problems.

<b>Unit: I</b>	<b>Introduction</b>
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Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

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

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

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

<b>Unit: V</b>	<b>Clustering</b>
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Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

**Text Books:**

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

**REFERENCE BOOK:**

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

## PROFESSIONAL ELECTIVE -II Software Testing Methodologies

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

### B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** 1. A course on "Software Engineering"

#### Course Objectives:

To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.

To develop skills in software test automation and management using latest tools.

**Course Outcomes:** Design and develop the best test strategies in accordance to the development model.

#### Unit: I Introduction

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

#### Unit: II Transaction Flow Testing

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

Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

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

#### Unit: III Paths, Path products and Regular expressions

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

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

#### Unit: IV State, State Graphs and Transition testing

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

#### Unit: V Graph Matrices and Application

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

#### Text Books:

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

**REFERENCE BOOK:**

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

## Machine Learning Lab

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	-	-	-	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Prerequisite:** Machine Learning Lab

### Course Objectives:

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

### Course Outcomes:

1. After the completion of the course the student can able to:
2. understand complexity of Machine Learning algorithms and their limitations;
3. understand modern notions in data analysis-oriented computing;
4. be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
5. Be capable of performing experiments in Machine Learning using real-world data.

### List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbors classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no -> highRisk

high golf trading married forties yes -> lowRisk

low speedway transport married thirties yes -> medRisk  
medium football banking single thirties yes -> lowRisk  
high flying media married fifties yes -> highRisk  
low football security single twenties no -> medRisk  
medium golf media single thirties yes -> medRisk  
medium golf transport married forties yes -> lowRisk  
high skiing banking single thirties yes -> highRisk  
low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of 'golf' and the conditional probability of 'single' given 'medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

# COMPUTER NETWORKS LAB

## Course Objectives:

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance
3. To analyze the traffic flow and the contents of protocol frames

## Course Outcomes:

1. Implement data link layer framing methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

## List of Experiments:

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
  - i. Packet Capture Using Wire shark
  - ii. Starting Wire shark
  - iii. Viewing Captured Traffic
  - iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
  - i. NS2 Simulator-Introduction
  - ii. Simulate to Find the Number of Packets Dropped
  - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
  - iv. Simulate to Find the Number of Packets Dropped due to Congestion
  - v. Simulate to Compare Data Rate & Throughput.
  - vi. Simulate to Plot Congestion for Different Source/Destination
  - vii. Simulate to Determine the Performance with respect to Transmission of Packets

## Text Book:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5<sup>th</sup> Edition. Pearson Education/PHI

## References:

1. An Engineering Approach to Computer Networks, S.Keshav, 2<sup>nd</sup> Edition, Pearson Education  
Data Communications and Networking - Behrouz A. Forouzan. 3<sup>rd</sup> Edition, TMH.

## Advanced Communication Skills Lab

(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

<b>B.Tech. III Year I Semester</b>									
Course Code	Category	Hours/Week			Credits	Maximum Marks			
		L	T	P	C	CIA	SEE	Total	
		3	-	-	-	30	70	100	
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>			
<b>Unit: I</b>	<b>Introduction</b>								
<p><b>1. INTRODUCTION:</b>                      The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.                      The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:</p> <ol style="list-style-type: none"> <li>1. Gathering ideas and information to organize ideas relevantly and coherently.</li> <li>2. Engaging in debates.</li> <li>3. Participating in group discussions.</li> <li>4. Facing interviews.</li> <li>5. Writing project/research reports/technical reports.</li> <li>6. Making oral presentations.</li> <li>7. Writing formal letters.</li> <li>8. Transferring information from non-verbal to verbal texts and vice-versa.</li> <li>9. Taking part in social and professional communication.</li> </ol>									
<b>Unit: II</b>	<b>OBJECTIVES:</b>								
<p><b>2. OBJECTIVES:</b>                      This Lab focuses on using multi-media instruction for language development to meet the following targets:</p> <ul style="list-style-type: none"> <li>● To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.</li> <li>● Further, they would be required to communicate their ideas relevantly and coherently in writing.</li> <li>● To prepare all the students for their placements.</li> </ul>									
<b>Unit: III</b>	<b>SYLLABUS</b>								

## SYLLABUS:

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

### 1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary -

Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word

roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

**2. Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

**3. Activities on Writing Skills** – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one’s writing.

**4. Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.

**5. Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock

<b>Unit: IV</b>	<b>MINIMUM REQUIREMENT:</b>
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#### 4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

<b>Unit: V</b>	<b>5. SUGGESTED SOFTWARE:</b>
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The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner’s Compass, 7th Edition
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

**Text Books:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

**REFERENCE BOOK:**

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009

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(Common to EEE, ECE, CSE, IT, IOT, AI&ML, DSE)

## B.Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	0	0	0	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			

**Course Objective:** The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

**Course Outcome:** Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

### Course Contents

- Basic structure of Indian Knowledge System: अ ा दिशव 4 ा T - 8 वा द, 8 उपवा द (आया व द, धनव द, गनव वा द, 3 था प ं ि आद) 6 वा दा ा ग (ि ं ा शा ा T, क 3/4, ि ं ा न 7<sup>a</sup>, ा T करण, 3/4 ा ि ं ा तष, छा द) 8 उपाडा ग (धम शाा™, मीमा ा सा, पा राण, तक शाा™)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

### REFERENCE BOOKS:

1. Knowledge traditions and practices of India, CBSE Publication.
2. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.
3. Swami Jitatmanand, Modern Physics and Vedantharatiya Vidya Bhavan.
4. Swami Jitatmanand, Holistic Science and Vedantharatiya Vidya Bhavan.
5. Fritzo Capra, Tao of Physics.
6. Fritzo Capra, The Wave of life.
7. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam.
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
9. GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
10. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakashan, Delhi 2016.
11. P B Sharma (English translation), Shodashang Hridayan

**Pedagogy:** Problem based learning, group discussions, collaborative mini projects.