

## SHADAN WOMEN'S COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

## B.Tech. in COMPUTER SCIENCE AND ENGINEERING (AI &amp; ML)

## COURSE STRUCTURE &amp; SYLLABUS (R23 Regulations)

Applicable from AY 2023-24 Batch

## II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS301PC	Statistical Foundations for Artificial Intelligence	3	1	0	4
2	CS302PC	Data Structures	3	0	0	3
3	CS303PC	Computer Organization and Architecture	3	0	0	3
4	CS304PC	Software Engineering	3	0	0	3
5	CS305PC	Operating Systems	3	0	0	3
6	CS306PC	Introduction to Data Structures Lab	0	0	2	1
7	CS307PC	Operating Systems Lab	0	0	2	1
8	CS308PC	Software Engineering Lab	0	0	2	1
9	CS309PC	Node JS/ React JS/ Django	0	0	2	1
	*MC310	Constitution of India	3	0	0	0
		<b>Total</b>	<b>18</b>	<b>0</b>	<b>10</b>	<b>20</b>

## II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS401PC	Discrete Mathematics	3	0	0	3
2	CS402PC	Automata Theory and Compiler Design	3	0	0	3
3	CS403PC	Database Management Systems	3	0	0	3
4	CS404PC	Introduction to Artificial Intelligence	3	0	0	3
5	CS405PC	Object Oriented Programming through Java	3	0	0	3
6	CS406PC	Database Management Systems Lab	0	0	2	1
7	CS407PC	Java Programming Lab	0	0	2	1
8	CS408PC	Real-time Research Project/Field-Based Research Project	0	0	4	2
9	CS409PC	Prolog/ Lisp/ Pyswip	0	0	2	1
10	*MC410	Gender Sensitization Lab	0	0	2	0
		<b>Total</b>	<b>15</b>	<b>0</b>	<b>12</b>	<b>20</b>

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	AM501PC	Design and Analysis of Algorithms	3	1	0	4
2	AM502PC	Machine Learning	3	0	0	3
3	AM503PC	Computer Networks	3	0	0	3
4	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective-I	3	0	0	3
6	AM505PC	Machine Learning Lab	0	0	2	1
7	AM506PC	Computer Networks Lab	0	0	2	1
8	EN508HS	Advanced English Communication Skills Lab	0	0	2	1
9	AM507PC	UI design- Flutter	0	0	2	1
10	*MC510	Intellectual Property Rights	3	0	0	0
		<b>Total</b>	<b>18</b>	<b>01</b>	<b>08</b>	<b>20</b>

**III YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	AM601PC	Knowledge Representation and Reasoning	3	0	0	3
2	AM602PC	Data Analytics	3	0	0	3
3	AM603PC	Natural Language Processing	3	0	0	3
4		Professional Elective – II	3	0	0	3
5		Open Elective-I	3	0	0	3
6	AM604PC	Natural Language Processing Lab	0	0	3	1.5
7	AM605PC	Data Analytics Lab	0	0	3	1.5
8	AM606PC	Industrial Oriented Mini Project/ Internship/Skill Development Course (DevOps)	0	0	4	2
9	*MC609	Environmental Science	3	0	0	0
		<b>Total</b>	<b>18</b>	<b>0</b>	<b>10</b>	<b>20</b>

**Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.**

**\*MC – Satisfactory / Unsatisfactory**

**Professional Elective-I**

AM511PE	Graph Theory
AM512PE	Introduction to Data Science
AM513PE	Web Programming
AM514PE	Image Processing
AM515PE	Computer Graphics

**Professional Elective - II**

AM621PE	Software Testing Methodologies
AM622PE	Information Retrieval Systems
AM623PE	Pattern Recognition
AM624PE	Computer Vision and Robotics
AM625PE	Data Warehousing and Business Intelligence

**Open Elective I:**

1. AM611OE: Fundamentals of AI
2. AM612OE: Machine Learning Basics

**CS301PC: STATISTICAL FOUNDATIONS FOR ARTIFICIAL INTELLIGENCE****B.Tech. II Year I Sem.**

L	T	P	C
3	1	0	4

**Prerequisites:** Mathematics courses of first year of study.**Course Objectives:**

- The Number Theory basic concepts useful for cryptography etc
- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making inferences
- Stochastic process and Markov chains.

**Course Outcomes:** After learning the contents of this course, the student must be able to

- Apply the number theory concepts to cryptography domain
- Apply the concepts of probability and distributions to some case studies
- Correlate the material of one unit to the material in other units
- Resolve the potential misconceptions and hazards in each topic of study.

**UNIT - I****Greatest Common Divisors and Prime Factorization:** Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers**Congruences:** Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences**UNIT - II****Simple Linear Regression and Correlation:** Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study**UNIT – III****Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.**Discrete Probability Distributions:** Binomial Distribution, Poisson distribution.**Continuous Probability Distributions:** Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Central Limit Theorem.**UNIT - IV****Estimation & Tests of Hypothesis:** Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.**Statistical Hypothesis:** General Concepts, Testing a Statistical Hypothesis for large samples and small samples, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion, Two samples: tests on two proportions.**UNIT - V****Stochastic Processes and Markov Chains:** Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

**TEXT BOOKS:**

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

**REFERENCE BOOK:**

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications
2. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

**CS302PC: DATA STRUCTURES****B.Tech. II Year I Sem.****L T P C**  
**3 0 0 3****Prerequisites:** Programming for Problem Solving**Course Objectives**

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

**Course Outcomes**

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

**UNIT - I**

Introduction to Data Structures, abstract data types, Linear list — singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array and linked representations.

**UNIT - II**

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing- linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

**UNIT - III**

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**UNIT - IV**

Graphs: Graph Implementation Methods. Graph Traversal Methods.  
Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**TEXT BOOKS:**

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

**REFERENCE BOOK:**

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning.

**CS303PC: COMPUTER ORGANIZATION AND ARCHITECTURE****B.Tech. II Year I Sem.****L T P C**  
**3 0 0 3****Co-requisite:** A Course on “Digital Electronics”.**Course Objectives**

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

**Course Outcomes**

- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computerprocessor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

**UNIT - I**

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

**UNIT - II**

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

**UNIT - III**

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

**UNIT - IV**

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

**UNIT - V**

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**TEXT BOOK:**

1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

**REFERENCE BOOKS:**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, V th Edition, McGrawHill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4 th Edition, PHI/Pearson.



**CS304PC: SOFTWARE ENGINEERING****B.Tech. II Year I Sem.****L T P C****3 0 0 3****Course Objectives**

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

**Course Outcomes**

- Ability to translate end-user requirements into system and software requirements, using e.g.UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**UNIT - I**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths. **A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models:** The waterfall model, Spiral model and Agile methodology

**UNIT - II**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**UNIT - III**

**Design Engineering:** Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequencediagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT - IV**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

**UNIT - V**

**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**TEXT BOOKS:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

**REFERENCE BOOKS:**

1. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

**CS305PC: OPERATING SYSTEMS****B.Tech. II Year I Sem.****L T P C****3 0 0 3****Prerequisites:**

1. A course on “Computer Programming and Data Structures”.
2. A course on “Computer Organization and Architecture”.

**Course Objectives:**

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Course Outcomes:**

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

**UNIT - I**

**Operating System - Introduction**, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

**Process** - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

**UNIT - II**

**CPU Scheduling** - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

**UNIT - III**

**Process Management and Synchronization** - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors **Interprocess**

**Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT - IV**

**Memory Management and Virtual Memory** - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**UNIT - V**

**File System Interface and Operations** - Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

**TEXT BOOKS:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

**REFERENCE BOOKS:**

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

**CS306PC: INTRODUCTION TO DATA STRUCTURES LAB****B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

**Prerequisites:** A Course on “Programming for problem solving”.**Course Objectives:**

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

**Course Outcomes:**

- Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

**List of Experiments:**

1. Write a program that uses functions to perform the following operations on singly linkedlist.:  
i) Creation      ii) Insertion      iii) Deletion      iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linkedlist.:  
i) Creation      ii) Insertion      iii) Deletion      iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linkedlist.:  
i) Creation      ii) Insertion      iii) Deletion      iv) Traversal
4. Write a program that implement stack (its operations) using  
i) Arrays                      ii) Pointers
5. Write a program that implement Queue (its operations) using  
i) Arrays                      ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order  
i) Quick sort      ii) Heap sort      iii) Merge sort
7. Write a program to implement the tree traversal methods( Recursive and Non Recursive).
8. Write a program to implement  
i) Binary Search tree    ii) B Trees      iii) B+ Trees      iv) AVLtrees  
v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

**TEXT BOOKS:**

1. Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

**REFERENCE BOOK:**

1. Data Structures: A Pseudocode Approach with C, 2<sup>nd</sup> Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

**CS307PC: OPERATING SYSTEMS LAB****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Prerequisites:** A course on “Programming for Problem Solving”, A course on “Computer Organization and Architecture”.

**Co-requisite:** A course on “Operating Systems”.

**Course Objectives:**

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Course Outcomes:**

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

**List of Experiments:**

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) RoundRobin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close,fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer — Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

**TEXT BOOKS:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7<sup>th</sup> Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

**REFERENCE BOOKS:**

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

**CS308PC: SOFTWARE ENGINEERING LAB****B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

**Prerequisites**

- A course on “Programming for Problem Solving”.

**Co-requisite**

- A Course on “Software Engineering”.

**Course Objectives:**

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

**Course Outcomes:**

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**List of Experiments**

Do the following seven exercises for any two projects given in the list of sample projects or any other Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

**Sample Projects:**

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

**TEXT BOOKS:**

1. Software Engineering, A practitioner’s Approach- Roger S. Pressman, 6th edition, McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

**REFERENCE BOOKS:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill

**CS309PC: NODE JS/ REACT JS/ DJANGO****B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

**Prerequisites:** Object Oriented Programming through Java, HTML Basics**Course Objectives:**

- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

**Course Outcomes:** At the end of the course, the student will be able to,

- Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
- Demonstrate Advanced features of JavaScript and learn about JDBC
- Develop Server – side implementation using Java technologies like
- Develop the server – side implementation using Node JS.
- Design a Single Page Application using React.

**Exercises:**

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various sessiontracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS,path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation usingchart.js
14. Create a TODO application in react with necessary components and deploy it into github.

**REFERENCE BOOKS:**

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2ndEdition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node, 2nd Edition, A Press.



**\*MC310: CONSTITUTION OF INDIA****B.Tech. II Year I Sem.**

L	T	P	C
3	0	0	0

**Course Objectives:** Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

**Unit - 1** History of Making of the Indian Constitution- History of Drafting Committee.**Unit - 2** Philosophy of the Indian Constitution- Preamble Salient Features**Unit - 3** Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**Unit - 4** Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions**Unit - 5** Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy**Unit - 6** Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.**Suggested Reading:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

**CS401PC: DISCRETE MATHEMATICS****B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

**Course Outcomes:**

- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

**UNIT - I**

**Mathematical logic:** Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**UNIT - II**

**Set theory:** Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

**UNIT - III**

**Algebraic Structures:** Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

**UNIT - IV**

**Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

**UNIT - V**

**Graph Theory:** Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1<sup>st</sup> ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2<sup>nd</sup> ed.

**REFERENCE BOOKS:**

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5<sup>th</sup> edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

**CS402PC: AUTOMATA THEORY AND COMPILER DESIGN****B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

**Prerequisite:** Nil**Course Objectives**

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

**Course Outcomes**

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

**UNIT - I**

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

**UNIT - II**

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages:** Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT - III**

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA and CFG's, Acceptance by final state

**Turing Machines:** Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

**UNIT - IV**

**Introduction:** The structure of a compiler,

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex,

**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

**UNIT - V**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science — Automata languages and computation, Mishra and Chandrashekar, 2<sup>nd</sup> Edition, PHI.

**REFERENCE BOOKS:**

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2<sup>nd</sup> Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.

**CS403PC: DATABASE MANAGEMENT SYSTEMS****B.Tech. II Year II Sem.****L T P C****3 0 0 3****Prerequisites:** A course on “Data Structures”.**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Course Outcomes:**

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

**UNIT - I**

**Database System Applications:** A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

**UNIT - II**

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

**UNIT - III**

**SQL: QUERIES, CONSTRAINTS, TRIGGERS:** form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

**Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

**UNIT - IV**

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

**UNIT - V**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

**TEXT BOOKS:**

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition. 3rd Edition

2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

**REFERENCE BOOKS:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

**CS404PC: INTRODUCTION TO ARTIFICIAL INTELLIGENCE****B.Tech. II Year II Sem.****L T P C**  
**3 0 0 3****Prerequisite:** Knowledge on Data Structures.**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:**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

**UNIT - I****Introduction to AI** - Intelligent Agents, Problem-Solving Agents,**Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.**UNIT-II****Games** - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic**- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.**UNIT-III****First-Order Logic** - 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, Forward Chaining, Backward Chaining, Resolution.**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.**UNIT-IV****Planning** - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.**UNIT-V****Probabilistic Reasoning:**

Acting under Uncertainty, Basic Probability Notation 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.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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



**CS405PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA****B.Tech. II Year II Sem.****L T P C**  
**3 0 0 3****Course Objectives**

- To Understand the basic object-oriented programming concepts and apply them in problemsolving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

**Course Outcomes**

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

**UNIT - I**

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world — Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

**UNIT - II**

Inheritance, Packages and Interfaces — Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

**UNIT - III**

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

**UNIT - IV**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

**UNIT - V**

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

**TEXT BOOKS:**

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

**REFERENCE BOOKS:**

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A.Johnson-Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

**CS406PC: DATABASE MANAGEMENT SYSTEMS LAB****B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Co-requisites:** “Database Management Systems”**Course Objectives:**

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

**Course Outcomes:**

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

**List of Experiments:**

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)  
B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

**TEXT BOOKS:**

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3<sup>rd</sup> Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

**REFERENCE BOOKS:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7<sup>th</sup> Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

**CS407PC: JAVA PROGRAMMING LAB****B.Tech. II Year II Sem.**

L	T	P	C
0	0	2	1

**Course Objectives:**

- To understand OOP principles.
- To understand the Exception Handling mechanism.
- To understand Java collection framework.
- To understand multithreaded programming.
- To understand swing controls in Java.

**Course Outcomes:**

- Able to write the programs for solving real world problems using Java OOP principles.
- Able to write programs using Exceptional Handling approach.
- Able to write multithreaded applications.
- Able to write GUI programs using swing controls in Java.

**List of Experiments:**

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try codeformatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]
3. Write a Java program to handle checked and unchecked exceptions. Also, demonstrate the usage of custom exceptions in real time scenario.
4. Write a Java program on Random Access File class to perform different read and write operations.
5. Write a Java program to demonstrate the working of different collection classes. [Use package structure to store multiple classes].
6. Write a program to synchronize the threads acting on the same object. [Consider the example of any reservations like railway, bus, movie ticket booking, etc.]
7. Write a program to perform CRUD operations on the student table in a database using JDBC.
8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]

**REFERENCE BOOKS:**

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

**CS409PC: PROLOG/ LISP/ PYSWIP****B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**List of Programs:**

1. Write simple fact for following:
  - A. Ram likes mango.
  - B. Seema is a girl.
  - C. Bill likes Cindy.
  - D. Rose is red.
  - E. John owns gold
2. Write predicates one converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
3. Write a program to solve the Monkey Banana problem
4. WAP in turbo prolog for medical diagnosis and show the advantages and disadvantages of green and red cuts.
5. Write a program to solve the 4-Queen problem.
6. Write a program to solve traveling salesman problems.
7. Write a program to solve water jug problems using Prolog.
8. Write simple Prolog functions such as the following. Take into account lists which are too short.
  - remove the Nth item from the list. -- insert as the Nth item.
9. Assume the prolog predicate `gt(A, B)` is true when A is greater than B. Use this predicate to define the predicate `addLeaf(Tree, X, NewTree)` which is true if `NewTree` is the Tree produced by adding the item X in a leaf node. Tree and `NewTree` are binary search trees. The empty tree is represented by the atom `nil`.
10. Write a Prolog predicate, `countLists(Alist, Ne, Nl)`, using accumulators, that is true when `Nl` is the number of items that are listed at the top level of `Alist` and `Ne` is the number of empty lists. Suggestion: First try to count the lists, or empty lists, then modify by adding the other counter.
11. Define a predicate `memCount(AList, Blist, Count)` that is true if `Alist` occurs `Count` times within `Blist`. Define without using an accumulator. Use "not" as defined in `utilities.pro`, to make similar cases are unique, or else you may get more than one count as an answer.

Examples:

```
memCount(a,[b,a],N). N
= 1 ;
no memCount(a,[b,[a,a,[a],c],a],N).
N = 4 ;
no memCount([a],[b,[a,a,[a],c],a],N).
N = 1 ;
No
```

**REFERENCE BOOK:**

1. PROLOG: Programming for Artificial Intelligence, 3e, by BRATKO, WILEY

**\*MC410: GENDER SENSITIZATION LAB****B.Tech. II Year II Sem.****L T P C**  
**0 0 2 0****COURSE DESCRIPTION**

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines — such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies — to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

**Objectives of the Course**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Learning Outcomes**

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**Unit-I: UNDERSTANDING GENDER**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men  
- Preparing for Womanhood. Growing up Male. First lessons in Caste.

**Unit – II: GENDER ROLES AND RELATIONS**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

### Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn’t Work.” “Share the Load.”-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.  
-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

### Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”.  
Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”

### Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals  
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

**Note:** Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.*

- **ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

### ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50

**AM501PC: DESIGN AND ANALYSIS OF ALGORITHMS****B.Tech. III Year I Sem.****L T P C**  
**3 1 0 4****Prerequisites:**

1. A course on “Computer Programming and Data Structures”.
2. A course on “Advanced Data Structures”.

**Course Objectives:**

- Introduces the notations for analysis of the performance of algorithms and 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:**

- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods

**UNIT - I**

**Introduction:** Algorithm, 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 set operations, union and find algorithms, Priority Queue- Heaps, Heapsort

**Backtracking:** General method, applications, n-queen’s problem, sum of subsets problem, graph Coloring, hamiltonian cycles.

**UNIT - III**

**Dynamic Programming:** General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

**UNIT - IV**

**Greedy method:** General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

**UNIT - V**

**Branch and Bound:** General method, applications - Traveling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

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



**TEXT BOOK:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University press, 1998.

**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.

**AM502PC: MACHINE LEARNING****B.Tech. III Year I Sem.****L T P C****3 0 0 3****Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

**Course Outcomes:**

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensemble to increase the classification accuracy

**UNIT - I**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

**UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

**UNIT - III**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

**UNIT - IV**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization  
Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

**UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example  
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

**TEXT BOOKS:**

1. Stephen Marsland, —Machine Learning — An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

**REFERENCE BOOKS:**

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

**AM503PC: COMPUTER NETWORKS****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Prerequisites**

1. A course on “Programming for problem solving”
2. A course on “Data Structures”

**Course Objectives**

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- 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**

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of subnetting and routing mechanisms.
- 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, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission. Data link layer: Design issues, framing, Error detection and correction.

**UNIT - II**

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

**UNIT - V**

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

**SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Prerequisites:** None**Course Objective:** To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.**Course Outcome:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.**UNIT – I****Introduction to Business and Economics:****Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.**UNIT - II****Demand and Supply Analysis:****Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.**Supply Analysis:** Determinants of Supply, Supply Function & Law of Supply.**UNIT - III****Production, Cost, Market Structures & Pricing:****Production Analysis:** Factors of Production, Production Function, Production Function with onevariable input, two variable inputs, Returns to Scale, Different Types of Production Functions.**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.**UNIT - IV****Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.**UNIT - V****Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

**TEXT BOOKS:**

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGrawHill Education Pvt. Ltd. 2012.

**REFERENCE BOOKS:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

**AM511PE: GRAPH THEORY (Professional Elective – I)****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Course Objectives:**

- Understanding graphs, trees, connected paths, applications of trees and graphs.

**Course Outcomes:**

- Know some important classes of graph theoretic problems;
- Prove central theorems about trees, matching, connectivity, coloring and planar graphs;
- Describe and apply some basic algorithms for graphs;
- Use graph theory as a modeling tool.

**UNIT - I**

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

**UNIT - IV**

**Independent sets coverings and matchings**– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, König's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**UNIT - V**

**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, 1<sup>st</sup> edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

**REFERENCE BOOKS:**

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

**AM512PE: INTRODUCTION TO DATA SCIENCE (Professional Elective – I)****B.Tech. III Year I Sem.**

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**Course Objectives:**

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

**Course Outcomes:**

- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

**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, 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 Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

**UNIT- III**

**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

**UNIT- IV**

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT- V**

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

**Regression:** Linear Regression Analysis, Multiple Linear regression



**TEXT BOOKS:**

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

**REFERENCE BOOKS:**

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

**AM513PE: WEB PROGRAMMING (Professional Elective – I)****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Course Objectives:**

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

**Course Outcomes:**

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

**UNIT – I Client side Programming****HTML-** Basic Tags- List, Tables, Images, Forms, Frames, CSS**JAVA Script -**

Web page Designing using HTML, Scripting basics- Client side and server side scripting. JavaScriptObject, 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 – StringHandling.

**UNIT – III JDBC**

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets – UDPsockets, Java Beans –RMI.

**UNIT – IV APPLETS**

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 Graphicsand Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. TheServlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction toJSP.

**UNIT – V XML AND WEB SERVICES**

Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services-UDDI-WSDL-Javaweb 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 BOOKS:**

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.

**AM514PE: IMAGE PROCESSING (Professional Elective – I)****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Prerequisites**

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**

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

**UNIT - I**

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

**UNIT - III**

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, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

**UNIT - V**

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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.

**AM515PE: COMPUTER GRAPHICS (Professional Elective – I)****B.Tech. III Year I Sem.****L T P C****3 0 0 3****Prerequisites**

1. Programming for problem solving and Data Structures

**Course Objectives**

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D,3D objective transformations

**Course Outcomes**

- Explore applications of computer graphics
- Understand 2D, 3D geometric transformations and clipping algorithms
- Understand 3D object representations, curves, surfaces, polygon rendering methods, colormodels
- Analyze animation sequence and visible surface detection methods

**UNIT - I**

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices

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

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

**UNIT - II**

**2-D geometric transformations:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

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

**UNIT - III**

**3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Polygon rendering methods, color models and color applications.

**UNIT - IV**

**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**viewing:** Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

**UNIT - V**

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

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

**TEXT BOOKS:**

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education

**REFERENCE BOOKS:**

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.
4. “Computer Graphics Principles & practice”, second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
5. Computer Graphics, Steven Harrington, TMH.

**AM505PC: MACHINE LEARNING LAB****B.Tech. III Year I Sem.**

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**Course Objective:**

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

**Course Outcomes:**

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

**List of Experiments**

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode  
Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**TEXT BOOK:**

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

**REFERENCE BOOK:**

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

**AM506PC: COMPUTER NETWORKS LAB****B.Tech. III Year I Sem.****L T P C****0 0 2 1****Course Objectives**

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

**Course Outcomes**

- Implement data link layer framing methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- 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 bitstuffing.
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.

How to run Nmap scan

Operating System Detection using NmapDo

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.

**REFERENCE BOOKS:**

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

**EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB****B.Tech. III Year I Sem.**

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**1. Introduction**

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

**2. Objectives:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

**3. Syllabus:**

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

1. **Activities on Listening and Reading Comprehension:** Active Listening — Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application – Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills** - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation



4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure -Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do’s and Don’ts - GD Strategies – Exercises for Practice.
5. **Interview Skills:** Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

#### 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
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

**5. Suggested Software:** The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner’s Dictionary**, 10<sup>th</sup> Edition
- **Cambridge Advanced Learner’s Dictionary**
- **DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

#### 6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2<sup>nd</sup> ed.). McGraw Hill Education(India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English*. Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). *Academic Writing: A Handbook for International Students*. (5<sup>th</sup> Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice*. (4<sup>TH</sup> Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication*. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O’Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use Series*. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills*. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power*. Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence: Why it can matter more than IQ*. Bloomsbury Publishing.

**AM507PC: UI DESIGN-FLUTTER****B.Tech. III Year I Sem.****L T P C**  
**0 0 2 1****Course Objectives:**

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

**Course Outcomes:**

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and customstyles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

**List of Experiments:** Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.  
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).  
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.  
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.  
b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.  
b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.  
b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.  
b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.  
b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.  
b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.  
b) Use Flutter's debugging tools to identify and fix issues.

**TEXT BOOK:**

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

**\*MC510: INTELLECTUAL PROPERTY RIGHTS****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 0****Course Objectives:**

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

**Course Outcomes:**

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

**UNIT – I**

**Introduction to Intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

**Law of copyrights:** Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international — trade mark law, copyright law, international patent law, and international development in trade secrets law.

**TEXT BOOK:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

**REFERENCE BOOK:**

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd.

**AM601PC: KNOWLEDGE REPRESENTATION AND REASONING****B.Tech. III Year II Sem.****L T P C****3 0 0 3****Course Objectives:**

- To investigate the key concepts of Knowledge Representation (KR) techniques and different notations.
- To integrate the KR view as a knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques and process, knowledge acquisition and sharing of ontology.

**Course Outcomes:**

- Analyze and design knowledge-based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge.

**UNIT - I**

**The Key Concepts:** Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

**UNIT - II**

**Ontology:** Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

**UNIT - III**

**Knowledge Representations:** Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

**UNIT - IV**

**Processes:** Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

**UNIT - V**

**Knowledge Soup:** Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

**TEXT BOOKS:**

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F.Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

**AM602PC: DATA ANALYTICS****B.Tech. III Year II Sem.****L T P C**  
**3 0 0 3****Prerequisites**

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

**Course Objectives:**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

**Course Outcomes:** After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

**UNIT - I**

**Data Management:** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

**UNIT - II**

**Data Analytics:** Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**UNIT - III**

**Regression** — Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

**Logistic Regression:** Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**UNIT - IV**

**Object Segmentation:** Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. **Time Series Methods:** Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

**UNIT - V**

**Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

1. Student’s Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.

**AM603PC: NATURAL LANGUAGE PROCESSING****B.Tech. III Year II Sem.****L T P C****3 0 0 3****Prerequisites:**

1. Data structures and compiler design

**Course Objectives:**

- Introduction 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
- Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Design, implement, and analyze NLP algorithms; and design different language modeling Techniques.

**UNIT - I**

**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, Features

**UNIT - II**

**Syntax I:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

**UNIT – III**

**Syntax II:** Models for Ambiguity Resolution in Parsing, Multilingual Issues

**Semantic Parsing I:** Introduction, Semantic Interpretation, System Paradigms, Word Sense

**UNIT - IV**

**Semantic Parsing II:** Predicate-Argument Structure, Meaning Representation Systems

**UNIT - V**

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

**TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication.

**REFERENCE BOOK:**

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

**AM621PE: SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)****B.Tech. III Year II Sem.****L T P C**  
**3 0 0 3****Prerequisites**

1. 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 the latest tools.

**Course Outcomes**

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic-based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

**UNIT - I**

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 flows, transaction flow testing techniques.  
 Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.  
 Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interface testing, domain and interface testing, domains and testability.

**UNIT - III**

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 graphs, good & bad state graphs, state testing, Testability tips.

**UNIT - V**

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/selenium/soapUI/Catalon).

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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.

**AM622PE: INFORMATION RETRIEVAL SYSTEMS (Professional Elective – II)****B.Tech. III Year I Sem.****L T P C**  
**3 0 0 3****Prerequisites:**

1. Data Structures

**Course Objectives:**

- To learn the concepts and algorithms in Information Retrieval Systems
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

**Course Outcomes:**

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

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

Text Search Algorithms: 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 BOOK:**

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

**REFERENCE BOOKS:**

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.



**AM623PE: PATTERN RECOGNITION (Professional Elective – II)****B.Tech. III Year II Sem.****L T P C****3 0 0 3****Prerequisites:**

- Programming for problem solving
- Computer Oriented Statistical Methods

**Course Objectives:**

- Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.

**Course Outcomes:**

- Understand the importance of pattern recognition and its representation
- Analyze the variants of NN algorithm
- Understand the necessity of Hidden Markov models, decision tree and SVM for classification
- Understand different types of clustering algorithms

**UNIT - I**

Introduction: 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 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: 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: 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: Importance of clustering, 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 BOOK:**

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

**REFERENCE BOOKS:**

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

**AM624PE: COMPUTER VISION AND ROBOTICS (Professional Elective – II)****B.Tech. III Year II Sem.****L T P C**  
**3 0 0 3****Pre-Requisites:** Linear Algebra and Probability.**Course Objectives:**

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

**Course Outcomes:**

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

**UNIT - I****CAMERAS:** Pinhole Cameras**Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases**Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models**Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.**UNIT - II****Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates**Edge Detection:** Noise, Estimating Derivatives, Detecting Edges**Texture:** 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**Stereopsis:** Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras**Segmentation by Clustering:** 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:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness**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**UNIT - V****Introduction to Robotics:** Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

**Common sensing techniques for Reactive Robots:** Logical sensors, Behavioural Sensor Fusion, Proprioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOKS:**

1. David A. Forsyth and Jean Ponce: Computer Vision — A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

**REFERENCE BOOKS:**

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

**AM625PE: DATA WAREHOUSING AND BUSINESS INTELLIGENCE****(Professional Elective – II)****B.Tech. III Year II Sem.****L T P C****3 0 0 3****Course Objectives:**

- 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
- 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:**

- Understand architecture of data warehouse and OLAP operations.
- Understand Fundamental concepts of BI
- Application of BI Key Performance indicators
- Understand Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

**UNIT - I**

Data Warehouse, Data Warehouse Modelling, OLAP operations, Data Qube Computation methods

**UNIT - II**

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.

**UNIT - III**

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 Informationuse.

**UNIT - IV**

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

**UNIT - V**

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, 4<sup>th</sup> Edition.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

**REFERENCE BOOKS:**

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 SQLServer, 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 Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

**AM611OE: FUNDAMENTALS OF AI (Open Elective – I)****B.Tech. III Year II Sem.****L T P C**  
**3 0 0 3****Course Objective:**

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

**Course Outcomes:**

- Gain the knowledge of what is AI, risks and benefits of AI, limits of AI and the ethics involved in building an AI application.
- Understand the nature of environments and the structure of agents.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Gain an understanding of the applications of AI

**UNIT – I**

**Foundations of AI:** Introduction to AI, History of AI, Strong and Weak AI, The State of the Art, Risks and Benefits of AI

**Philosophy, Ethics and Safety of AI:** The Limits of AI, Machine thinking capability, The Ethics of AI

**Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT – II**

**Solving Problems by Searching:** Problem – Solving Agents

**Uninformed Search Strategies:** Best-First Search, Breadth-First Search, Uniform-Cost Search, Depth-First Search, Iterative Deepening Search and Bidirectional Search

**Informed Search Strategies:** Greedy Best-First Search, A\* Search

**UNIT – III**

**Logical Agents:** Knowledge-based agents, Propositional Logic, Propositional Theorem Proving

**First-Order Logic:** Syntax and Semantics of First-Order Logic

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

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events

**UNIT – IV**

**Quantifying Uncertainty:** Basic Probability Notation, Inference Using Full-Joint Distributions, Independence, Bayes' Rule and its Use, Naive Bayes Models

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The semantics of Bayesian Networks, Exact Inference in Bayesian Networks

**UNIT – V**

**Learning from Examples:** Forms of Learning, Supervised Learning, Learning Decision Trees, Model Selection, Linear Regression and Classification, Ensemble Learning

**Natural Language Processing:** Language Models, Grammar, Parsing, Complications of Real Natural Language, Natural Language Tasks

**Robotics:** Robots, Robot Hardware, Kind of Problems solved, Application Domains

**Computer Vision:** Simple Image Features, Using Computer Vision

**TEXT BOOKS:**

1. “Artificial Intelligence a Modern Approach”, Fourth Edition, Stuart J. Russell & Peter Norvig – Pearson.

**REFERENCE BOOKS:**

1. “Artificial Intelligence”, Elaine Rich, Kevin Knight & Shivashankar B Nair — McGraw Hill Education.
2. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
3. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

**AM612OE: MACHINE LEARNING BASICS (Open Elective – I)****B.Tech. III Year II Sem.****L T P C**  
**3 0 0 3****Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

**Course Outcomes:**

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

**UNIT - I**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

**UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation

**UNIT - III**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

**UNIT - IV**

Support Vector Machines

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

**UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Hidden Markov Models

**TEXT BOOKS:**

1. Stephen Marsland, —Machine Learning — An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

**REFERENCE BOOKS:**

1. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
4. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.



**AM604PC: NATURAL LANGUAGE PROCESSING LAB****B.Tech. III Year II Sem.****L T P C**  
**0 0 3 1.5****Prerequisites:**

1. Data structures, finite automata and probability theory.

**Course Objectives:**

- To Develop and explore the problems and solutions of NLP

**Course Outcomes:**

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Knowledge on NLTK Library implementation
- Work on strings and trees, and estimate parameters using supervised and unsupervised training methods.

**List of Experiments**

1. Write a Python Program to perform following tasks on text
  - a) Tokenization
  - b) Stop word Removal
2. Write a Python program to implement Porter stemmer algorithm for stemming
3. Write Python Program for a) Word Analysis                      b) Word Generation
4. Create a Sample list for at least 5 words with ambiguous sense and Write a Python program to implement WSD
5. Install NLTK tool kit and perform stemming
6. Create Sample list of at least 10 words POS tagging and find the POS for any given word
7. Write a Python program to
  - a) Perform Morphological Analysis using NLTK library
  - b) Generate n-grams using NLTK N-Grams library
  - c) Implement N-Grams Smoothing
8. Using NLTK package to convert audio file to text and text file to audio files.

**TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. O'Reilly Practical natural Language Processing, A Comprehensive Guide to Building Real World NLP Systems.
3. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

**REFERENCE BOOKS:**

1. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

**AM605PC: DATA ANALYTICS LAB****B.Tech. III Year II Sem.****L T P C**  
**0 0 3 1.5****Course Objectives:**

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

**Course Outcomes:**

- Understand linear regression and logistic regression
- Understand the functionality of different classifiers
- Implement visualization techniques using different graphs
- Apply descriptive and predictive analytics for different types of data

**List of Experiments:**

1. Data Preprocessing
  - a. Handling missing values
  - b. Noise detection removal
  - c. Identifying data redundancy and elimination
2. Implement any one imputation model
3. Implement Linear Regression
4. Implement Logistic Regression
5. Implement Decision Tree Induction for classification
6. Implement Random Forest Classifier
7. Implement ARIMA on Time Series data
8. Object segmentation using hierarchical based methods
9. Perform Visualization techniques (types of maps - Bar, Colum, Line, Scatter, 3D Cubes etc)
10. Perform Descriptive analytics on healthcare data
11. Perform Predictive analytics on Product Sales data
12. Apply Predictive analytics for Weather forecasting.

**TEXT BOOKS:**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.

**AM606PC: DEVOPS****B.Tech. III Year II Sem.****L T P C****0 0 4 2****Course Objectives:**

- Develop a sustainable infrastructure for applications and ensure high scalability. DevOps aimsto shorten the software development lifecycle to provide continuous delivery with high-quality.

**Course Outcomes:**

- Understand the need of DevOps tools
- Understand the environment for a software application development
- Apply different project management, integration and development tools
- Use Selenium tool for automated testing of application

**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 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 for 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, Packt Publishing, 2016.

**REFERENCE BOOKS:**

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

**\*MC609: ENVIRONMENTAL SCIENCE****B.Tech. III Year II Sem.**

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**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

**Course Outcomes:** Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.