VIDYA JYOTHI
INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

COURSE STRUCTURE

R-22

For

B. Tech- Artificial Intelligence & Data Science

II Year B.Tech.AI & DS- I Semester

S.No	Course Code	Course Title	L	T	P	C
1	A223009	Probability and Statistics	3	1	0	4
2	A223508	Software Engineering	3	0	0	3
3	A223510	Data Structures	3	0	0	3
4	A223506	Database Management Systems	3	0	0	3
5	A223505	Computer System Architecture	3	0	0	3
6	A223584	Data Structures Lab	0	0	2	1
7	A223585	Database Management Systems Lab	0	0	2	1
8	A223013	Quantitative Methods and Logical Reasoning	2	0	0	1
9	A223589	Skill Development Course **(Data Visualization using Power BI)**	0	0	2	1
Total			**17**	**1**	**06**	**20**

II Year B.Tech.AI &DS –II Semester

S.No	Course Code	Course Title	L	T	P	C
1	A224520	Discrete Mathematics	3	0	0	3
2	A224515	Introduction to Artificial Intelligence	2	0	0	2
3	A224513	Object Oriented Programming through Java	3	0	0	3
4	A224512	Operating Systems	3	0	0	3
5	A224522	Introduction to Data warehousing and Data mining	3	0	0	3
6	A224595	Artificial Intelligence Lab	0	0	2	1
7	A224592	Object Oriented Programming through Java Lab	0	0	2	1
8	A2245P1	Real-time Research Project/Field Based Research Project	0	0	4	2
9	A224014	Professional Communication	0	0	2	1
10	A224598	Skill Development Course(Django)	0	0	2	1
Total			**15**	**0**	**12**	**20**

III Year B.Tech. AI&DS - I Semester

S.No	Course Code	Course Title	L	T	P	C
1	A225547	Design and Analysis of Algorithms	3	0	0	3
2	A225551	Data Science	3	1	0	4
3	A225525	Computer Networks	3	1	0	4
4	A225552 A225541 A225549 A225545	Professional Elective-I • Agile Methodologies • Computer Graphics • Cyber Security • Information retrieval Systems	3	0	0	3
5		Open Elective–I	3	0	0	3
6	A2255A7	Data Science Using R Lab	0	0	2	1
7	A2255A0	Computer Networks Lab	0	0	2	1
8	A225017	Gender Sensitization	2	0	0	0
9	A2255A8	Skill Development Course(Flutter)	0	0	2	1
Total			**17**	**2**	**6**	**20**

III Year B.Tech. AI&DS - II Semester

S.No	Code	Course Title	L	T	P	C
1	A226575	Automata Theory and Compiler Design	3	0	0	3
2	A2265E6	Essentials of Machine Learning	3	1	0	4
3	A226563	Big data Analytics	3	0	0	3
4	A226558 A226567 A226574 A2265E3	Professional Elective-II • Object Oriented Analysis & Design • Cloud Computing & Security • Image Processing • Artificial Neural Networks	3	0	0	3
5		Open Elective–II	3	0	0	3
6	A2265B8	Machine Learning using Python Lab	0	0	2	1
7	A2265P1	Industry Oriented Mini Project/Internship	0	0	4	2
8	A226088	Advanced English Communication Skills Lab	0	0	2	1
9	A226020	Environmental Science	2	0	0	0
Total			**17**	**1**	**8**	**20**

IV Year B.Tech. AI&DS - I Semester

S.No	Course Code	Course Title	L	T	P	C
1	A2275F2	Deep Learning	3	0	0	3
2	A227021	Business Economics &Financial Analysis	3	0	0	3
3	A2275H4 A2275J0 A2275G2 A2275H0	**Professional Elective-III** • Computer Vision • Introduction to Robotics • Full Stack Development • DevOps	3	0	0	3
4	A2275H3 A2275G5 A2275F5 A2275J1	**Professional Elective-IV** • Web Technologies • Quantum Computing • Natural Language Processing • Augmented Reality & Virtual Reality	3	0	0	3
5	A2275J3 A2275H8	**Open Elective – III** R- Programming Smart Chatbots	3	0	0	3
6	A2275C6	Deep Learning Lab	0	0	2	1
7	A2275D0 A2275D2 A2275C8 A2275D1	**Professional Elective-III Lab** • Computer Vision Lab • Introduction To Robotics Lab • Full Stack Development Lab • DevOps Lab	0	0	2	1
8	A2275PS1	Project Stage- I	0	0	6	3
Total			**15**	**0**	**10**	**20**

IV Year B.Tech. AI&DS - II Semester

S.No	Course Code	Course Title	L	T	P	C
1	A2285J6	E-Commerce	3	0	0	3
2	A2285J9	Software Testing Methodologies	3	0	0	3
3	A2285K1	Web And Social Media Analytics	3	0	0	3
4	A2285PS2	Project Stage – II including Seminar	0	0	22	9+2
Total			**9**	**0**	**22**	**20**

PROBABILITY AND STATISTICS

II YEAR B.Tech. AI & DS– I Sem. **L T P C**
Course Code: A223009 **3 1 0 4**

Course Outcomes:

After learning the contents of this course, the students must be able to:

1. To differentiate among random variables involved in the probability models which are useful for all branches of engineering.
2. Derive relationship among variety of performance measures using probability distributions.
3. Acquire elementary knowledge of parametric and non-parametric –tests and understand the use of observing state analysis for predicting future conditions.
4. Identify and examine situations that generate using problems and able to solve the tests of ANOVA for classified data and apply proper measurements, Indicators and techniques of Correlation and regression analysis.
5. Identify different types of ques and select appropriate que for different situations.

Unit – I

Probability: Probability Distributions, Random Walk, Sample Space, Probability Density Function, Cumulative distribution Function, Independent Events, Mutual Exclusive, Conditional Probability, Joint Probability, Baye's theorem.

Unit – II

Probability Distributions & Testing of Hypothesis I:

Fitting of Binomial, Poisson &Normal distributions and their properties (only Statements) Moment Generating Functions, mean and variance.

Testing of hypothesis for single mean and difference of means of large samples. Confidence interval for the proportions, Tests of hypothesis for the proportions- single and difference between the proportions for large samples.

Unit – III

Testing of hypothesis II: Small Samples - t-distribution, F-Distribution, distribution, ANOVA for one-way classified data

Unit – IV

Correlation, Regression & Curve Fitting: Coefficient of Correlation-Regression coefficients- The lines of Regression- The Coefficient of Rank Correlation.

Curve Fitting- Fitting a Straight line- Second Degree Polynomial- Exponential, Power Curve by Method of Least Squares.

Unit – V

Queuing Theory: Structure of a queuing system, Operating characteristics of queuing system, Transient and steady states, Terminology of Queuing systems, Arrival and service processes- Pure

Birth-Death process Deterministic queuing models- M/M/1 Model of infinite queue, M/M/1 model of finite queue.

Text Books:

1. Probability and Statistics for Engineers, by Richard Arnold Johnson, Irvin Miller and John E Freund, New Delhi Prentice
2. Probability and Statistics, by T. K. V. Iyengar others, S. Chand Publications.

References Books:

1. Fundamentals of Mathematical Statistics, by S C Gupta and V K Kapoor, S Chand.
2. Fundamentals of Queueing Theory, by John F Shortle et.el. Fifth Edition, John Wiley & Sons.

SOFTWARE ENGINEERING

B. Tech. II Year- AI & DS - I Sem.
Course Code: A223508

L	T	P	C
3	0	0	3

Course Outcomes:

1. Outline the framework activities for a given project.
2. Examine Right process model for a given project.
3. Analyze various system models for a given Context.
4. Understand various testing techniques for a given project.
5. Identify various risks in project development.

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), personal and team process models.

UNIT II

Process Models: The waterfall model, Incremental process models, Evolutionary process model, Unified process model, Agile process model.

Software Requirements: Functional and non-functional requirements, the software requirements document.

Requirements Engineering Process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT III

System models: Context Models, Behavioral models, Data models, Object models, structured methods. **Design Engineering:** Design process and Design quality, Design concepts, the design model, Modeling component level design: design class-based components, conducting component level design.

User interface design: Golden rules.

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing techniques, Validation testing, System testing.

Product Metrics: Software Quality, Metrics for Requirements Model- function based metrics, Metrics for Design Model-object oriented metrics, class-oriented metrics, component design metrics, Metrics for source code, Metrics for Testing, Metrics for maintenance.

UNIT V

Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Software Reviews, Formal technical reviews, Software reliability, The ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 8th edition McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

References Books:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, JohnWiely.
   Systems Analysis and Design- ShelyCashmanRosenblatt,Thomson Publications.

DATA STRUCTURES

II YEAR B. Tech AI & DS-I Sem.

L	T	P	C
3	0	0	3

Course Code: A223504

Course Outcomes:

1. Understand the concepts of Stacks and Queues with their applications.
2. Analyze various operations on Binary trees.
3. Examine of various concepts of binary trees with real time applications.
4. Analyze the shortest path algorithm on graph data structures.
5. Outline the concepts of hashing, collision and its resolution methods using hash functions.

UNIT - I

Data Structures: Introduction, Types of data structures, Static and Dynamic representation of data structure and comparison. Stacks: Stacks definition, operations on stacks, Representation and evaluation of expressions using Infix, Prefix and Postfix, Algorithms for conversions and evaluations of expressions from infix to prefix and postfix using stack.

Queues: Types of Queues- Circular Queue, Deque and operations.

UNIT - II

Trees: Basic terminologies, Types of Binary Tree: Complete and Full Binary Tree, Extended Binary Trees, Representation of Trees using Arrays and Linked lists (advantages and disadvantages), Tree Traversal, Representation of Algebraic expressions, Threaded Binary Trees.

UNIT - III

Advanced concepts on trees: Representation and Creation of Binary Search Trees (BST), Operations on BST, Representationand advantages of AVL Trees, algorithms & operations on AVL Trees, Multi-way trees, Definition and advantages of B-trees, B+ Trees, Red-Black Trees.

UNIT - IV

Graphs: Basic terminology, Representation of graphs: sequential representation, Adjacency, Path Matrix) Linked representation. Graph Traversals-Breadth First Search, Depth First Search algorithms. Spanning Tree, Minimum Spanning Trees- Prim's Algorithm, Kruskals Algorithm, Dijkstra Algorithm.

UNIT - V

Hashing: General Idea, Hash Functions, collisions, Collision avoidance techniques, Separate Chaining, Open Addressing-Linear probing, Quadratic Probing, Double Hashing, Rehashing, ExtensibleHashing, Implementation of Dictionaries

Text Books:

1. Data Structures Using C, 2nd Edition Reema Thereja OXFORD higher Education
2. Fundamentals of Data Structures, 2nd Horowitz and Sahani,*Galgotia Publications* Pvt LtdDelhi India.

Reference Books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, Tata McGraw-Hill, Special SecondEdition.
2. Data Structures Using C and C++‖, Aaron M. Tenenbaum, YedidyahLangsam and Moshe J.Augenstein PHI Learning Private Limited, Delhi India.
3. Data Structures, A Pseudo code Approach with C, Richard F.Gillberg & Behrouz A. Forouzan, Cengage Learning, India Edition, Second Edition, 2005.

DATABASE MANAGEMENT SYSTEMS

II Year B.Tech. AI & DS– I Sem. **L T P C**
Course Code: A223506 **3 0 0 3**

Course Outcomes:

At the end of the course student would be able to

1. Understand the concepts of Entity-Relationship Model for enterprise level databases.
2. Analyze the database and provide restricted access to different users of database.
3. Understand various Normal forms to carry out schema refinement.
4. Analyze various Concurrency control protocols.
5. Understand working principles of Recovery algorithms

Unit-I

Introduction to Database System Concepts: Database-System Applications, Purpose of Database Systems, View of data, Database Language, Database Architecture, Database Users and Administrators.

Introduction to the Relation Models and Database Design using ER Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Feature, Structure of relational databases , database schema.

Unit-II

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions Nested Sub queries, Modification of the Database.

Intermediate and Advanced SQL: Join Expressions, Views, Integrity Constraints, SQL Data Types, Authorization. Functions and Procedures, Triggers.

Unit-III

Formal Relational Query Languages: The Relational operations, The Tuple Relational Calculus, The Domain Relational Calculus.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Decomposition Using Multi valued Dependencies, BCNF.

Unit-IV

Transactions: Transaction Concept, a Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity.

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Timestamp- Based Protocols, Validation based protocols.

Unit-V

Recovery System: Failure Classification, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, ARIES, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S.Sudarshan, Database System Concepts‖,6th Edition, Tata McGraw-Hill.
2. RaghuRamaKirshna, JohannesGehrk,DatabaseManagementSystem‖TataMcGrawHill 3rd Edition.

Reference Books:

1. PeterRob&CarlosCoronel DatabaseSystemConceptsCengageLearning.
2. RamezElmasri, ShamkanthB. Navrate–FundamentalsofDatabaseSystems7thEdition, Pearson Education.
3. C.J. Date Introduction to Database Systems PearsonEducation

COMPUTER SYSTEM ARCHITECTURE

B.Tech. II Year –AI & DS- I Sem.
Course Code: A223505

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the various number System
2. Classify the basics of instruction sets
3. Demonstrate the design of functional units of a digital computer system.
4. Analyze various computer arithmetic operations.
5. Design a pipeline for consistent execution of instruction with minimum hazards

UNIT - I

Number Systems: Binary, Octal, Hex Decimal, and Conversions, range; Binary additions and subtractions (using 1c, and 2c), concept of overflow, representations of negative numbers using 1's and 2's complement and range; BCD numbers: Representation of 8421, 2421, Ex-3, Gray and self-complementary codes; additions and subtractions on 8421 codes.

UNIT - II

Structure of Computers: Computer types, functional units, basic operational concepts,Von Neumann architecture,bus structures, software, performance, multiprocessors and multicomputer, data representation, fixed and floating point and error detecting codes. Register Transfer and Micro Operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, shift micro-operations, arithmetic logic shift unit.

UNIT III

Basic Computer Organization and Design: Instruction, codes, computer registers, computer instructions, instruction cycle, timing and control, memory reference instructions, input, output and interrupt.

Central Processing Unit: stack organization, instruction formats, addressing modes, data transfer and m anipulation, program control, reduced instruction set computer (**RISC).**

UNIT IV:

Computer Arithmetic: Addition and subtraction, multiplication and division algorithms, floating point arithmetic operation, decimal arithmetic unit, and decimal arithmetic operations.

UNIT V:

The Memory System:

Basic concepts, semiconductor RAM types of read only memory (ROM), cache memory, performa nce considerations, virtual memory, secondary storage raid, direct memory access (DMA). Processor and control unit Basic MIPS implementation Building data path Control Implementation scheme Pipelining Pipelined data path and control Handling Data hazards & Control hazards Exceptions.

TEXT BOOK:

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

REFERENCE BOOKS:

1. Computer Organization – Car Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

DATA STRUCTURES LAB

B.Tech. II Year –AI & DS- I Sem. **L T P C**
Course Code: A223584 **0 0 2 1**

Course Outcomes:

1. Develop the programs on stacks and its applications.
2. Design and implementation of programs on Linked lists and Tree Traversals.
3. Apply Tree Concepts on advanced Trees
4. Implement Graph and its Traversing techniques
5. Apply Hashing techniques in real world applications

List of Experiments:

1. C Programs to illustrate concepts of arrays, structures, unions and enumerated data types.
2. Write a Program to implement stack, queue using linked list
3. Program to convert infix to postfix notation
4. Program to evaluate postfix notations
5. Write a program to implement doubly linked list and its operations
6. Program to illustrate tree traversals
    a) In order
    b) Pre order
    c) Post order
7. Program to illustrate insertion, deletion and searching in Binary Search Tree.
8. Program to illustrate Insertion, deletion and Rotation on AVL Trees.
9. Program to illustrate Graph traversals
    1. Breadth First Search
    2. Depth First Search
10. Program to implement hash table using linear and quadratic probing.
11. Implement Dictionaries using hashing.

Text books:

1. Fundamentals of Data Structures in C, 2nd 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 Books:

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

DATABASE MANAGEMENT SYSTEMS LAB

II Year B.Tech. AI & DS – I Sem.	**L**	**T**	**P**	**C**
Course Code: A223585	**0**	**0**	**2**	**1**

Course Outcomes:

1. Use the SQL commands such as DDL, DML, DCL, TCL to create, manipulate, access data from database objects and providing authorization to access database by different users.
2. To apply various integrity Constraints on the database tables for preserving the integrity of the database.
3. Design and implement Pl/SQL programs which includes procedures, functions, cursor and triggers.

List of Experiments

1. Database Schema for a customer-sale scenario

Customer(**Cust id : integer,** cust_name: string)
Item(**item_id: integer,**item_name: string, price: integer)
Sale(**bill_no: integer,** bill_data: date, **cust_id: integer, item_id: integer**, qty sold: integer)

For the above schema, perform the following—
a. Create the tables with the appropriate integrity constraints
b. Insert around 10 records in each of the tables
c. List all the bills for the current date with the customer names and item numbers
d. List the total Bill details with the quantity sold, price of the item and the final amount
e. List the details of the customer who have bought a product which has a price>200
f. Give a count of how many products have been bought by each customer
g. Give a list of products bought by a customer having cust_id as 5
h. List the item details which are sold as of today
i. Create a view which lists out the bill_no, bill_date, cust_id, item_id, price, qty_sold, amount Create a view which lists the daily sales date wise for the last one week.

2. Database Schema for a Student Library scenario

Student (Stud_no : integer,Stud_name: string) Membership (Mem_no: integer,Stud_no: integer) Book (book_no: integer, book_name:string, author: string)Iss_rec(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)

For the above schema, perform the following
a. Create the tables with the appropriate integrity constraints
b. Insert around 10 records in each of the tables
c. List all the student names with their membership numbers

d. List all the issues for the current date with student and Book names
e. List the details of students who borrowed book whose author is CJDATE
f. Give a count of how many books have been bought by each student
g. Give a list of books taken by student with stud_no as 5
h. List the book details which are issued as of today
i. Create a view which lists out the iss_no, iss _date, stud_name, book name
j. Create a view which lists the daily issues-date wise for the last one week.

3. Database Schema for a Employee-pay scenario

Employee (emp_id:integer,emp_name:string)
Department (dept_id:integer,dept_name:string)
paydetails (emp_id : integer, dept_id: integer, basic: integer, deductions: integer, additions: integer, DOJ: date)
Payroll **(emp_id: integer**, pay date: date)
For the above schema, perform the following
1. Create the tables with the appropriate integrity constraints
2. Insert around 10 records in each of the tables
3. List the employee details department wise
4. List all the employee names who joined after particular date
5. List the details of employees whose basic salary is between 10,000 and 20,000
6. Give a count of how many employees are working in each department
7. Give a names of the employees whose netsalary>10,000
8. List the details for an employee_id=5
9. Create a view which lists out the emp_name, department, basic, dedeuctions, netsalary
10. Create a view which lists the emp_name and his netsalary

4. Database Schema for a Video Library scenario

Customer(**cust_no: integer**, cust_name: string) Membership(**Mem_no: integer**, **cust_no: integer**) Cassette(**cass_no:integer**, cass_name:string, Language: String) Iss_rec**(iss_no: integer**, iss_date: date, **mem_no: integer**, **cass_no: integer**)
For the above schema, perform the following

a. Create the tables with the appropriate integrity constraints
b. Insert around 10 records in each of the tables
c. List all the customer names with their membership numbers
d. List all the issues for the current date with the customer names and cassette names
e. List the details of the customer who has borrowed the cassette whose title is ― The Legend‖
f. Give a count of how many cassettes have been borrowed by each customer
g. Give a list of book which has been taken by the student with mem_no as 5
h. List the cassettes issues for today
i. Create a view which lists outs the iss_no, iss_date, cust_name, cass_name
j. Create a view which lists issues-date wise for the last one week.

5. Database Schema for a student-Lab scenario

Student(**stud_no: integer**, stud_name: string, **class: string**) Class (**class: string,descrip: string**)Lab (**mach_no: integer**, Lab no: integer, description: String) Allotment (**Stud_no: Integer, mach_no: integer, day of week: string)**

For the above schema, perform the following

a. Create the tables with the appropriate integrity constraints

b. Insert around 10 records in each of the tables

c. List all the machine allotments with the student names, lab and machine numbers

d. List the total number of lab allotments day wise

e. Give a count of how many machines have been allocated to the 'IT' class

f. Give a machine allotment details of the stud_no 5 with his personal and class details

g. Count for how many machines have been allocated in **Lab_no 1** for the day of the week as ―Monday‖

h. How many students class wise have allocated machines in the labs

i. Create a view which lists out the stud_no, stud_name, mach_no, lab_no, dayofweek

j. Create a view which lists the machine allotment details for ―Thursday‖.

g salary > 50000.

6) Create a procedure to find reverse of a given number
7) Create a procedure to update the salaries of all employees as per the given data
8) Create a procedure to demonstrate IN, OUT and INOUT parameters
9) Create a function to check whether given string is palindrome or not.
10) Create a function to find sum of salaries of all employees working in depart number 10.
11) Create a trigger before/after update on employee table for each row/statement.
12) Create a trigger before/after delete on employee table for each row/statement.
13) Create a trigger before/after insert on employee table for each row/statement.

SKILL DEVELOPMENT COURSE -DATA VISUALIZATION USING POWER BI

II Year B.Tech. AI & DS– I Sem. **L T P C**
Course Code: A223589 **0 0 2 1**

Course Outcomes:

1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real worldproblems.

List of Experiments

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations,
Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau,
creating basic charts (line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different
displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India

DISCRETE MATHEMATICS

II YEAR B.Tech. AI & DS– II Sem. **L T P C**
Course Code: A224520 **3 0 0 3**

Course Outcomes:

1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. 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, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

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

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

	L	T	P	C
II YEAR B.Tech. AI & DS– II Sem				
Course Code: A224515	**2**	**0**	**0**	**2**

Course Outcomes:

Student will be able to:

1. Understand the basic concepts and environment of Artificial intelligence.
2. Analyze various uniformed and informed search algorithm related to artificial intelligence.
3. Design various simple and complex network with real time applications.
4. Analyze the basic principles Markov Decision with real time applications.
5. Illustrate various types of Reinforcement Learning learning.

Unit – I

Concept of AI, History, Current Status, Scope, Intelligent Agents, Environments, Problem Formulations, Review of Tree and Graph Structures, State Space Representation, Search Graph and Search Tree.

Unit – II

Uninformed and Informed Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search: Generate & Test, Hill Climbing, Best first search, A* algorithm, Game Search, Alpha-Beta Pruning Genetic Algorithm

Unit – III

Probabilistic Reasoning : Probability, Conditional Probability, Bayes Rule, Bayesian Networks-Representation, Construction and Inference, Temporal Model, Hidden Markov Model, Dynamic Bayesian networks (DBN), Natural Language Processing using HMM

Unit – IV

Markov Decision Process, MDP Formulation, Utility Theory, Utility Functions, Value Iteration, Policy Iteration and Partially Observable MDPs.

Unit – V

Reinforcement Learning: Passive Reinforcement Learning, Direct Utility Estimation, Adaptive dynamic Programming, Temporal Difference Learning, Active Reinforcement Learning- Q Learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill

REFERENCE BOOKS:

1. Trivedi, M.C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

II YEAR B.Tech. AI & DS– II Sem.	**L**	**T**	**P**	**C**
Course Code: A224513	**3**	**0**	**0**	**3**

Course Outcomes:

1. Understand OOP concepts to apply basic Java constructs.
2. Analyze different forms of inheritance and usage of Exception Handling
3. Understand the different kinds of file I/O and Multithreading in complex Java programs,and usage of Container classes
4. Contrast different GUI layouts and design GUI applications
5. Construct a full-fledged Java GUI application, and Applet with database connectivity

UNIT - I

Java Basics: History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays,operators, expressions, control statements, type conversion and casting, simple java program.

Fundamentals of Object Oriented Programming: Object-Oriented Paradigm, Basic Concepts of Object Oriented Programming, Applications of OOP. Concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, static keyword,nested and inner classes, Strings, Object class.

UNIT - II

Inheritance & Polymorphism: Introduction, Forms of Inheritance - specialization, specification, construction, extension, limitation, combination, Member access rules, super keyword, polymorphism-method overriding, abstract classes, final keyword.

Interfaces and Packages: Introduction to Interfaces, differences between abstract classes and interfaces, multiple inheritance through interfaces, Creating and accessing a package, Understanding CLASSPATH, importing packages.

Exception handling: Concepts of exception handling, exception hierarchy, built in exceptions, usage of try, catch, finally, throw, and throws, creating own exception sub classes.

UNIT - III

Files: Introduction to I/O Streams: Byte Streams, Character Streams. File I/O.

Multi-threading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication. Java.util package-**Collection Interfaces:** List, Map, Set. The Collection classes: LinkedList,HashMap, Tree Set, String Tokenizer, Date, Random, Scanner**.**

UNIT - IV

AWT: Class hierarchy, Component, Container, Panel, Window, Frame, Graphics.

AWT controls: Labels, Button, Scrollbar, Text Components, Checkbox, CheckboxGroup, Choice, List, Panes –ScrollPane, Dialog and Menu Bar.

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouseand keyboard events, Adapter classes.

UNIT - V

Layout Manager: Border, Grid, Flow, Card and Grid bag**.**

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters toapplets.

JDBC Connectivity: JDBC Type 1 to 4 Drivers, connection establishment, Query Execution.

Text Books:

1. Java- the complete reference, Seventh edition, Herbert Schildt, Tata McGraw Hill.
2. Database Programming with JDBC & JAVA, Second Edition, George Reese, O'Reilly Media.

Reference Books:

1. Programming in JAVA, Second Edition, OXFORD Higher Education.
2. Thinking in Java Fourth Edition, Bruce Eckel
3. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
4. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

OPERATING SYSTEM

II Year B.Tech. AI & DS – II Sem.
Course Code: A224512

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic functions of Operating systems and system calls.
2. Analyze process scheduling and synchronization.
3. Understand the concepts of memory management.
4. Examine the concepts of MASS storage structure
5. Compare different protection methods of OS and understand the deadlock concepts.

UNIT - I

Operating System Introduction: Operating Systems Objectives and functions, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Virtual Machines.

UNIT - II

Process and CPU Scheduling: Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switching, Preemptive Scheduling, Scheduling Criteria, Scheduling algorithms, thread scheduling, Case studies: Linux, Windows.

Process Coordination: Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

UNIT - III

Memory Management and Virtual Memory: Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms, Thrashing.

UNIT - IV

File System Interface: The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure: Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management.

UNIT - V

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

Protection: System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

Text Books:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne , th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

References Books:

1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.

INTRODUCTION TO DATA WAREHOUSING AND DATA MINING

	L	T	P	C
II YEAR B. Tech AI & DS-II Sem				
Course Code: A224522	**3**	**0**	**0**	**3**

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

1. Understand the fundamentals of Data warehousing and OLAP technology.
2. Outline the Data Mining and Data pre-processing techniques.
3. Identify the frequent patterns using association algorithms.
4. Distinguish how classification algorithms are used on data sets.
5. Compare different clustering techniques on large data sets.

UNIT – I:
Data Warehouse and OLAP Technology: What is Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data ware housing to data mining.

UNIT – II:
Introduction to Data Mining: What motivated data mining? Why it is important? So- What is Data mining, Data Mining-On What Kind of Data, Data Mining Functionalities-What kind of patterns can be Mined, Are All of the patterns Interesting, Classification of Data Mining systems, Data Mining Task Primitives.
Data pre-processing:-Why Preprocess the Data**,** Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT – III:
Mining Frequent Patterns, Associations and Correlations: Basic Concepts and a Road Map, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT – IV:
Classification & Prediction: What is Classification? What is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back Propagation, Support Vector Machines, Associative Classification: Classification by Association Rule Analysis, Lazy Learners, Other Classification Methods, Prediction.

UNIT – V:
Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Outlier Analysis.

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei Morgan Kaufmann publishers 2nd edition

References:

1. Data Mining Techniques Arun K Pujari, 2nd edition, Universities Press.
2. Data Warehousing in the Real World Sam Aanhory & Dennis Murray, Pearson Edn Asia, 2002.
3. Data Warehousing Fundamentals Paulraj Ponnaiah Wiley student Edition.

ARTIFICIAL INTELLIGENCE LAB

II YEAR B.Tech. AI & DS– II Sem	**L**	**T**	**P**	**C**
Course Code: A224595	**0**	**0**	**2**	**1**

Course Outcomes:

1. Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
2. Possess the skill for representing knowledge using the appropriate technique
3. Possess the ability to apply AI techniques to solve problems of Game Playing

List of Experiments

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

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010. Pearson Education, Inc. ISBN: 978-0-13-604259-4

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

II YEAR B.Tech. AI & DS– II Sem	**L**	**T**	**P**	**C**
Course Code: A224592	**0**	**0**	**2**	**1**

Course Outcomes:

1. Apply basic Java constructs and OOP to solve mathematical problems.
2. Apply Inheritance in Java programs and Analyze Exception Handling code
3. Implement File input/output and multithreading concepts in advanced Java programs.
4. Design different GUI applications using GUI layouts.
5. Apply Applet development and Database connectivity to build GUI applications

List of Experiments

Week 1 & 2

Write a program to find total, average of given two numbers by using function with command-line arguments, static data members.

Write a program to illustrate class and objects.

Write a program to illustrate method & constructor overloading.

Write a program to illustrate parameter passing using objects.

Write a program to illustrate Array Manipulation.

Week 3

Write a program to illustrate different types of inheritances.

Write a java program to illustrate Method overriding.

Write a java program to demonstrate the concept of polymorphism (Dynamic Method Dispatch).

Write a program to demonstrate final keyword.

Week 4 & 5

Write a program to illustrate the use of creation of packages.

Write a java program to handle the situation of exception handling using multiple catch blocks.

Write a program to implement the concept of User defined Exceptions.

Week 6 & 7

Write a program to illustrate Multithreading and Multitasking.

Write a program to illustrate thread priorities.

Write a program to illustrate Synchronization

Week 8 & 9:

Write a program to implement StringTokenizer.

Write a program to read one line at a time, and write it to another file.

Week 10 & 11

Write a program to illustrate Event Handling (keyboard, Mouse events)

Write a program to illustrate applet life cycle and parameter passing.

Week 12:

Write a program to develop a calculator application using AWT.

Week 13

Write a program to illustrate JDBC.

REAL-TIME RESEARCH PROJECT

	L	T	P	C
II Year B.Tech. AI & DS – II Sem.				
Course Code: A2245P1	**0**	**0**	**4**	**2**

Course Outcomes:

At the end of the course the student should be able to

1. Understand market and industries deeply
2. Able to solve problems with the leanest available solution
3. Self-learning through practical applications
4. Predict a timeline for the project
5. Evaluate the requirements of the projects in terms of different subsystems

The objective of a real-time research project can vary depending on the specific topic and context. However, in general, the objective of a real-time research project is to gather and analyze data in a timely manner to provide insights and inform decision-making in a rapidly changing situation. Real-time research projects often focus on current events, trends, or phenomena that require timely and accurate analysis to inform immediate action or decision-making. The objective of such projects is to collect and analyze data in real-time or near real-time, and to present findings and insights quickly and effectively.

Examples of objectives for real-time research projects include:

6. Monitoring and analyzing social media trends to inform a marketing campaign.
7. Tracking and analyzing stock market data to inform investment decisions.
8. Gathering and analyzing public health data to inform responses to a disease outbreak.
9. Monitoring and analyzing political polls to inform election campaigns.
10. Collecting and analyzing customer feedback to inform product development.

In all of these cases, the objective of the real-time research project is to provide timely and accurate information to support decision-making and achieve the desired outcome.

PROFESSIONAL COMMUNICATION

II Year B.Tech. AI & DS II Sem.	**L**	**T**	**P**	**C**
Course Code: A224014	**0**	**0**	**2**	**1**

Course Objectives
The course intends to:

- Develop soft skills for professional enhancement
- Understand professional etiquette and learn appropriate mannerism
- Learn about leadership, team building skills
- Attempt to solve problems by taking appropriate decisions
- Correspond in multiple contexts, for varied audiences, across genres and modalities.

Course Outcomes

- Acquire enhanced personality
- Demonstrate appropriate professional etiquette
- Practice team building with strong communication skills
- Develop problem solving skills and decision-making
- Exhibit effective communication on digital platforms

Unit: I: Introduction to Soft Skills

Soft Skills for personal and professional development
Self Introduction in various situations
SWOC Analysis
Goal setting

Unit: II: Professional Etiquette

Etiquette-Mobile Etiquette- Netiquette
Non-Verbal Communication
Presentations – Individual & Team
Time Management

Unit: III: Team Essentials

Leadership Skills
Team Building
Negotiation Skills
Group Discussion-Functional Aspects

Unit: IV: Decision Making & Problem Solving

Logical Thinking
Decision Making
Problem Solving
Critical Thinking

Unit: V: Digital Communication

Role of Multimedia in Communication
E-Mail
Social Networking: Importance and Effects.
Communication in Corporate World

References Books:

1. Ashrif Rizvi, Effective Technical Communication, Tata Mac Graw Hill, 2018.
2. Barun, K Mitra, Personality Development and Soft Skills, Oxford University Press, 2nd Edition, 2017.

SKILL DEVELOPMENT COURSE- DJANGO

II Yr. B.Tech. AI & DS– II Sem	**L**	**T**	**P**	**C**
Course Code: A224598	**0**	**0**	**2**	**1**

Course Outcomes:

At the end of the course, the student will be able to,

1. Build a blog with HTML, CSS, and Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC
3. Design a django application for cookies and forms and admin page

List of Experiments

1. Create a static web blog using html, css
2. Create a web calculator using Html, bootstrap and javaScript
3. Create a website which store contact in session storage and peform curd operation
4. Design a website using html, css, javascripot and django
5. Devlop a application to perform curd operations in sqlite (Ex: Todo App)
6. Design a login page and signup page to login into the website using djangoauthentication
7. Devlop a multi-page web application using django
8. Create a web application for shopping cart with registration, login, catalog and cart pages.
9. Add a customized admin page to add new products to the catalog using django
10. Create a application which fetches the data from a rest api and display the data using the Chart.jsin django use cookies and Http sessions
11. Create a django application which uses generic views and forms

III Year B.Tech. AI&DS - I Semester

S.No	Course Code	Course Title	L	T	P	C
1	A225547	Design and Analysis of Algorithms	3	0	0	3
2	A225551	Data Science	3	1	0	4
3	A225525	Computer Networks	3	1	0	4
4	A225552 A225541 A225549 A225545	Professional Elective-I • Agile Methodologies • Computer Graphics • Cyber Security • Information retrieval Systems	3	0	0	3
5		Open Elective–I	3	0	0	3
6	A2255A7	Data Science Using R Lab	0	0	2	1
7	A2255A0	Computer Networks Lab	0	0	2	1
8	A225017	Gender Sensitization	2	0	0	0
9	A2255A8	Skill Development Course(Flutter)	0	0	2	1
Total			**17**	**2**	**6**	**20**

III Year B.Tech. AI&DS - II Semester

S.No	Code	Course Title	L	T	P	C
1	A226575	Automata Theory and Compiler Design	3	0	0	3
2	A2265E6	Essentials of Machine Learning	3	1	0	4
3	A226563	Big data Analytics	3	0	0	3
4	A226558 A226567 A226574 A2265E3	Professional Elective-II • Object Oriented Analysis & Design • Cloud Computing & Security • Image Processing • Artificial Neural Networks	3	0	0	3
5		Open Elective–II	3	0	0	3
6	A2265B8	Machine Learning using Python Lab	0	0	2	1
7	A2265P1	Industry Oriented Mini Project/Internship	0	0	4	2
8	A226088	Advanced English Communication Skills Lab	0	0	2	1
9	A226020	Environmental Science	2	0	0	0
Total			**17**	**1**	**8**	**20**

DESIGN AND ANALYSIS OF ALGORITHMS

III YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code:A225547	**3**	**0**	**0**	**3**

Course Outcomes:

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

1. Analyze the efficiency of algorithms
2. Develop algorithms divide & conquer, greedy and related problems
3. Examine the performance of Dynamic programming
4. Comprehensive knowledge on backtracking
5. Analyze NP-Hard and NP-Complete Problems

UNIT I

Introduction:

Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation,Disjoint Sets- disjoint set operations, union and find operations.

Divide and conquer:

General method, applications - Binary search, Quick sort, Merge sort, Stassen‘s matrix multiplication.

UNIT II

Graphs:

Breadth First Search, Depth First Search, spanning trees, connected and bi- connected components Greedy method:

General method, Applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III

Dynamic Programming:

General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsackproblem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT IV

Backtracking:

General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltoniancycles.

Branch and Bound:

General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch andBound solution, FIFO Branch and Bound solution.

UNIT V

Lower Bound Theory: Comparison Trees, NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Satisfiability problem, Clique Decision Problem (CDP), Node cover decision problem.

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, Galgotia publications Pvt. Ltd.

References:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGraw Hill.
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

DATA SCIENCE

	L	T	P	C
III YEAR B.Tech. AI&DS – I Sem.				
Course Code:A225551	**3**	**1**	**0**	**4**

Course Outcomes:

1. Understand basic terms of data science
2. Analyze different data type and statistical modeling
3. Understanding of data frames and list
4. Implementation of R programming concepts
5. 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.

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

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

UNIT - III

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, sub setting 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.

Regression: Linear Regression Analysis

UNIT-V

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.

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

CASE STUDIES: Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014.
2. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.
3. 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.

COMPUTER NETWORKS

	L	T	P	C
III YEAR B.Tech. AI&DS – I Sem.				
Course Code:A225525	**3**	**1**	**0**	**4**

Course Outcomes:

1. Understand the overview of reference models.
2. Illustrate various sub protocols in multi access protocols.
3. Analyze various routing algorithms and their operations.
4. Apply transport protocols for the given scenarios.
5. Evaluate various protocols and functionalities of application layer.

UNIT - I

Overview of the Internet:

Definition of networks, Topology, Protocol, Layering Scenario, TCP/IP Protocol Suite, The OSI Model, Internet history standards and administration, Comparison of the OSI and TCP/IP reference model.

Physical Layer:

Guided transmission media, wireless transmission media.

UNIT - II

Data Link Layer:

Design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol.

Multiple Access Protocols:

ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer – CSMA/CD with Binary Exponential Backoff, Ethernet Performance, Switched, Fast, Gigabit, 10-Gigabit Ethernets, Data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT - III

Network Layer:

Network Layer Design issues, routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

Internetworking:

Tunneling, Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addresses, CIDR, ICMP, ARP, RARP, DHCP.

UNIT - IV

Transport Layer:

Services provided to the upper layers, elements of transport protocol- addressing, connection establishment, connection release, Crash Recovery.

The Internet Transport Protocols:

UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

UNIT - V

Application Layer:

Introduction, providing services, Application layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS.

Text Books:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding Communications And Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Introduction To Computer Networks And Cyber Security, Chwan-Hwa(John)Wu, J. David Irwin, CRC Press.

PE-I: AGILE METHODOLOGIES

	L	T	P	C
III YEAR B.Tech. AI&DS – I Sem.				
Course Code:A225552	**3**	**0**	**0**	**3**

Course Outcomes:

At the end of the course student would be able to:

1. Identify basic concepts of agile methodology and Extreme programming
2. Analyze real customer involvement in collaboration
3. Discuss risk management and iteration planning
4. Understanding incremental requirements, refactoring, incremental design and architecture

UNIT - I

Introduction Extreme Programming (XP) - Agile Development: Why Agile?, Understanding Success, Beyond Deadlines, Importance of Organizational Success, Introduction to Agility, Agile methods-Scrum and XP, Manifesto for Agile Software Development, Principles of Agile Process. Understanding XP (Extreme Programming) - XP life cycle, XP team, XP Concepts, Adopting XP - Knowing whether XP is suitable, Implementing XP, assessing Agility, Practicing XP - Thinking, Pair Programming, Energized work, Informative Workspace, Root cause Analysis, Retrospectives.

UNIT - II

Collaborating: Trust, Sit together, Real customer involvement, Ubiquitous language, Stand-Up meetings, coding standards, Iteration demo, Reporting.

UNIT - III

Releasing: Bugfree Release, Version Control, Ten-Minute Build, continuous integration, Collective ownership and Documentation.

UNIT – IV

Planning: Version, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories and Estimating

UNIT - V

Developing: Incremental requirements, Customer tests, Test driven development, Refactoring, Incremental design and architecture, spike solutions, Performance optimization, Exploratory testing.

Text Book:

1. The art of Agile Development, James Shore and Shane Warden, 11th Indian Reprint, O'Reilly,2018.

Reference Books:

1. Learning Agile, Andrew Stellman and Jennifer Greene, O'Reilly, 4th Indian Reprint, 2018
2. Practices of an Agile Developer, Venkat Subramaniam and Andy Hunt, SPD, 5th Indian Reprint,2015
3. Agile Project Management - Jim Highsmith, Pearson Low price Edition 2004

PE-1: COMPUTER GRAPHICS

	L	T	P	C
III YEAR B.Tech. AI&DS – I Sem.				
Course Code:A225541	**3**	**0**	**0**	**3**

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

1. Outline the areas of Computer Graphics.
2. Examine various 2D Geometrical transforms.
3. Understand 3D Geometrical transforms.
4. Apply different visible surface detection methods.
5. Plan the sequence of an animation for a given scenario.

UNIT - I
Introduction
Application areas of Computer Graphics, overview of graphics systems, video-display devices and raster-scan systems, random scan systems, graphics monitors and work stations and input devices.
Output Primitives
Points and lines, tine drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNIT - II
2D Geometrical Transformations
Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms transformations between coordinate systems.
2D Viewing
The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen- Sutherland and Cyrus-beck line clipping algorithms, Sutherland -Hodgeman polygon clipping algorithm.

UNIT - III
3D Object Representation
Polygon surfaces, quadric surfaces. Spline representation, Hermite curve, Bezier curve and B-spine curves. Bezier and B-spline surfaces, sweep representations, octrees BSP Trees.
3D Geometric transformations

Translation, rotation, scaling, reflection and shear transformations**,** composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and Clipping.

UNIT - IV
Visible Surface Detection Methods:
Classification, back face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, and area sub division and octree methods.
Illumination Models and Surface Rendering Methods Basic illumination models, polygon rendering method.

UNIT - V
Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame system, Motion specification.

Text Book:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, 2nd Edition, Pearson education.

Reference Books:

1. Computer Graphics Principles & practice, second edition In C, Foley, VanDam, Feiner and Hugues, Pearson Education.
2. "Computer Graphics Second edition", Zhigand xiang. Roy Plastock, Schaum's outlines. rats Mc Graw 19 edition.
3. Procedural elements lot Computer Graphics, David F Rogers. Tata Mc Graw hill, 2nd edition.

PE-1: CYBER SECURITY

	L	T	P	C
III YEAR B.Tech. AI&DS – I Sem.				
Course Code:A225549	**3**	**0**	**0**	**3**

Course Outcomes:

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

1. Analyze and evaluate the cyber security needs of an organization.
2. Understand Cyber Security Regulations and Roles of International Law.
3. Design and develop security architecture for an organization.
4. Comprehensive knowledge of fundamental concepts of cyber security attacks.
5. Understand fundamental concepts of data privacy attacks.

UNIT- I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIATriad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles ofInternational Law. The INDIAN Cyberspace, National Cyber Security Policy.
Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need forComputer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, DigitalForensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics.

UNIT - III

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

UNIT- IV

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

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy indifferent domains- medical, financial, etc.
Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime,Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives, Wiley

REFERENCE BOOKS:

1. B. B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
3. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J.David Irwin, CRC Press T&F Group.

PE-I: INFORMATION RETRIEVAL SYSTEMS

III YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code:A225545	**3**	**0**	**0**	**3**

Course Outcomes:

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

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

UNIT - I

Introduction to Information Retrieval Systems: 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, PrenticeHall, 1992.

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

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

DATA SCIENCE USING R LAB

III YEAR B.Tech. AI&DS – I Sem. **L T P C**
Course Code: A2255A7 **0 0 2 1**

Course Outcomes:

1. Setup R programming environment.
2. Understand and use R – Data types and R – Data Structures.
3. Develop programming logic using R – Packages.
4. Analyze data sets using R – programming capabilities

LIST OF EXPERIMENTS:

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write R command to
   i) Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
   ii) Enumerate multiplication and division operations between matrices and vectors in R console
4. Write R command to
   i) Illustrates the usage of Vector subsetting and Matrix subsetting
   ii) Write a program to create an array of 3×3 matrices with 3 rows and 3 columns.
5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file
6. Create a CSV file having Speed and Distance attributes with 1000 records. Write R program to draw
   i) Box plots
   ii) Histogram
   iii) Line Graph
   iv) Multiple line graphs
   v) Scatter plot
   to demonstrate the relation between the cars speed and the distance.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.
9. Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file.

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

REFERENCE BOOKS:

1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press

COMPUTER NETWORKS LAB

III YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code: A2255A0	**0**	**0**	**2**	**1**

Course Outcomes:

1. Implement various network topologies and protocols of Physical and Data Link Layer
2. Design various networks and Apply Routing algorithms of Network Layer
3. Analyze the packets in Transport and Application Layer Protocols.

Programs:

Week1: Study of different types of Network cables and Implement the cross-wired cable and straight through cable and configure the Network Topology using Packet Tracer

Week 2: Implement the data link layer framing methods such as character stuffing and bit stuffing.

Week 3: Implementation of hamming code algorithm

Week 4: Implementation of CRC polynomial.

Week 5: Study of Basic Network Configuration Commands and Classification of IP address and Sub netting

Week 6: Connect the computers in Local Area Network and Observing Static and Dynamic Routing using Packet Tracer

Week 7: Implement Dijkstra's algorithm to compute the shortest path through a graph.

Week 8: Now obtain Routing table of each node using distance vector routing algorithm

Week 9: Take an example subnet of hosts. Obtain broadcast tree for it.

Week 10: Write a program for congestion control using leaky bucket algorithm.

Week 11: Capture and Analyze the Packets using Wire shark for the following Protocols IPv4, TCP, UDP

Week 12: Capture and Analyze the Packets using Wire shark for the following Protocols HTTP, DNS

GENDER SENSITIZATION

III YEAR B.Tech. AI &DS – I Sem. **L T P C**
Course Code:A225017 **2 0 0 0**

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 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 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 labour 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 social media and literature.

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudestowards 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.

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 and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

SKILL DEVELOPMENT COURSE (UI DESIGN- FLUTTER)

III YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code:A2255A8	**0**	**0**	**2**	**1**

Course Outcomes:

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

1. Knowledge on installation of various software's.
2. Understanding of various widgets.
3. Application of animation to app.

List of Experiments

Week 1:
Installation of Android studio & Flutter.

Week 2:
Create an application using Flutter to print hello world.

Week 3:
Create an application to implement Decision making and loops using Dart.

Week 4:
Create an application to demonstrate user defined functions using Dart.

Week 5:
Create an application to implement object oriented programming using Dart.

Week 6:
Create an application for platform basic widgets (Text, Image, and Icon).

Week 7:
Create an application for Layout widgets (Single child, Multiple Child).

Week 8:
Create an application to demonstrate Gesture Detector.

Week 9 & 10:
Create an application for Registration form.

Week 11:
Create an application to implement flutter calendar.

Week 12:
Create an application to implement Animated Text in Flutter.

TEXT BOOK:

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

REFERENCE BOOKS:

1. Flutter for Beginners: An introductory guide to building cross-platform mobile applications withFlutter and Dart 2, Packt Publishing Limited.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps, 1stedition, Apress.
3. Frank Zammetti, Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK, 1st edition, Apress

III Year B.Tech. AI&DS - II Semester

S.No	Code	Course Title	L	T	P	C
1	A226575	Automata Theory and Compiler Design	3	0	0	3
2	A2265E6	Essentials of Machine Learning	3	1	0	4
3	A226563	Big data Analytics	3	0	0	3
4	A226558 A226567 A226574 A2265E3	Professional Elective-II • Object Oriented Analysis & Design • Cloud Computing & Security • Image Processing • Artificial Neural Networks	3	0	0	3
5		Open Elective–II	3	0	0	3
6	A2265B8	Machine Learning using Python Lab	0	0	2	1
7	A2265P1	Industry Oriented Mini Project/Internship	0	0	4	2
8	A226088	Advanced English Communication Skills Lab	0	0	2	1
9	A226020	Environmental Science	2	0	0	0
Total			**17**	**1**	**8**	**20**

AUTOMATA THEORY AND COMPILER DESIGN

III YEAR B.Tech. AI&DS – II Sem.	**L**	**T**	**P**	**C**
Course Code:A226575	**3**	**0**	**0**	**3**

Course Outcomes:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. 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 €-transitions to NFA without €-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's 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, SyntaxDirected 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, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.

2. Theory of Computer Science- Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.

2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

ESSENTIALS OF MACHINE LEARNING

III YEAR B.Tech. AI&DS – II Sem. | **L T P C**
Course Code: A2265E6 | **3 1 0 4**

Course Outcomes:

1. Understand the Concepts of Machine Learning
2. Develop Simple Regression Models
3. Build various classification algorithms
4. Analyze the need of ensemble learning and dimension reduction
5. Apply the Clustering algorithms for developing applications

Unit – I
Introduction to Machine Learning
What is Machine Learning, Types of Machine Learning, Applications of Machine learning, preparing to Model, Modelling and Evaluation

Unit – II
Supervised Learning: Regression
Introduction to Regression, Example of Regression, Simple Linear Regression, Multiple Linear Regression, Assumptions in Regression Analysis, Improving the accuracy of the Linear Regression Model, Ridge Regression, Lasso Regression.

Unit – III
Supervised Learning: Classification
What is Classification, General Approach to Classification, K-Nearest Neighbour Algorithm, Logistic Regression, Decision Trees: Construction, classification and regression trees, example, Naive Bayesian Classifier, Support Vector Machines: Optimal Separation, Kernels, Algorithm

Unit – IV
Unsupervised Learning and Dimensionality Reduction
Types of Unsupervised Learning, Challenges in Unsupervised Learning, Clustering Algorithms: K-Means, Agglomerative, DBSCAN, Comparing and Evaluating Clustering Algorithms.
Dimensionality Reduction: Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), Factor Analysis (FA).

Unit – V
Ensemble Learning and Reinforcement Learning
Ensemble Methods: Bagging, Boosting & Random Forests, Reinforcement Learning: Overview, Example: Getting Lost, Markov Decision Process, Values, difference between SARSA and Q Learning, Uses of Reinforcement Learning

Text Books:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, Pearson, 2018.
2. Machine Learning: An Algorithmic Perspective by Stephen Marsland, CRC Press, 2009

Reference Books:

1. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition Aurélien Géron, 2019, O'Reilly Media, Inc.

BIG DATA ANALYTICS

III YEAR B.Tech. AI&DS – II Sem.	**L**	**T**	**P**	**C**
Course Code:A226563	**3**	**0**	**0**	**3**

Course Outcomes:

1. Explain the foundations, definitions, and challenges of Big Data.
2. Use Hadoop file system interfaces.
3. Program using HADOOP and Map reduce.
4. Understand various Hadoop Eco Systems like Pig, Hive.
5. Outline Hadoop Eco System using HBase, Zookeeper.

UNIT - I

Introduction to Big Data and Hadoop

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop,Analyzing Data with UNIX tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System.

UNIT - II

HDFS (Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Dataflow, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT - III

Map Reduce

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, MapReduce Types and Formats, Map Reduce Features.

UNIT - IV

Hadoop Eco System-I

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin,User Defined Functions, Data Processing operators.

Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

UNIT - V

Hadoop Eco System-II

HBase: HBasics, Concepts, Clients, Example, Hbase versus RDBMS. Zookeeper: The Zookeeper Services, Zookeeper in Production.

Text Books:

1. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reily Media, 2012.2.Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.

PE-2: OBJECT ORIENTED ANALYSIS & DESIGN

III YEAR B.Tech. AI&DS – II Sem. **L T P C**
Course Code: A226558 **3 0 0 3**

Course Outcomes:

1. Understand Object Oriented Software Development Process
2. Construct class and object diagrams for the given scenario
3. Model interaction diagrams, use case diagrams and activity diagrams for a given project
4. Design State diagrams involving processes and threads
5. Apply Unified Modeling Language Construct for Developing Structural Design of an ATM Project.

UNIT – I
Introduction to UML:
Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture and Software Development Life Cycle.

UNIT – II
Basic Structural Modeling:
Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modeling:
Advanced classes, advanced relationships, Interfaces, Packages.

Class & Object Diagrams:
Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT – III
Basic Behavioral Modeling-I:
Interactions, Interaction diagrams.

Basic Behavioral Modeling-II:
Use cases, Use case Diagrams, Activity Diagrams.

UNIT – IV
Advanced Behavioral Modeling:
Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT – V
Architectural Modeling:
Component, Deployment, Component diagrams and Deployment diagrams
Case Study: The Unified library application, ATM System.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education 2nd Edition
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd-2003

Reference Books:

1. Analysis and Design and Unified Process, Craig Larman, Pearson Education.
2. Object Oriented Analysis, Design and Implementation, B.Dathan. S.Ramnath, Universities Press.
3. Learning UML 2.0, Russ Miles and Kim Hamilton, O'Reilly, SPD.

PE-2: CLOUD COMPUTING AND SECURITY

III YEAR B.Tech. AI&DS – II Sem.	L	T	P	C
Course Code:A226567	3	0	0	3

Course Outcomes:

At the end of this course, the student would be able to:

1. Understand different Cloud Services
2. Analyze different cloud deploy and service models.
3. Understand various enterprise applications in cloud computing
4. Understand and apply the virtualization concepts
5. Understand the data security mechanism and SLA management in cloud.

UNIT - I

Introduction to cloud computing:

Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as aService Providers, Challenge and Risks.

UNIT - II

Migration into a Cloud:

Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration in to aCloud.

Enriching the 'Integration as a Service' Paradigm for the Cloud Era:

An Introduction, The Onset of Knowledge Era, The Evolution of SaaS, The challenges of SaaS Paradigm, new integration scenarios, the integration Methodologies, SaaS Integration Services, Business to BusinessIntegration (B2Bi) Services

UNIT - III

The Enterprise Cloud Computing Paradigm:

Introduction, Background, Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers toward a Marketplace for Enterprise Cloud Computing, the Cloud Supply Chain.

UNIT - IV

Virtual Machines Provisioning and Migration Services:

Introduction and Inspiration, Background and Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action Secure Distributed Data Storage in Cloud Computing:

Introduction, Cloud Storage: from LANs TO WANs, Technologies for Data Security in Cloud Computing

UNIT - V

Data Security in the Cloud:

An Introduction to the idea of Data Security, The Current State of Data Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Digital Identity and DataSecurity, Content Level Security-Pros and Cons.

Text Book:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms,Wiley Publications-2013

Reference Books:

1. Michael Miller, Cloud Computing Web-Based Application That Change the Way You Work andCollaborate Online, Pearson Publications-2008
2. Thomas Erl, Zaigham Mahmood, & Ricardo Puttini, Cloud Computing- Concepts, Technology &Architecture Pearson Publications-2013
3. Kai Hwang, Geoffrey C.Fox. Jack J. Dongarra
4. , Distributed and Cloud Computing – From ParallelProcessing to the Internet of Things, ELSEVIER Publications-First Edition.

PE-2: IMAGE PROCESSING

III YEAR B.Tech. AI&DS – II Sem.
Course Code:A226574

L	T	P	C
3	0	0	3

Course Outcomes:

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

1. Understand Digital image fundamentals,
2. Program Image Transformations,
3. Design Color Image Processing and Restoration,
4. Implement Image segmentation techniques and
5. Program Image 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.

UNIT - II

Image Transforms 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, Hotelling transform. Image enhancement Point processing. Histogram processing. Spatial filtering.

UNIT - III

Enhancement in frequency domain, Image smoothing, Image sharpening. Color image processing: Pseudocolor image processing, full color image processing.

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 Books:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education..

Reference Books:

1. Image Processing with Scilab and Image Processing Design Toolbox; Dr. Eng. (J) Harald Galda, 2011.
2. Fundamentals of Digital Image processing – A.K.Jain , PHI.
3. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L.Edition, PEA, 2004.

PE-2: ARTIFICIAL NEURAL NETWORKS

III YEAR B.Tech. AI&DS – II Sem.	**L**	**T**	**P**	**C**
Course Code:A2265E3	**3**	**0**	**0**	**3**

Course Outcomes:

1. Understanding the concept of Human Brain Neuron inspired ANN
2. Able to create different neural networks of various architectures both feed forward and feed backward.
3. Perform the training of neural networks using various learning rules.
4. Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.
5. Comprehension of Attractor Neural Networks and Self-organization Feature Map

Unit- I

Introduction: What is a Neural Network, The Human Brain, Models of a Neuron, Neural Networks Viewed As Directed Graphs, Feedback, Network Architectures, Knowledge Representation, Learning Processes, Learning Tasks,

Rosenblatt's Perceptron, Introduction, Perceptron, The Perceptron Convergence Theorem, Relation Between the Perceptron and Bayes Classifier for a Gaussian Environment.

Unit- II

Model Building through Regression: Introduction, Linear Regression Model: Preliminary Considerations, Maximum a Posteriori Estimation of the Parameter Vector, Relationship Between Regularized Least-Squares Estimation and MAP Estimation

The Least-Mean-Square Algorithm: Introduction, Filtering Structure of the LMS Algorithm, unconstrained Optimization: a Review, The Wiener Filter, The Least-Mean-Square Algorithm, Markov Model Portraying the Deviation of the LMS Algorithm from the Wiener Filter, Virtues and Limitations of the LMS Algorithm, Learning-Rate Annealing Schedules

Unit- III

Multilayer Perceptrons: Introduction, Some Preliminaries, Batch Learning and On-Line Learning, The Back-Propagation Algorithm, XOR Problem, Heuristics for Making the Back-Propagation Algorithm Perform Better, Cross-Validation, Complexity Regularization and Network Pruning, Virtues and Limitations of Back-Propagation Learning

Unit –IV

Kernel Methods and Radial-Basis Function Networks: Introduction, Cover's Theorem on the Separability of Patterns, Radial-Basis-Function Networks, K-Means Clustering, Recursive Least-Squares Estimation of the Weight Vector, Hybrid Learning Procedure for RBF Networks

Support Vector Machines: Introduction, Optimal Hyperplane for Linearly Separable Patterns, Optimal Hyperplane for Non-separable Patterns, the Support Vector Machine Viewed as a Kernel Machine, Design of Support Vector Machines.

Unit –V

Regularization Theory: Introduction, Hadamard's Conditions for Well-Posedness, Tikhonov's Regularization Theory, Regularization Networks, Estimation of the Regularization Parameter

Self-Organizing Maps: Introduction, Two Basic Feature-Mapping Models, Self-Organizing Map, Properties of the Feature Map, Principal-Components Analysis.

TEXT BOOKS :

1. Simon Haykin, "Neural Networks & Learning Machines", Pearson
2. B. Yegnanarayana, "Artificial Neural Networks", Prentice Hall India

REFERENCE BOOKS :

1. Li Min Fu, "Neural Networks in Computer Intelligence", TMH
2. Tariq Rashid, “Make your own Neural Network”

MACHINE LEARNING USING PYTHON LAB

III YEAR B.Tech. AI&DS – II Sem.	L	T	P	C
Course Code:A2265B8	0	0	2	1

Course Outcomes:

At the end of the course the student should be able to

1. Select data, model selection, model complexity and identify the trends
2. Understand a range of machine learning algorithms along with their strengths andweaknesses
3. Build predictive models from data and analyze their performance

List of Experiments

WEEK 1 :

a) Write a program using scikit-learn to implement K-means Clustering
b) Program to calculate the entropy and the information gain
c) Program to implement perceptron.

WEEK 2:

- Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

WEEK 3:

- For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of allhypotheses consistent with the training examples.

WEEK 4:

- Write a program to demonstrate the working of the decision tree based ID3
- algorithm.Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

WEEK 5:

- Build an Artificial Neural Network by implementing the Backpropagation algorithm andtest the same using appropriate data sets.

WEEK 6:

- Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease DataSet.

WEEK 7:

- Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data setfor clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

WEEK 8:

- Write a program to implement k-Nearest Neighbors algorithm to classify the iris dataset. Print both correct and wrong predictions.

WEEK 9:

- Write a program to implement SVM algorithm to classify the iris data set. Print bothcorrect and wrong predictions.

WEEK 10:

- Implement the non-parametric Locally Weighted Regression algorithm in order to fitdata points. Select appropriate data set for your experiment and draw graphs.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

	L	T	P	C
III YEAR B.Tech. AI&DS – II Sem.				
Course Code: A226088	**0**	**0**	**2**	**1**

Course Objectives:

The course intends to:

- Improve the students' fluency in English with a focus on vocabulary
- Enable them to listen to English spoken at normal conversational speed by educated English speakers
- Respond appropriately in different socio-cultural and professional contexts
- Communicate their ideas relevantly and coherently in writing
- Prepare the students for placements

Course Outcomes:

At the end of the course a student is expected to:

1. Enhance reading and active listening techniques for a faster and better comprehension.
2. Exhibit strong writing skills to exhibit ideas effectively in social and professional situations.
3. Demonstrate effective presentation skills.
4. Develop critical thinking, problem-solving, decision-making and communication skills.
5. Display confidence during job interviews.

SYLLABUS:

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 land 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.

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

Suggested Software:

1. TOEFL&GRE (BARRONS, USA, Cracking GRE by CLIFFS)
2. Oxford Advanced Learner's Dictionary,10th Edition
3. Cambridge Advanced Learner's Dictionary

Text books:

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed.).McGraw Hill Education (India) Pvt. Ltd.
2. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5th Edition). Routledge.

References Books:

1. Raman, Meenakshi & Sharma, Sangeeta. (2022).Technical Communication, Principles and Practice. (4th Edition) Oxford University Press.
2. Anderson, Paul V (2007).Technical Communication**.** Cengage Learning Pvt.Ltd. New Delhi.

ENVIRONMENTAL SCIENCE

III YEAR B.Tech. AI&DS – II Sem.	**L**	**T**	**P**	**C**
Course Code:A226020	**2**	**0**	**0**	**0**

Course Outcomes

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

1. Define and explain the structure and functions of ecosystem, value of biodiversity, threats andconservation of biodiversity.
2. Explain the limitations of the resources and impacts of over utilization of all natural resources.
3. Explain the sources and effects of environmental pollutions and list the available techniques tocontrol the pollution.
4. Explain the global environmental issues like climate change, ozone hole and can explain the scopeof EIA, Environmental Management Plan, environmental audit and list the EIA methods.
5. Mention the salient features of environmental acts and rules, define the sustainable goals along withmeasures required for the sustainability.

UNIT I:

Ecosystem: Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Foodchains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.

Biodiversity and Biotic Resources: Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situconservation.

UNIT II:

Natural Resources: Classification of Resources, Water resources: use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting; Energy resources: growing energy needs, Renewable and Non-Renewable Energy resources. Land resources: land degradation – Landslide and Soil Erosion; Forest Resources – Uses and Exploitation.

UNIT III:

Environmental Pollution and Control: Types of Pollution, Sources, Effects and Control measures of Air Pollution, Water Pollution, Soil Pollution and Noise Pollution.

UNIT IV:

Global Environmental Problems and Global Efforts: Greenhouse effect, Global Warming, climate changeand their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); Aid Rains.

Environmental Impact Assessment (EIA): Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

UNIT V:

Environmental Policy, Legislation, Rules And Regulations: Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

Towards Sustainable Future: Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

Text Books:

1. Text Book of Environmental Studies by Anubha Kaushik (4th Edition), New age InternationalPublishers.
2. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

Reference books:

1. Textbook of Environmental Science and Technology by M. Anji Reddy,2007.
2. Text Book of Environmental Studies by Anubha Kaushik (3rdEdition), New age InternationalPublishers.
3. Environmental Science: Towards a Sustainable Future by Richard T. Wright,2008 PHL LearningPrivate Ltd, New Delhi

IV Year B.Tech. AI&DS - I Semester

S.No	Course Code	CourseTitle	L	T	P	C
1	A2275F2	Deep Learning	3	0	0	3
2	A227021	Business Economics &Financial Analysis	3	0	0	3
3	A2275H4 A2275J0 A2275G2 A2275H0	**Professional Elective-III** • Computer Vision • Introduction to Robotics • Full Stack Development • DevOps	3	0	0	3
4	A2275H3 A2275G5 A2275F5 A2275J1	**Professional Elective-IV** • Web Technologies • Quantum Computing • Natural Language Processing • Augmented Reality & Virtual Reality	3	0	0	3
5	A2275J3 A2275H8	**Open Elective – III** R- Programming Smart Chatbots	3	0	0	3
6	A2275C6	Deep Learning Lab	0	0	2	1
7	A2275D0 A2275D2 A2275C8 A2275D1	**Professional Elective-III Lab** • Computer Vision Lab • Introduction To Robotics Lab • Full Stack Development Lab • DevOps Lab	0	0	2	1
8	A2275PS1	Project Stage- I	0	0	6	3
Total			**15**	**0**	**10**	**20**

DEEP LEARNING

IV YEAR B.Tech. AI&DS – I Sem. **L T P C**
Course Code: A2275F2 **3 0 0 3**

Course Outcomes:

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

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT I

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions.

UNIT II

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT IV

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, VariationalAutoencoders, GANS

UNIT V

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books:

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning” , MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, “Transfer Learning in Action”, Manning Publications, 2021

Reference Books:

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow:Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code:A227021	3	0	0	3

Course Outcomes:

At the end of the course the students are expected to

1. Understand the nature and scope of business economics.
2. Analyze the Demand, Supply Functions and to forecast the demand.
3. Understand the concept of production and its relationship with business operations**.**
4. Analyze the Financial Statements of a Company.
5. Compare and interpret the Financial Statements of a Company using ratios.

UNIT –I

Introduction to Business and Economics: Types of Business Entities, Theory of Firm, Capital and Sources of Capital for a Company, Economics - Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Types of 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 one variable input, two variable inputs, Returns to Scale. Cost analysis: Types of Costs. Market Structures: Nature of Competition, Features of Perfect competition,Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and 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, and 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).

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. GeethikaGhosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e,Tata Mc Graw Hill 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.

PE-3: DEVOPS

IV YEAR B.Tech. AI&DS I Sem.	L	T	P	C
Course Code:A2275H0	3	0	0	3

Course Outcomes:

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

1. Understand the various components of DevOps environment.
2. Identify Software development models and architectures of DevOps
3. Use different project management and integration tools.
4. Select an appropriate testing tool and deployment model for project.
5. Understand the different testing & deployment tools.

UNIT-I

Introduction to DevOps: Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifyingbottlenecks.

UNIT-II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb,The separation of concerns, Handling database migrations, Micro servicesand the data tier, DevOps, architecture, and resilience.

UNIT-III

Introduction to project management: The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull requestmodel, GitLab.

UNIT-IV

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

UNIT-V

Testing Tools and Deployment: Various types of testing, Automation of testing Pros and cons, Selenium

- Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

TEXT BOOKS:

1. Joakim Verona., Practical DevOps, 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.

PE-3: FULL STACK DEVELOPMENT

IV YEAR B.Tech. AI&DS– I Sem.	L	T	P	C
Course Code: A2275G2	3	0	0	3

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

1. Design Front-End of the Full Stack Applications by using HTML and CSS.
2. Create dynamic web pages with the help of JavaScript and JQuery.
3. Design interactive User Interfaces with React JS and implement using Servlets
4. Implement Back-End programs using JSP and Spring framework.
5. Connect database with server-side applications using Hibernate.

UNIT - I
Building Blocks of Full Stack Development: Introduction, Front-End Technologies, Back-End Technologies, MVC, Web Services, Communication between Front-End and Back-End, JSON - Syntax, Parsing and Serialization.
HTML 5.0: Components of HTML, Text Formatting tags, Quotations, Links, Images, **CSS**: syntax, Box Model, CSS outline, Links in CSS, Responsiveness, Position Property, Navigation Bars, Dropdown, Forms.

UNIT - II
JavaScript: Introduction, variables, functions, Event handling, DOM, Form validation, **JQuery** - Syntax,Selectors, Events.
React: Introduction, Components - React Classes, Composing Components, passing data using Properties & Children, Dynamic Composition, React State - Initial State, Async State Initialization, Updating State, Event Handling, Stateless Components, Designing Components.

UNIT - III
More about React: React Router - Simple Routing, Route Parameters, Query Parameters, Links, NestedRoutes, React Forms - Controlled Components, Filters, Typed Input, Edit Form, Number Input, Date Input, Text Input, Update API, Delete API.
Servlet: Lifecycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, Connecting to database.

UNIT - IV
JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, implicit objects,Java Bean, Connecting to database.
Spring Framework: Introduction, Architecture, MVC, Interception, Chain of Resolvers, View Resolution, Multiple View Pages, Multiple Controllers, Model Interface, RequestParam, Form Tag Library, Form Text Field, CRUD example, File Upload, Validations.

UNIT - V
Hibernate: Introduction, Architecture, Installation and Configuration, Java Objects, Inheritance

Mapping, Collection Mapping, Mapping with Map, Hibernate Query Language, Caching, Spring Integration.

Web Services: Introduction, types of web services, Building RESTful Web Services with JAX-RS.

Text Books:

1. MAYURRAMGIR, FullStack Development with Spring MVC,Hibernate,jquery and BootStrap,WILEY Publications,2020.
2. Uttam K. Roy, Web Technologies, OXFORD University press, 2010.

References:

1. Matt Frisbie, Professional JavaScript for Web Developers, WILEY Publications, 2020.
2. Terry Ann Felke-Morris, Basics of Web Design, Pearson, Fifth Edition.
3. Alex Banks and Eve Porcello, Learning React, O'Reilly, 2017.

INTRODUCTION TO ROBOTICS

IV YEAR B.Tech. AI&DS – I Sem. **L T P C**
Course Code: A2275J0 **3 0 0 3**

Course outcomes: At the end of the course student would be able to

1. Understand the types of robot configurations and sensors
2. Apply the concepts of forces while designing the grippers
3. Understanding forward and inverse kinematics of robot manipulators
4. Understanding the role of machine vision in robots
5. Understanding how to programming a robot (Pick and place)

Unit - I

Introduction to Robotics: Definition, A brief history of Robotics.

Robot Anatomy: Serial Manipulator & Parallel Manipulator, Components of Industrial Robotics, Geometrical Configurations (Articulated(RRR), Spherical(RRP), SCARA(RRP), Cylindrical(RPP), Cartesian(PPP)) Motions, Joint Notations, Work volumes.

Controlled System & Chain Type: Precession of Movement - Resolution, Accuracy & Repeatability - Dynamic Characteristics - Speed of Motion, Load Carrying Capacity & Speed of Response

Unit - II

Sensors: Internal Sensors: Position Sensors & Velocity Sensors, External Sensors: Proximity Sensors, Tactile Sensors, & Force or Torque Sensors.

Unit - III

Grippers:

The Interface, Mechanical Gripper, Grasping Force, Engelberger-G-Factors-Mechanisms for Actuation, Magnetic Gripper, Vacuum-cup Gripper, Gripper Selection & Design.

Unit - IV

Kinematics:

Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H Transformation Matrix, Direct Kinematics for Industrial Robots.

Unit - V

Machine Vision: Introduction, Block diagram of functions of machine vision system, Image Storage, introduction to image processing and analysis.

Robot Programming: Lead through Programming Methods, Val commands with description, Def and Statements of AL and AML, Flowchart & Program for Pick-and-Place Activity,

Text Books:

1. Groover M P, “Industrial Robotics”, Mc Graw Hill
2. John J. Craig, “Introduction to Robotics”, Pearson

Reference Books:

1. Jazar, “Theory of Applied Robotics”, Springer
2. Ghosal, “Robotics”, Oxford

PE-3: COMPUTER VISION

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275H4	3	0	0	3

Course Outcomes:

1. Understanding Computer Vision and Image Processing Basics
2. Understanding the functionalities of different types of Cameras and Hence Lenses
3. Understanding Features Extraction of the image
4. Analysis of the Image Segmentation Techniques
5. Comprehension of Motion Analysis and shape of the object

UNIT – I

Introduction to Computer Vision:

Computer Imaging Systems, Digital Image Formation and Low-Level Processing, Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT – II

Depth Estimation and Multi-Camera Views :

Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D Reconstruction Framework; Auto-Calibration.

UNIT – III

Feature Extraction :

Edges - Canny, LOG, DOG; Line Detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and GaussianDerivative Filters, Gabor Filters and DWT.

UNIT – IV

Image Segmentation :

Region Growing, Edge Based Approaches to Segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object Detection

UNIT – V

Motion Analysis :

Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo;Motion parameter estimation.

Shape from X :

Light at Surfaces; Phong Model; Reflectance Map; Albedo Estimation; Photometric Stereo; Use ofSurface Smoothness Constraint; Shape from Texture, Colour, Motion and Edges.

TEXT BOOKS :

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer
2. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education

REFERENCE BOOKS :

1. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", SecondEdition, Cambridge University Press
2. K. Fukunaga, "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press,Morgan Kaufmann
3. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Addison- Wesley

PE-4: QUANTUM COMPUTING

IV YEAR B.Tech. AI&DS– I Sem.	**L**	**T**	**P**	**C**
Course Code: A2275G5	**3**	**0**	**0**	**3**

Course Outcomes:

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

1. Understand basics of quantum computing
2. Understand the background principles of quantum computing
3. Understand physical implementation of Qubit
4. Understand Quantum algorithms and their implementation
5. Understand the Impact of Quantum Computing on Cryptography

UNIT - I

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements.

Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Blochsphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT - V

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

TEXT BOOK:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci

2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information,Vol. I: Basic Concepts, Vol II.

3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to QuantumComputing Algorithms.

PE-4 AUGMENTED REALITY & VIRTUAL REALITY

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275J1	3	0	0	3

Course Outcomes:

1. Describe how AR systems work and list the applications of AR.
2. Understand the software architectures of AR.
3. Understand the Visual perception and rendering in VR
4. Understand the interaction, auditory perception and rendering in VR

UNIT - I

Introduction to Augmented Reality: Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Related fields

Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT - II

Computer Vision for Augmented Reality: Marker Tracking, Multiple-Camera Infrared Tracking,Natural Feature Tracking by Detection, Outdoor Tracking.

Interaction: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on RealSurfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

Software Architectures: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

UNIT - III

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology andPerception

The Geometry of Virtual Worlds: Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

UNIT - IV

The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color

Visual Rendering: Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT - V

Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics inthe Virtual World, Mismatched Motion and Vection

Interaction: Motor Programs and Remapping, Locomotion, Social Interaction

Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

TEXT BOOKS:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

REFERENCE BOOKS:

1. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
2. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
3. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija — Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

PE-4 WEB TECHNOLOGIES

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275H3	3	0	0	3

Course Outcomes:

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

1. Develop static and dynamic web pages using HTML and javascript.
2. Understand the XML tags and to parse XML data with java.
3. Develop web applications using server side programming with PHP.
4. Implement web applications using JDBC and Servlets.
5. Apply web applications with JSP.

UNIT –I:

Introduction to HTML: HTML tags, Lists, Tables, Images, Forms, Frames, Cascading Style Sheets
Client Side Scripting: Java Script Language Declaring variables, Scope of variables, Functions, Objectsin java scripts, Dynamic HTML with java scripts, Form Validation.

UNIT –II:

XML: Introduction to XML, Defining XML tags their attributes and values, Document Type Definition,XML Schema, Document Object Model, and XHTML.
Parsing XML Data: DOM and SAX Parsers in java.

UNIT –III:

Introduction to PHP:
Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc. Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. binary files listing directories.

UNIT –IV:

Introduction to Servlets: Common Gateway Interface (CGI), The Servlet API, Life cycle of a Servlet,

Deploying a Servlet, Reading Servlet parameters, Reading Initialization parameters, Handling HTTP Request & Responses, Using Cookies and Sessions,
Introduction to JDBC: JDBC Drivers, JDBC Process, Connecting to a Database using JDBC

UNIT –V:

Introduction to JSP: The Anatomy of a JSP Page, Introduction to MVC Architecture, JSP Processing, Declarations, Directives, Expressions, Code Snippets, Implicit Objects, Using Beans in JSP Pages, Using Cookies and Session for Session Tracking, Connecting to Database using JSP.

TEXT BOOKS

1. Programming the World Wide Web, 4th Edition by Robert W. Sebesta
2. Web Technologies, Uttam K Roy, Oxford University Press

REFERENCE BOOKS

1. Web Programming, Building Internet Applications , Chris Bates 2nd edition , Wiley Dreamtech
2. Java Script , D Flanagan, O'Reilly,SPD
3. Java Server Pages- Hans Bergsten , SPD O'Reilly

PE-4 NATURAL LANGUAGE PROCESSING

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275F5	3	0	0	3

Course Outcomes:

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Design, implement, and analyze NLP algorithms; and design different language modeling Techniques.
5. Understand the Language Models.

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

Sem.antic Parsing I: Introduction, Sem.antic Interpretation, System Paradigms, Word Sense

UNIT - IV

Sem.antic 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.

DEEP LEARNING LAB

IV YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code: A2275C6	**0**	**0**	**2**	**1**

Course Outcomes:

Upon the Successful Completion of the Course, the Students would be able to:

1. Learn The Fundamental Principles of Deep Learning.
2. Identify The Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
3. Implement Deep Learning Algorithms and Solve Real-world problems.

List of Programs:

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning
9. Case Study: Implement all deep learning pre-trained models (GooLeNet, VGGNet, AlexNet, ResNet, Xception) on any dataset and analyze the accuracy.

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

2. The Elements of Statistical Learning. Hastie, R. Tibshirani, J. Friedman, Springer.

3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCE BOOKS:

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

PE-3 LAB: DEVOPS LAB

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275D1	0	0	2	1

Course Outcomes:

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

1. Understand the need of DevOps tools
2. Understand the environment for a software application development
3. Apply different project management, integration and development tools. And able to 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, Wileypublications.

2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective.
AddisonWesley.

PE-3 LAB: FULL STACK DEVELOPMENT LAB

	L	T	P	C
IV YEAR B.Tech. AI&DS – I Sem.				
Course Code: A2275C8	**0**	**0**	**2**	**1**

Course Outcomes:

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

1. To gain the knowledge of various Front-End technologies.
2. To Design Front-End of the full stack applications.
3. To understand and develop Back-End applications to connect to database.

WEEK-1

1. a) Create a Web Page using HTML which contains a Heading, Image and 2 hyperlinks. Each hyperlinkopens a new page in the same web browser. New page contains "Go Back" link that takes you to the mainpage.

a) Write a HTML program to create a Registration form, which contains User Name, Password, Date of Birth, Gender, Mail-id, Contact number, Address and submit button.

WEEK-2

2. a) Create a web page to demonstrate Position Property in CSS.

b) Create a Newspaper Style Design to print minimum 2 articles using HTML and CSS.

WEEK-3

3. a) Write a JavaScript program to change the background color after clicking "change color" button.

b) Write a JavaScript program to validate registration page using regular expression.

WEEK-4

4. a) Write a code to hide and show an element in a periodic interval without any action from the user using JQuery.

b) Write a program to create and Build a star rating system using JQuery.

WEEK-5

5. a) Write a program to demonstrate ReactJS Class and Instance.

b) Write a program to create a basic calculator to perform arithmetic operations using ReactJS.

WEEK-6

6. . a) Demonstrate simple event handling example using ReactJS.

b) Write a program to create a simple voting application system using ReactJS.

WEEK-7

7. a) Create a webpage to display "Hello World" using SERVLET.

b) Implement a web application using SERVLET, which takes a name as input and on submitting it, shows a hello <name> page. It shows start time at the right top comer of the page and provides a logout button. On clicking logout button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).

WEEK-8

8. a) Write a JSP program to find a factorial of the given number.

b) Create a user validation web application using JSP, where the user submits the login name and password to the server. The name and password are checked against the data already available in database and if the data matches, a successfull login page is returned. Otherwise show a failure message to the user.

WEEK-9

9. a) Demonstrate a simple example of Spring web MVC framework.

b) Illustrate how database is connected in Spring Framework by using simple CRUD application.

WEEK-10

10. a) create a simple example of hibernate application using eclipse IDE.

b) Create an application to demonstrate Hibernate Query Language.

WEEK-11 and 12

CASE STUDY-1: Create a Chat module/Interface using HTML CSS and JavaScript. The chat interfaceprimarily consists of two segments: the message header and the chat box.

Message-Header- The message header resides at the top of the chat box. It includes the user's name,avatar or profile image, and the user's last seen. Last seen is the last time the user was active.

The Chat-Box- The chat box consists of the message page and the message bottom sections.

- Message page-The message page consists of incoming and outgoing messages, as well as the avatarsof the senders. It also displays the time at which each message is sent.
- The Message-Bottom-This section contains an input field where the user can type in the messages anda send button to send them.

INTRODUCTION TO ROBOTICS LAB

IV YEAR B.Tech. AI&DS – I Sem.	**L**	**T**	**P**	**C**
Course Code: A2275D2	**0**	**0**	**2**	**1**

Course Out comes:

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

1. Willbeabletodevelop3differentbasicautonomousrobotswhichareguidedusingsensors.
2. Able to create line follower Robot
3. Able to develop robot which can avoid/follow obstacles or light.

List of Experiments:

Week-1&2: Understanding Sensor Based Robot and robot making kits

1) Line Follower Robot
2) Phototropic/Obstacle Follower Robot
3) Photophobic/Obstacle Avoider Robot

Be thorough with Sensor Guided Robotic Kit and Arduino

- Arduino Uno
- Arduino USB Cable
- L293DMotorDriverCircuit
- DigitalIRSensors-2Nos.
- DCmotors-2Nos.
- WheelsforMotors-2Nos.
- CastorWheels-1No.
- Breadboard-1No.
- Chassis-1No.
- UClamps-2Nos.
- Wirestripper-1No.
- Screwdriver-1No.
- Connecting Wires & Other miscellaneous items
- Multi meter and Battery(6F229V) are required

Week–3&4: Graphical Programming for Beginners

- Programming Arduino through Blocks
- Arduino Programming

- Introduction to Arduino IDE
- Structure of Arduino Programming
- First program in Arduino: Blinking LED

Week-5: Sensing Light using IR Sensors

- **Learn**: Sensors-Types &Working
- **Learn**: Semi conductors
- **Learn**: Working of IR Sensors
- **Do**: Interface Digital IR sensor with Arduino & Read Data
- **Do**: Calibration of Digital IR Sensor
- **Do**: Design Scratch Program to Control LED using IR Sensor
- **Do**: Design Arduino Sketch to Control LED based on Line Detection
- **Do**: Design Arduino Sketch to Control LED based on Obstacle Detection

Week-6:Motors & Motor drivers in Arduino based Robots

- **Learn**: DC Motors &their Working
- **Learn**: Motors &Motor Drivers for the Arduino Robot
- **Do**: Interface & Test Motor with Arduino
- **Do**: Control Motorusing Arduino
- **Do**: Design Sketch to Control Motor

Week- 7: Arduino based Robots-Build your Robot

- **Learn**: Structural Design of a Robot
- **Do**: Assemble the Chassis of the Robot
- **Do**: Fixing the Wheels to the Robot Chassis
- **Do**: Final Chassis Assembly of the Robot
- **Do**: Mount Arduino on Chassis & Interface Motor Driver

Week- 8-9: Build a Movable robot

- **Learn**: Programming Logic for Robot Motion
- **Do**: Design Sketch to Move the Robot

Week-10 & 11: Real Time Face Detection Robot

- **Do**: : **Real Time Face Detection Robot** –Placement of Components & IR Sensors
- **Do**: : **Real Time Face Detection Robot** –Final Connections &Calibration
- **Do**: : **Real Time Face Detection Robot** –Test your Robot

- **Do**: : **Real Time Face Detection Robot** –Test your Robot with Arduino Sketch

Week-12-14: Simple & Smart Robotic Arm Using Arduino

- **Learn**: **Simple & Smart Robotic Arm** –Programming Logic
- **Do**: Design Arduino Sketch for **Simple & Smart Robotic Arm**
- **Do**: **Simple & Smart Robotic Arm** t-Test your Robot with Arduino Sketch

PE-3 LAB: COMPUTER VISION LAB

IV YEAR B.Tech. AI&DS – I Sem.	L	T	P	C
Course Code: A2275D0	0	0	2	1

Course Outcomes:

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

1. Learning basic techniques to handle images using python and OpenCV
2. Learning the techniques to load any images and handle them using python
3. Understanding how to use OpenCV to convert between color spaces and segment out ranges.

WEEK 1 & 2 :

- Installation of Python , OpenCV, Understanding the functionalities of OpenCV
- Importing an Image with OpenCV, NumPy and Matpltlib
- Convert the Image into RGB
- Convert the image into gray scale
- Plot the three channels of the image
- Transform the image into HSV and HLS models
- Drawing rectangle, lines, circle on Image
- Adding Text on Image

Week 3 & 4

Storing and Accessing many Images using Python (pickle) :

- Storing images on disk
- Storing images in lightning memory-mapped databases (LMDB)
- Storing images in hierarchical data format (HDF5)

Week 5 & 6

Image Segmentation Using Color Spaces in OpenCV + Python

- Color Spaces and Reading Images in OpenCV
- Visualizing Nemo in RGB Color Space
- Visualizing Nemo in HSV Color Space
- Picking Out a Range
- Using OpenCV to convert between color spaces and segment out ranges.

Week 7 & 8

- Face Detection in Python, OpenCV - Using a Webcam
- Face Recognition with Python

Week 9 & 10

- Handling Images with Tensorflow over CoLab

Week 11 & 12

- Converting normal Image to cartoon image using OpenCV & Python
- Line detection in python with OpenCV | Houghline method

TEXT BOOKS:

Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer
D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education

IV Year B.Tech. AI&DS - II Semester

S.No	Course Code	Course Title	L	T	P	C
1	A2285J6	E-Commerce	3	0	0	3
2	A2285J9	Software Testing Methodologies	3	0	0	3
3	A2285K1	Web And Social Media Analytics	3	0	0	3
4	A2285PS2	Project Stage – II including Seminar	0	0	22	9+2
Total			**9**	**0**	**22**	**20**

E – COMMERCE

IV YEAR B.Tech. AI&DS – II Sem.	L	T	P	C
Course Code:A2285J6	3	0	0	3

Course Outcomes:

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

1. Identify the anatomy of E-Commerce applications and its process models.
2. Categorize different electronic payment systems.
3. Examine Supply chain Management.
4. Analyze the various marketing strategies for an online business.
5. Design strategies for E-Commerce Catalogues.

UNIT-I

Electronic Commerce

Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications and E-Commerce organization applications, Consumer Oriented Electronic commerce, Mercantile Process models.

UNIT-II

Electronic Payment Systems

Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce EDI, EDI Implementation, Value added networks.

UNIT-III

Intra Organizational Commerce and work Flow, Automation, Customization, Internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing Information based marketing, advertising on Internet, on-line marketing process, market research.

UNIT-V

Consumer Search and Resource Discovery

Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktopvideo conferencing.

Text Book:

1. Frontiers of electronic commerce Kalakata, Whinston, Pearson Education, 2004.

References Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.

SOFTWARE TESTING METHODOLOGIES

IV YEAR B.Tech. AI&DS – II Sem.	L	T	P	C
Course Code:	3	0	0	3
A2285J9				

Course Outcomes:

1. Design and develop the best test strategies in accordance to the development model.
2. Distinguish characteristics of structural testing methods
3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible
4. Discuss about the functional and system testing methods
5. Demonstrate various issues for object oriented testing

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

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 or Win- runner).

Text Books:

1. Software Testing techniques, Baris Beizer, 2nd Edition, Dreamtech.
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.

WEB AND SOCIAL MEDIA ANALYTICS

IV YEAR B.Tech. AI&DS – II Sem.
Course Code: A2285K1

L	T	P	C
3	0	0	3

Course Outcomes:

1. Knowledge on decision support systems
2. Apply natural language processing concepts on text analytics
3. Understand sentiment analysis
4. Knowledge on search engine optimization and web analytics

UNIT - I

An Overview of Business Intelligence, Analytics, and Decision Support

Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics

UNIT - II

Text Analytics and Text Mining

Machine Versus Men on Jeopardy: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools

UNIT - III

Sentiment Analysis

Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics

UNIT - IV

Web Analytics, Web Mining

Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools

UNIT - V

Social Analytics and Social Network Analysis

Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics

Prescriptive Analytics - Optimization and Multi-Criteria Systems:

Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

TEXT BOOK:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education

REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence– Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.