

**ACADEMIC REGULATIONS COURSE STRUCTURE**

**AND**

**DETAILED SYLLABUS (III.B.Tech)**

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

**FOR**

**B. TECH FOUR YEAR DEGREECOURSE**

(Applicable for the batches admitted from 2020-2021)



# 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



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

### COURSE STRUCTURE

III Year			II Semester			
S.No.	Course Code	Course Title	Periods Per Week			Credits
			L	T	P	
1	CM601PC	Artificial Intelligence	3	1	0	4
2	CM602PC	DevOps	3	1	0	4
3	CM603PC	Natural Language Processing	3	1	0	4
4		<b>Professional Elective - III</b>	3	0	0	3
5		<b>Open Elective - I</b>	3	0	0	3
6	CM604PC	Artificial Intelligence and Natural Language Lab	0	0	3	1.5
7	CM605PC	DevOps Lab	0	0	3	1.5
8		<b>Professional Elective - III Lab</b>	0	0	2	1
9	MC607	Cyber Security	3	0	0	0
<b>Total Credits</b>			<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

#### Professional Elective III

S.No	Course Code	Course Title
1		Deep Learning
2		Mobile Application & Development
3		Cryptography and Network Security
4		Internet of Things
5		Data Mining

#### Open Elective - I

S.No	Course Code	Course Title
1		Fundamental of AI
2		Machine Learning
3		Natural Language Processing

#### Professional Elective III Lab

S.No	Course Code	Course Title
1		Internet of Things Lab
2		Data Mining lab
3		Deep Learning Lab
4		Mobile Application Development lab
5		Cryptography and Network Security Lab

# 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	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

**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

Unit: I	Algorithm
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.	
Unit: II	Disjoint Sets
Disjoint Sets: Disjoint set operations, union and find algorithms Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring	
Unit: III	Dynamic Programming
Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.	
Unit: IV	Greedy method
Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.	
Unit: V	Branch and Bound
<b>Branch and Bound:</b> General method, applications - Travelling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. <b>NP-Hard and NP-Complete problems:</b> 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.

<b>Unit: IV</b>	<b>Genetic Algorithms</b>
<p><b>Genetic Algorithms</b> – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.</p> <p><b>Learning Sets of Rules</b> – 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.</p> <p><b>Reinforcement Learning</b> – Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.</p>	
<b>Unit: V</b>	<b>Analytical Learning-1</b>
<p><b>Analytical Learning-1</b>- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.</p> <p><b>Analytical Learning-2</b>-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.</p> <p>Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.</p>	
<p><b>Text Books:</b></p> <p>1.Machine Learning – Tom M. Mitchell, MGH-</p>	
<p><b>REFERENCE BOOK:</b></p> <p>2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor &amp; Francis</p>	

## 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		
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		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.

#### Unit: I      Network hardware, Network software

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.

#### Unit: II      Data link layer

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.

#### Unit: III      Network Layer

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.

#### Unit: IV      Transport Layer

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

#### Unit: V      Application Layer

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
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

**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, Jeffry 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.

#### **Unit: I      Introduction**

**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.

#### **Unit: II      Connected graphs and shortest paths**

**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.

#### **Unit: III      Trees**

**Trees-** Definitions and characterizations, Number of trees, Cayley's formula, Kirchoff-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.

#### **Unit: IV      Independent sets coverings and matchings**

**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.

#### **Unit: V      Vertex Colorings**

**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>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:**

### **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>B.Tech. III Year I Semester</b>								
<b>Course Code</b>	<b>Category</b>	<b>Hours/Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		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.

### **Unit: I      SCRIPTING.**

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.

### **Unit: II      JAVA**

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

### **Unit: III      JDBC**

**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.

### **Unit: IV      APPLET**

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.

### **Unit: V      XML AND WEB SERVICES**

## **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		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:**

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.

#### **Unit: I      Digital Image Fundamentals**

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

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

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

#### **Unit: II      Image Enhancement in Spatial Domain Point Processing**

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

#### **Unit: III      Image Restoration Degradation Model**

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

#### **Unit: IV      Image Segmentation Detection of Discontinuities**

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

#### **Unit: V      Image Compression Redundancies and their Removal Methods**

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	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. 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>
<p><b>Introduction:</b> 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</p> <p><b>Output primitives:</b> Points and lines, line drawing algorithms (Bresenham’s and DDA Algorithm), midpoint circle and ellipse algorithms</p> <p><b>Polygon Filling:</b> Scan-line algorithm, boundary-fill and flood-fill algorithms</p>	
<b>Unit: II</b>	<b>2-D geometrical transforms</b>
<p><b>2-D geometrical transforms:</b> Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems</p> <p><b>2-D viewing:</b> The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland – Hodgeman polygon clipping algorithm.</p>	
<b>Unit: III</b>	<b>3-D object representation</b>
<p><b>3-D object representation:</b> 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.</p>	
<b>Unit: IV</b>	<b>Run-Time Environments</b>

**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.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
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
<b>Prerequisite:</b> UG level Course in Linear Algebra and Probability.								
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>To understand the Fundamental Concepts Related To sources, shadows and shading</li> <li>To understand the The Geometry of Multiple Views</li> </ol>								
<b>Course Outcomes:</b> <ol style="list-style-type: none"> <li>Implement fundamental image processing techniques required for computer vision</li> <li>Implement boundary tracking techniques</li> <li>Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.</li> <li>Apply 3D vision techniques and Implement motion related techniques.</li> <li>Develop applications using computer vision techniques.</li> </ol>								
Unit: I	CAMERAS: Pinhole Cameras							
<b>CAMERAS:</b> Pinhole Cameras <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.								
Unit: II	Linear Filters							
<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.								
Unit: III	The Geometry of Multiple Views: Two Views							
<b>The Geometry of Multiple Views:</b> Two Views <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,								
Unit: IV	Segmentation by Fitting a Model:							

**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.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:** 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.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
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			

**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.

<b>Unit: I</b>	<b>Introduction to Information Retrieval Systems</b>
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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

<b>Unit: II</b>	<b>Cataloging and Indexing</b>
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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

<b>Unit: III</b>	<b>Automatic Indexing</b>
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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

<b>Unit: IV</b>	<b>User Search Techniques</b>
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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

<b>Unit: V</b>	<b>Text Search Algorithms</b>
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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.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:** 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.

#### **Unit: I      Introduction**

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.

#### **Unit: II      Nearest Neighbor Based Classifier**

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

#### **Unit: III      Hidden Markov Models**

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

#### **Unit: IV      Support Vector Machines**

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

#### **Unit: V      Clustering**

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, Springer 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.Tech. III Year I Semester

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

**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. 3rd Edition, TMH.

## Advanced Communication Skills Lab

(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	-	-	-	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60			
Unit: I		Introduction								
<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:  <div><div>1. Gathering ideas and information to organize ideas relevantly and coherently.</div><div>2. Engaging in debates.</div><div>3. Participating in group discussions.</div><div>4. Facing interviews.</div><div>5. Writing project/ research reports/technical reports.</div><div>6. Making oral presentations.</div><div>7. Writing formal letters.</div><div>8. Transferring information from non-verbal to verbal texts and vice-versa.</div><div>9. Taking part in social and professional communication.</div></div>										
Unit: II		OBJECTIVES:								
<b>2. OBJECTIVES:</b> This Lab focuses on using multi-media instruction for language development to meet the following targets: <div><div>● 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.</div><div>● Further, they would be required to communicate their ideas relevantly and coherently in writing.</div><div>● To prepare all the students for their placements.</div></div>										
Unit: III		SYLLABUS								

## 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

## Intellectual Property Rights

(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
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

**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 ा दिशव4ा T -8वा द,8उपवा द (आया व'द, धनव'द, गNव'वा द, 3थTपÆ िंआद) 6वा दा ा ग (िंा शा1ा T, क3/4, िंा न7<sup>a</sup>, ा Tकरण, 3/4ा िंा तष, छा द) 8 उपाडा ग (धम'शाT™, मीमा ा सा, पा राण, तक'शाT™)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

### REFERENCE BOOKS:

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

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

# ARTIFICIAL INTELLIGENCE

## B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

1. **Prerequisite:** A course on “Computer Programming and Data Structures”
2. A course on “Advanced Data Structures”
3. A course on “Design and Analysis of Algorithms”
4. A course on “Mathematical Foundations of Computer Science”
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

### Course Objectives:

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

### Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.  
Possess the skill for representing knowledge using the appropriate technique for given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

<b>Unit: I</b>	<b>Problem Solving by Search-I:</b>
<b>Problem Solving by Search-I:</b> Introduction to AI, Intelligent Agents <b>Problem Solving by Search -II:</b> Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .	
<b>Unit: II</b>	<b>Problem Solving by Search-II and Propositional Logic</b>

## **Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

### **Unit: III**

### **Logic and Knowledge Representation**

#### **Logic and Knowledge Representation**

**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

### **Unit: IV**

### **Planning**

#### **Planning**

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

**Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

### **Unit: V**

### **Uncertain knowledge and Learning**

#### **Uncertain knowledge and Learning**

**Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

#### **Text Books:**

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

#### **REFERENCE BOOK:**

1. Artificial Intelligence, 3<sup>rd</sup> Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3<sup>rd</sup> Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

## DEVOPS

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

**Course Objectives:** The main objectives of this course are to:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

**Course Outcomes:** On successful completion of this course, students will be able to:

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tool.
4. Investigate different DevOps Software development models.
5. Assess various Devops practices.
6. Collaborate and adopt Devops in real-time projects.

#### Unit: I

#### Introduction:

**Introduction:** Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

#### Unit: II

#### Software development models and DevOps:

**Software development models and DevOps:** DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. **DevOps influence on Architecture:** Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

#### Unit: III

#### Introduction to project management:

**Introduction to project management:** The need for source code control, The history of sourcecode management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

#### Unit: IV

#### Integrating the system:

**Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

#### Unit: V

#### Testing Tools and automation:

**Testing Tools and automation:** Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

**Deployment of the system:** Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

**Text Books:**

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

**REFERENCE BOOK:**

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

# NATURAL LANGUAGE PROCESSING

## B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

**Prerequisite:** Data structures, finite automata and probability theory

### Course Objectives:

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

### Course Outcomes:

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

#### Unit: I

#### Finding the Structure of Words:

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

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

#### Unit: II

#### Syntax Analysis:

**Syntax Analysis:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

#### Unit: III

#### Semantic Parsing:

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

#### Unit: IV

#### Predicate-

Predicate-Argument Structure, Meaning Representation Systems, Software.

#### Unit: V

#### Uncertain knowledge and Learning

**Discourse Processing:** Cohension, Reference Resolution, Discourse Cohension and Structure

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

**Text Books:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

**REFERENCE BOOK:**

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

## DEEP LEARNING (Professional Elective – III)

### B.Tech. III Year II 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>		

#### Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

#### Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

<b>Unit: I</b>	<b>Artificial Neural Networks</b>
Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.	
<b>Unit: II</b>	<b>Unsupervised Learning Network</b>
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks- Introduction to various networks.	
<b>Unit: III</b>	<b>Introduction to Deep Learning,</b>
Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms	
<b>Unit: IV</b>	<b>Regularization for Deep Learning:</b>
<b>Regularization for Deep Learning:</b> Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier	
<b>Unit: V</b>	<b>Optimization for Train Deep Models:</b>

**Optimization for Train Deep Models:** Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms

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

**Text Books:**

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3<sup>rd</sup> Edition, Pearson Prentice Hall.

## MOBILE APPLICATION DEVELOPMENT (Professional Elective - III)

### B.Tech. III Year II 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. Acquaintance with JAVA programming.
2. A Course on DBMS.

#### Course Objectives:

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

#### Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

<b>Unit: I</b>	<b>Introduction to Android Operating System:</b>
<p>Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools</p> <p>Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration</p> <p>Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes</p>	
<b>Unit: II</b>	<b>Android User Interface:</b>
<p>Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts</p> <p>User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers</p> <p>Event Handling – Handling clicks or changes of various UI components</p> <p>Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities</p>	
<b>Unit: III</b>	<b>Intents and Broadcasts</b>

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

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

Notifications – Creating and Displaying notifications, Displaying Toasts

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

<b>Unit: V</b>	<b>Database – Introduction to SQLite database,</b>
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Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Text Books:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

**REFERENCE BOOK:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

## CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective - III)

### B.Tech. III Year II 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>		

#### Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

#### Course Outcomes:

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

#### Unit: I

#### Security Concepts:

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

#### Unit: II

#### Symmetric key Ciphers:

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

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

#### Unit: III

#### Cryptographic Hash Functions:

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

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

<b>Unit: IV</b>	<b>Transport-level Security:</b>
<b>Transport-level Security:</b> Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) <b>Wireless Network Security:</b> Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security	
<b>Unit: V</b>	<b>E-Mail Security:</b>
<b>E-Mail Security:</b> Pretty Good Privacy, S/MIME <b>IP Security:</b> IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange <b>Case Studies on Cryptography and security:</b> Secure Multiparty Calculation, Virtual Elections, Singesign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition</li> <li>2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3<sup>rd</sup> Edition</li> </ol>	
<b>REFERENCE BOOK:</b> <ol style="list-style-type: none"> <li>1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1<sup>st</sup> Edition.</li> <li>2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition.</li> <li>3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.</li> <li>4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.</li> <li>5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.</li> <li>6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.</li> </ol>	

## Internet of Things (Professional Elective - III)

### B.Tech. III Year II 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>		

#### Course Objectives:

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

#### Course Outcomes:

1. Interpret the impact and challenges posed by IoT networks leading to new architectural models.
2. Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Elaborate the need for Data Analytics and Security in IoT.
5. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

#### Unit: I Introduction to Internet of Things

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

#### Unit: II IoT and M2M

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

#### Unit: III Introduction to Python

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

#### Unit: IV IoT Physical Devices and Endpoints

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming - Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

#### Unit: V IoT Physical Servers and Cloud Offerings

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

**Text Books:**

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

## Data Mining (Professional Elective - III)

### B.Tech. III Year II 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>		

#### Pre-Requisites:

1. A course on "Database Management Systems"
2. Knowledge of probability and statistics

#### Course Objectives:

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

#### Course Outcomes:

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

#### Unit: I

#### Data Mining:

**Data Mining:** Data-Types of Data-, Data Mining Functionalities- Interestingness Patterns- Classification of Data Mining systems- Data mining Task primitives -Integration of Data mining system with a Data warehouse-Major issues in Data Mining-Data Preprocessing.

#### Unit: II

#### Association Rule Mining:

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

#### Unit: III

#### Classification

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

#### UNIT - IV

#### Clustering and Applications:

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

#### UNIT - V

#### Advanced Concepts:

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

**TEXT BOOKS:**

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

**REFERENCE BOOK:**

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

## Fundamental of AI (Open Elective – I)

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
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

**Course Objectives:** To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

<b>UNIT-I</b>	<b>Introduction</b>
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## Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

**Basic Search Strategies:** Problem Spaces, Uninformed Search (Breadth-First, Depth- First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A\*), Constraint Satisfaction (Backtracking, Local Search)

<b>UNIT-II</b>	<b>Advanced Search</b>
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**Advanced Search:** Constructing Search Trees, Stochastic Search, A\* Search Implementation, Minimax Search, Alpha-Beta Pruning

**Basic Knowledge Representation and Reasoning:** Propositional Logic, First-Order Logic, ForwardChaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

<b>UNIT-III</b>	<b>Advanced Knowledge Representation and Reasoning</b>
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## Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non-monotonic Reasoning, Other Knowledge Representation Schemes

**Reasoning Under Uncertainty:** Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

<b>UNIT-IV</b>	<b>Learning</b>
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**Learning:** What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

<b>UNIT-V</b>	<b>Expert Systems</b>
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## Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

**TEXT BOOK:**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

### REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

## Machine Learning (Open Elective-1)

### B.Tech. III Year II Semester

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

#### Course Objectives:

1. To understand pattern classification algorithms to classify multivariate data
2. To understand the Implementation of genetic algorithms
3. To gain knowledge about Q-Learning
4. To create new machine learning techniques.

#### Course Outcomes:

Upon completion of the course, the students will be able to:

1. Develop and apply pattern classification algorithms to classify multivariate data.
2. Develop and apply regression algorithms for finding relationships between data variables.
3. Develop and apply reinforcement learning algorithms for learning to control complex systems.
4. Write scientific reports on computational machine learning methods, results and conclusions.

<b>Unit: I</b>	<b>BASICS Learning Problems</b>
BASICS Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate eEliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search	
<b>Unit: II</b>	<b>NEURAL NETWORKS AND GENETIC ALGORITHMS:</b>
<b>NEURAL NETWORKS AND GENETIC ALGORITHMS:</b> Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.	
<b>Unit: III</b>	<b>BAYESIAN AND COMPUTATIONAL LEARNING:</b>
<b>BAYESIAN AND COMPUTATIONAL LEARNING:</b> Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	
<b>Unit: IV</b>	<b>INSTANT BASED LEARNING:</b>
<b>INSTANT BASED LEARNING:</b> K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.	
<b>Unit: V</b>	<b>ADVANCED LEARNING:</b>
<b>ADVANCED LEARNING:</b> Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning – FOCL Algorithm - Reinforcement Learning Task Learning Temporal Difference Learning	

**Text Books:**

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010
2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995

**REFERENCE BOOK:**

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

## NATURAL LANGUAGE PROCESSING (Open Elective-1)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

**Prerequisite:** Data structures, finite automata and probability theory

#### Course Objectives:

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

#### Course Outcomes:

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

#### Unit: I      Finding the Structure of Words:

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

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

#### Unit: II      Syntax Analysis:

**Syntax Analysis:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

#### Unit: III      Semantic Parsing:

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

#### Unit: IV      Predicate-

Predicate-Argument Structure, Meaning Representation Systems, Software.

#### Unit: V      Uncertain knowledge and Learning

**Discourse Processing:** Cohension, Reference Resolution, Discourse Cohension and Structure

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

**Text Books:**

3. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication
4. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

**REFERENCE BOOK:**

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

## ARTIFICIAL INTELLIGENCE AND NATURAL LANGUAGE PROCESSING LAB

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

#### Course Objectives:

1. Become familiar with basic principles of AI toward problem solving, knowledge representation, and learning.
2. Knowledge on basic Language processing features, design an innovative application using NLP components

#### List of Experiments (AI)

- 1) Write a program in prolog to implement simple facts and Queries
- 2) Write a program in prolog to implement simple arithmetic
- 3) Write a program in prolog to solve Monkey banana problem
- 4) Write a program in prolog to solve Tower of Hanoi
- 5) Write a program in prolog to solve 8 Puzzle problems
- 6) Write a program in prolog to solve 4-Queens problem
- 7) Write a program in prolog to solve Traveling salesman problem
- 8) Write a program in prolog for Water jug problem

#### List of Experiments (NLP)

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing

#### Text Books:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010. Pearson Education, Inc. ISBN: 978-0-13-604259-4
2. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
3. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

#### REFERENCE BOOK:

1. Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.

## DEVOPS LAB

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	Total
		0	0	3	1.5	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

#### Course Objectives:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in
3. DevOps and related methods to reach a continuous delivery capability
4. Implement automated system update and DevOps lifecycle

#### List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

#### Text Books:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

#### REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. AddisonWesley
2. Edureka DevOps Full Course - [https://youtu.be/S\\_0q75eD8Yc](https://youtu.be/S_0q75eD8Yc)

## INTERNET OF THINGS LAB (PE – III LAB)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

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

#### Course Objectives:

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

#### Course Outcomes:

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

#### List of Experiments:

1. Using raspberry pi
  - a. Calculate the distance using a distance sensor.
  - b. Basic LED functionality.
2. Using Arduino
  - a. Calculate the distance using a distance sensor.
  - b. Basic LED functionality.
  - c. Calculate temperature using a temperature sensor.
3. Using Node MCU
  - a. Calculate the distance using a distance sensor.
  - b. Basic LED functionality.
  - c. Calculate temperature using a temperature sensor.

#### TEXT BOOKS:

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

#### REFERENCE BOOK:

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016.
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

## DATA MINING LAB (PE – III LAB)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

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

#### Course Objectives:

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

#### Course Outcomes:

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

#### List of Experiments:

Experiments using Weka & Pentaho Tools

1. Data Processing Techniques:
  - (i) Data cleaning
  - (ii) Data transformation - Normalization
  - (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbor approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

#### TEXT BOOKS:

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

#### REFERENCE BOOK:

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

## DEEP LEARNING LAB (PE – III LAB)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

#### Course Objectives:

1. To Build the Foundation of Deep Learning.
2. To Understand How to Build the Neural Network.
3. To enable students to develop successful machine learning concepts.

#### Course Outcomes:

1. Upon the Successful Completion of the Course, the Students would be able to:
2. Learn the Fundamental Principles of Deep Learning.
3. Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms and Solve Real-world problems.

#### List of Experiments:

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

#### TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

#### REFERENCE BOOK:

1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan, C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2004.

#### EXTENSIVE READING:

1. <http://www.deeplearning.net>
2. <https://www.deeplearningbook.org/>
3. <https://developers.google.com/machine-learning/crash-course/ml-intro>
4. [www.cs.toronto.edu/~fritz/absps/imagenet.pdf](http://www.cs.toronto.edu/~fritz/absps/imagenet.pdf)
5. <http://neuralnetworksanddeeplearning.com/>

## MOBILE APPLICATION DEVELOPMENT LAB (PE – III Lab)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

#### Course Objectives:

1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

#### Course Outcomes:

1. Student understands the working of Android OS Practically.
  2. Student will be able to develop user interfaces.
  3. Student will be able to develop, deploy and maintain the Android Applications.
1. Create an Android application that shows Hello + name of the user and run it on an emulator.  
(b) Create an application that takes the name from a text box and shows hello message alongwith the name entered in text box, when the user clicks the OK button.
  2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use  
(a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
  3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
  4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
  5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
  6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
  7. Create a user registration application that stores the user details in a database table.
  8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
  9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
  10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
  11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
  12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
  13. Create an application that shows the given URL (from a text field) in a browser.

**TEXT BOOKS:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCE BOOK:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

## CRYPTOGRAPHY AND NETWORK SECURITY LAB (PE – III Lab)

### B.Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
<b>Contact Classes: 45</b>	<b>Tutorial Classes: 15</b>	<b>Practical Classes: Nil</b>				<b>Total Classes: 60</b>		

#### Course Objectives:

1. Explain the objectives of information security
2. Explain the importance and application of each of confidentiality, integrity, authentication and availability
3. Understand various cryptographic algorithms.

#### Course Outcomes:

1. Understand basic cryptographic algorithms, message and web authentication and security issues.
2. Identify information system requirements for both of them such as client and server.
3. Understand the current legal issues towards information security.

#### List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
  - a. Ceaser cipher
  - b. Substitution cipher
  - c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

**TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition

**REFERENCE BOOK:**

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

# Cyber Security

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

## **B.Tech. III Year II 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>		

### **Course Objectives:**

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

**Course Outcomes:** The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

### **Unit: I      Introduction to Cyber Security**

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

### **Unit: II      Cyberspace and the Law & Cyber Forensics**

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

### **Unit: III      Cybercrime: Mobile and Wireless Devices**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

### **Unit: IV      Cyber Security: Organizational Implications**

Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

**Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

<b>Unit: V</b>	<b>Privacy Issues</b>
<p>Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc</p> <p><b>Cybercrime: Examples and Mini-Cases</b></p> <p><b>Examples:</b> Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.</p> <p><b>Mini-Cases:</b> The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley</li> <li>2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.</li> </ol>	
<p><b>REFERENCE BOOK:</b></p> <ol style="list-style-type: none"> <li>1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.</li> <li>2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&amp;F Group.</li> </ol>	