

HYDERABAD INSTITUTE OF TECHNOLOGY AND MANAGEMENT						
B.TECH. HR-22 COURSE STRUCTURE						
CSE-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING						
(Applicable for the batch admitted from 2022-23 onwards)						
III-Semester (2 Year)						
S. No.	Course code	Course title	Hours Per Week			Credits
			L	T	P	
1	22BS3MT03	Statistical and Mathematical Foundations	3	1	0	4
2	22PC3CS05	Object Oriented Programming using Java*	3	1	2	5
3	22PC3CS02	Database Management Systems*	3	0	2	4
4	22PC3CM01	Introduction to Artificial Intelligence	3	0	0	3
5	22PC3CM02	Artificial Intelligence Lab	0	0	2	1
6	22PR3CM01	Evaluation of Internship-I	0	1	0	1
7	22PR3CM02	SSDC/Doing Engineering-1	0	1	2	2
		TOTAL	13	3	8	20
8	22AC3HS01	Universal Human Values	0	2	0	0
IV-Semester (2 Year)						
S. No.	Course code	Course title	Hours Per Week			Credits
			L	T	P	
1	22PC4CS03	Operating System	3	0	0	3
2	22PC4CS12	Web Technologies*	2	0	2	3
3	22PC4CS06	Design and Analysis of Algorithms*	3	0	2	4
4	22ES4CD03	Descriptive and inferential Statistics*	2	0	2	3
5	22PC5CD03	Data mining and Data Analytics*	2	0	4	4
6	22PC4CS04	Operating System-Lab	0	0	2	1
7	22BS4EG03	English for Employability	1	0	2	2
		TOTAL	13	0	14	20
8	22MC4HS06	Constitution of India	0	1	0	0

B. Tech II Year–I Sem

L T P C

Subject Code: 22BS3MT03

3 1 0 4

STATISTICAL AND MATHEMATICAL FOUNDATIONS

Pre-requisite: Basic knowledge of set and relations theory, permutations, combinations, Venn diagrams, measures of central tendency and dispersion.

Course Objectives: To provide the student with

- 1.The theory of Probability, Probability distributions of single and multiple random variables.
- 2.The sampling theory, point estimation and interval estimation.
- 3.Testing of hypothesis and making statistical inferences.
- 4.The Number Theory basic concepts useful for cryptography etc.

MODULE I

Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Addition Theorem Conditional Probability, Independence, Multiplications theorem and Bayes' theorem.

Random Variables: Discrete and Continuous random variable. Definitions of Probability Distributions, Probability Mass function, Probability Density function. Definitions of Mathematical expectation, Variance Moment generating function of Discrete and continuous random variables.

MODULE II

Discrete Probability Distributions: Binomial, Poisson distribution and statistical constants of these distributions using moment generating function.

Continuous Probability Distributions Uniform Distribution, Exponential Distribution and statistical constants of these distributions using moment generating function. Normal Distribution and its related applications.

MODULE III

Sampling Distribution: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means, variance and the Central Limit Theorem.

Estimation and Tests of Significance: Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Null & Alternative Hypothesis, Critical region, Type I and Type II errors, level of significance, one tail, two-tail tests. Prediction Intervals: Estimating a Mean and Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples. Tests of significance for large sample: test for single mean, difference of means, single proportion, difference of proportions.

MODULE IV

Bivariate Distribution: Joint Probability distributions - Joint Probability mass function, joint probability density function, Marginal Distribution, Covariance of two random variables.

Correlation and Regression: Karl Pearson coefficient of correlation, Rank correlation, Regression coefficient, Lines of regression.

MODULE V

Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers.

Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

Text Books:

1. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, 6th Edition, Elsevier, 2021
2. Probability and Statistics for Engineers, Richard A Johnson, 8th edition, Pearson Education, 2011.
3. Elementary number theory & its applications, Kenneth H. Rosen, 6th edition, Addison Wesley, ISBN 978 0-321-50031-1

Reference Books:

1. Charles M Grinstead, J Laurie Snell “Introduction to Probability”, American Mathematical Society.
2. Jay Devore, “Probability and Statistics for Engineering and the Sciences” Cengage learning.
3. S. C Gupta & V K Kapoor, “Fundamentals of Mathematical Statistics”, S Chand

MOOC courses:

1. Probability: <http://nptel.ac.in/courses/111105041/>
2. Probability and Statistics: <http://nptel.ac.in/courses/111105035/>
3. Probability: <https://nptel.ac.in/courses/111/102/111102111/>

E- Books:

1. Fundamentals of Mathematical Statistics (A Modern Approach), 10th Edition
<https://1lib.in/book/1196320/1672b>
2. Miller & Freund’s Probability and Statistics for Engineers <https://1lib.in/book/2883098/927b28>
3. Statistics and Probability for Engineering Applications with Microsoft Excel
<https://1lib.in/book/487476/b6daef>
4. Charles M Grinstead, J Laurie Snell “Introduction to Probability”, American Mathematical Society
<https://1lib.in/book/556778/1a0fc2>

Course Outcomes: After learning the contents of this paper the student must be able to

CO1: Compute probabilities using theorems in probability and probability distributions of single and multiple random variables.

CO2: Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.

CO3: Establish relationships between variables using correlation and regression

CO4: Apply the number theory concepts to cryptography domain.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 – Low

Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2			1							
CO2	3	2			1							
CO3	3	2			1							
CO4	3	2			1							

B. Tech II Year– I Sem
Subject Code: 22PC3CS05

L	T	P	C
3	1	2	5

Object Oriented Programming Using Java

Prerequisites: Programming in c.

Course Objectives:

1. Understand fundamental concepts and object oriented concepts in java
2. Implementing the concept of packages and exception handling in Java.
3. Implement the concept of multithreading and interprocess communication in java.
4. Develop GUI applications

Course Outcomes:

1. Solve the given problem using OOPS technique.
2. Explain the concept of Package and Exception Handling.
3. Implement Multi threading and Inter process communication in java
4. Develop GUI based applications using applet, awt, Event handling and swing

Module- I

History and Evolution of java: Java's lineage, Java and internet, Byte code, Java buzzwords, Evolution of java.

Object oriented programming - data, types, variables, Arrays, operators, control statements, type conversion and casting, Introduction to classes, objects, methods, constructor, this and static keywords, garbage collection, overloading methods, parameter passing, access control, Command line arguments, exploring String class

Inheritance: member access and inheritance, Multilevel Inheritance, super and final keywords, method overriding, dynamic method dispatch, abstract classes and methods.

Programs:

1. A. Develop a java Program to find the roots of Quadratic equation.
B. Develop a java Program to find the Fibonacci sequence.
2. A. Develop a java program to demonstrate the concept of method overloading.
B. Develop a java program to demonstrate the concept of method overriding.
3. A. Develop a java program to demonstrate the concept of multi level inheritance.
B. Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

Module- II

Packages and Interfaces: Defining, Creating and Accessing a Package, understanding CLASSPATH, importing packages, Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

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

Programs:

- 1.A. Develop a java program to demonstrate the significance of multiple catch.
B. Develop a java program to demonstrate throws clause.
2. Develop a Java program using packages to demonstrate access control modifiers.

Module- III

Multithreading: Differences between multi-threading and multi programming, thread life cycle, creating threads using thread class and Runnable interface, thread priorities, synchronization , interthread communication.

I/O Streams: Stream classes, Byte and character streams, File class, reading and writing files, reading and writing from console, serialization.

Programs:

1. Develop a Java program that implements a multithread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
2. Develop a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
- 3.A. Develop a java program that copies the content of one file to another.
B. Develop a java Program to accept data from keyboard & develop it into a file

Module- IV

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, creating applets, passing parameters to applets.

AWT: class hierarchy, user interface components- labels, buttons, scrollbars, text components, checkbox, checkbox groups, choices, lists panels – scroll pane, dialogs, menu bar, Layout Managers- Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

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

Programs:

- 1.A. Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.
B. Develop a java program for passing parameters to applets
2. Develop a Java program to demonstrate Mouse Listener, Mouse Motion Listener
3. Develop a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.

B. Tech II Year–III Sem
SubjectCode:22PC3CS02

L	T	P	C
3	0	2	4

Database Management Systems

Prerequisite: Basics of computer programming language, Data structures.

Course Objectives:

1. To enable students, define and describe basic concepts of Relational database managements and applications.
2. To provide students the theoretical concepts of data models and database design and normal forms.
3. To make students familiarize with relational model, relational algebra, transaction control and concurrency control.
4. To master the basics of SQL, PL/SQL and design queries.
5. To introduce storage structures and access techniques.

Course Outcomes:

1. Describe fundamentals of RDBMS, database design and normal forms.
2. Design SQL & PL/SQL for retrieval and management of data.
3. Understand basics of transaction processing and concurrency control.
4. Summarize database storage structures and access techniques.

Module- I

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

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Super key, candidate key, Participating constraints, Weak entity, Additional Features of the ER Model, Conceptual Design with the ER Model.

Programs:

1. E-R Model:

Analyze any problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc.

Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.

2. Concept Design with E-R Model

Relate the entities appropriately .Apply cardinalities for each relationship. Identify strong entities and weak entities (if any).Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc where ever required.

3. Installation of Mysql / SQL for practicing commands

Module- II

SQL: Introduction To SQL , Query Languages, Basic SQL Query. Introduction to views, destroying/altering tables and views. Joins.

Relational Algebra and Calculus: Selection and Projection, Set operations, Joins, Division, More examples on Algebra queries, Tuple relational Calculus, Domain Relational Calculus.

Programs:

1. Practicing DDL commands
2. Practicing DML commands
3. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
4. Views, joins.

Module- III

Advanced SQL: SQL Functions, Aggregate Operators, Group by & having clause, Sub queries, Nested Queries, triggers and active data bases, cursors, procedures.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, 1NF, 2NF, 3NF, 3.5NF, lossless join decomposition, multi-valued dependencies, 4NF & 5NF.

Programs:

1. Queries using Aggregate functions, Group by & Having.
2. Apply Normalization(1NF, 2NF, 3NF, 4NF & 5NF)
3. Triggers (Creation of insert trigger, delete trigger, update trigger)
4. Procedures
5. Usage of Cursors

Module -IV

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, 2PL, Serializability, Time stamp based protocol, validation based Protocol. Implementation of isolation, Multiple granularity,

Recoverability: Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, shadow paging.

Programs:

1. Practicing DCL commands
2. Practicing TCL commands

Module -V

Storage and Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing.

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees.

Programs:

1. Apply indexing methods (primary, secondary, hashing, spars & dense indexing)
Example: An organization contains several employees in each department. Suppose we use a clustering index, where all employees which belong to the same Dept_ID are considered within a single cluster, and index pointers point to the cluster as a whole. Here Dept_Id is a non-unique key.
2. Write PL/SQL program for B-tree
3. Write PL/SQL program for B+tress

Text Books:

1. Database Management Systems, Raghuram Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition, 2007.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6 th Edition, 2017.

B.Tech II Year – IV Sem

L T P C

Subject Code: 22PC3CM01

3 0 0 3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Objectives

1. To provide a strong foundation of fundamental concepts in artificial intelligence.
2. To provide a basic exposition to the goals and methods of Artificial intelligence
3. To provide the exposition to uncertainty management, decision making and learning methods.
4. To provide different knowledge representation, reasoning, and learning techniques.

Course Outcomes

1. Discuss basic concepts of Artificial Intelligence, AI principles, AI Task domains and application.
2. Apply searching techniques, constraint satisfaction problem and game playing techniques which involve perception, reasoning and learning.
3. Explain working of uncertainty management, decision making and learning methods.
4. Apply different knowledge representation, reasoning, and learning techniques to real world problems.

MODULE-I

Introduction: Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Problem Space and Search, Defining the Problem as a State Space Search, Problem Characteristics; Tic-Tac-Toe Problem, Production Systems.

Basic Search Techniques: Solving Problems by searching; Issues in The Design of Search Programs; Uniform search strategies; Breadth first search, depth first search, depth limited search, bidirectional search, Best First search, comparing search strategies in terms of complexity.

MODULE-II

Special Search Techniques: Heuristic Search, greedy best first search, A* search Problem Reduction, AO*Algorithm; Hill climbing search, Simulated Annealing search; Genetic Algorithm; Constraint Satisfaction Problems; Adversarial search, Games, Optimal decisions and strategies in games, Minimax search, Alpha, beta pruning.

Knowledge Representation: Procedural Vs Declarative Knowledge, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms.

MODULE-III

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification &Resolution, Representation Using Rules, Natural Deduction.

Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC.

MODULE-IV

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Model and Temporal Logics.

Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory.

Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.

MODULE-IV

Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.

Learning: Types of learning, general learning model, Learning by induction; generalization, specialization, example of inductive learner.

Text Book:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence, Elaine Rich and Knight, Mcgraw-Hill Publications

References:

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
2. Multi Agent systems- a modern approach to Distributed Artificial intelligence, Weiss. G, MIT Press.
3. Artificial Intelligence: A modern Approach, Russell and Norvig, Printice Hall

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low															
CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2	PSO3
CO-1		3										2	2		
CO-2	3												2		
CO-3		3										2	2		
CO-4	3											2	2		

B.Tech II Year – IV Sem

L T P C

Subject Code: 22PC3CM02

0 0 2 1

ARTIFICIAL INTELLIGENCE LAB

Course Objectives

1. To study the applications of AI and agent-based approach to AI.
2. To study first-order predicate calculus, logical reasoning and problem-solving techniques.
3. To study and discuss various techniques and algorithms of AI used in general problem solving, optimization problems, constraint satisfaction problems.
4. To familiarize students with various sub-areas of AI, such as expert systems.

Course Outcomes

1. Apply artificial intelligence and its characteristics into its application areas.
2. Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.
3. Apply appropriate algorithms and AI techniques to solve complex problems.
4. Design an expert system by using appropriate tools and techniques.

LIST OF PROGRAMS :

1. Implementation of DFS for water jug problem.
2. Implementation of BFS for tic-tac-toe problem.
3. Implementation of TSP using heuristic approach.
4. Implementation of Simulated Annealing Algorithm.
5. Implementation of Hill Climbing Algorithm.
6. Implementation of Hill-climbing to solve 8- Puzzle Problem.
7. Implementation of Towers of Hanoi Problem.
8. Implementation of A* Algorithm.
9. Implementation Expert System with forward chaining.
10. Implementation Expert System with backward chaining.

CO-PO/PSO Mapping Chart															
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low															
CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2	PSO3
CO-1			3										2		
CO-2				3									2		
CO-3				3									2		
CO-4			3		2								2		

Text Book:

1. Practical Workbook Artificial Intelligence and Soft Computing for beginners, Anindita Das Bhattacharjee, Shroff Publisher-X Team Publisher

References:

1. Artificial Intelligence, Elaine Rich and Knight, McGraw-Hill Publications
2. Artificial Intelligence: A modern Approach, Russell and Norvig, Prentice Hall

Universal Human Values (UHV)**Course Objectives:**

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they ‘really want to be’ in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome: On completion of this course, the students will be able to

CO1: Explore on the basic aspiration of Human being and its fulfilment

CO2: Distinguish the difference between the Self and the Body

CO3: Explore the value of harmony in family, society and nature

CO4: Understanding of gender related issues and gender relationship.

Module I

Self- Exploration on UHV Basic Guidelines: Content and Process for Value Education Understanding the need, basic guidelines, Self- Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration.

Continuous Happiness and Prosperity:A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity.

Module II

Understanding Harmony in the Human Being: Harmony in Myself Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’

Understanding Harmony in self: Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail

Module III

Understanding Harmony in the Family: Harmony and Values in Relationships in the Family- the basic unit of human interaction, Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas & Samman; Difference between intention and competence,

Understanding Harmony in the Society: Understanding the harmony in the society: Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing Undivided Society (Akhand Samaj), Universal Order (SarvabhaumVyawastha).

Module IV

Understanding Harmony in the Nature and Existence: Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

Understanding Harmony in the Existence: Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.

Module V

Exploring Attitudes towards gender: Understanding gender and Basic Gender Concepts/terminology- exploring attitude towards gender-construction of gender- socialization: Making Women, making Men.

Gender relationship and Culture: Gender roles and relationship matrix, sex selection and consequences, declining sex ratio, Gender Issues- Gender sensitive language, Just Relationships: Being together as equals.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Towards a World of Equals: a bilingual Textbook on Gender. A Suneetha, and others... Telugu Academy, Telangana Gov. 2015

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.

MOOC Course: NPTEL -Exploring Human Values: Visions of Happiness and Perfect Society - Web course

HR22

CO-PO MAPPING:

CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low												
Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1								3				
CO2								3				
CO3								3				
CO4								3				

B.TechIIYear–IVSem
Subject Code: 22PC3CS03

L	T	P	C
3	0	0	3

OPERATING SYSTEMS

Course Objective

1. To understand the components, operations of the operating system
2. To interpret the scheduling policies and memory management issues
3. To understand the process concurrency and synchronization
4. To understand the concept of file management

Course Outcomes:

At the end of the course student will be able to

1. Understand the structure of Operating System and its architecture
2. Apply the scheduling strategies for real time implementations
3. Illustrate synchronization problems, deadlock and its techniques
4. Apply Memory Management Techniques

Module I

Operating System Introduction: Operating System and Function, Evolution of Operating System, Type of Operating System: Batch, Interactive, Multiprocessing, Time Sharing and Real Time System, Operating System Components,

Operating System Structure: Monolithic, Layered, Micro-Kernel, Client-Server, Virtual Machine, Operating System Services: System calls, Shell commands, Shell programming, Examples of O.S, UNIX, Linux, MS-Windows, Handheld OS.

Module II

Evolution of Operating Systems - Simple Batch, Multi programmed, timeshared, 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.

Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; Process Control Block, Threads, Process *Scheduling-Scheduling Queues*, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria

Module III

CPU Scheduling- Scheduling algorithms, *Multiple-Processor Scheduling, Real-Time Scheduling*, Threads- Overview, Multithreading models, threading issues.

WEB TECHNOLOGIES

Course Objectives

1. To introduce students to the fundamental concepts of web development, including HTML, CSS, JavaScript, PHP, Servlets, and JSP.
2. To enable students to develop dynamic and interactive web applications using server-side scripting and database integration.
3. To familiarize students with web standards, protocols, and tools, such as HTTP, XML, DOM, and IDEs.
4. To provide students with hands-on experience in designing, coding, testing, and debugging web applications using industry-standard practices.

Course Outcomes

1. Discuss basic concepts of Artificial Intelligence, AI principles, AI Task domains and application.
2. Apply searching techniques, constraint satisfaction problem and game playing techniques which involve perception, reasoning and learning.
3. Explain working of uncertainty management, decision making and learning methods.
4. Apply different knowledge representation, reasoning, and learning techniques to real world problems.

MODULE-I

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

1. Create an HTML page with a form to collect user information and store it in an XML file.
2. Create an XHTML page that displays an XML file using DOM and displays its content in a tabular format.
3. Write a CSS program to style an HTML table, including its background, border, and font.

MODULE-II

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. on text and binary files, listing directories.

4. Create a PHP program to calculate the area of a rectangle using the values entered through a web form
5. Write a PHP program to upload a file to the server and display the uploaded file's content on the webpage.
6. Create a PHP program to list all the files in a directory and display their attributes.

MODULE-III

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle 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 a database using JDBC.

7. Develop a simple servlet program that displays a "Hello World" message on the webpage.
8. Write a servlet program that reads user input from a web form and stores it in a database.

MODULE-IV

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

9. Create a JSP page that displays a list of items from a database using JDBC.
10. Write a JSP program that reads user input from a web form, stores it in a database, and displays a confirmation message.

MODULE-IV

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation..

11. Write a JavaScript program that validates a web form by checking if all the required fields are filled.
12. Develop a JavaScript program that changes the background color of a webpage based on user input.

Text Book:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

References:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
2. Java Server Pages — Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson.

CO-PO/PSO Mapping Chart															
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low															
CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO-1		3										2	2		
CO-2	3												2		
CO-3		3										2	2		
CO-4	3											2	2		

Design and Analysis of Algorithms

Prerequisites:

Data Structure, Discrete Mathematics

Course Objectives

1. To analyze the performance of algorithms.
2. To choose the appropriate data structure & algorithm design method for specific application
3. To understand how the choice of data structure & algorithm design method impact the performance of program
4. To design efficient algorithms for different problems

Course Outcomes:

At the end of the Course the Students will be able to

1. Describe computational solution to well-known problems like searching, sorting etc
2. Estimate the computational complexity of different algorithms.
3. Apply different designing methods for development of algorithms to realistic problems through greedy, dynamic programming, back tracking.
4. Devise an algorithm using appropriate design strategies for problem solving

Module - 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, Probabilistic analysis, Amortized Complexity.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication

Programs:

1. Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2. Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator

Module -II

Searching and Traversal Techniques: Efficient non-recursive binary tree traversal algorithms, disjoint set operations, union and find algorithms, spanning trees, Graph traversals-Breadth First Search and Depth First Search ,AND/OR Graphs, game tree, connected components and biconnected components.

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Programs:

1. Write a program, from a given vertex in a weighted connected graph, find shortest
 - i. paths to other vertices using Dijkstra's algorithm.
2. Write a C program to implement the Stack using arrays. Write Push(), Pop(), and
 - i. Display() methods to demonstrate its working.

Module – III

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees: Single source shortest path problem.

Programs:

1. Design and implement in Java to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.
2. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm

Module – IV

Dynamic Programming: General method, applications- 0/1 knapsack problem, All pairs shortest path problem: Travelling sales person problem, Reliability design

Programs:

1. Implement a C Program to implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
2. Write C programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm. (b) Implement Travelling Sales Person problem using Dynamic programming

Module – V

Branch and Bound:

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

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, NP-hard problems.

Programs

1. Design an algorithm and implement a program to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution.

Text Books:

1. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Satraj Sahni and S. Rajasekharam, Universities Press, 2008.
2. Foundations of Algorithms, 4th edition, R. Neapolitan and K. Naimipour, Jones and Barlett Learning.

Reference Books:

1. Introduction to Algorithms, third edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd./ Pearson Education.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley
3. Introduction to the Design and Analysis of Algorithms, A. Levitin, Pearson Education.
4. Design and Analysis of Algorithms, Aho, Ullman and Hopcroft, Pearson Education, 200

CO-PO/PSO Mapping:

Cos	POs												PSOs		
	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	O	O	O	O	O	O	O	O	O	O	O	O	S	S	S
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1				3	2								3	3	
CO2				1	2								3	3	
CO3				3	2								3	3	
CO4				3	2								3	3	

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B. Tech II Year–III Sem
Subject Code: 22PC3CS17

L	T	P	C
0	0	2	1

Operating Systems Lab

Prerequisites:

A course on “Programming for Problem Solving”.

A course on “Computer Organization and Architecture”.

Course Objectives:

1. To provide an understanding of the design aspects of operating system concepts through Simulation.
2. Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix.

Course Outcomes:

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

List of Experiments

1. Write C programs to simulate the following CPU Scheduling algorithms
 - a) FCFS
 - b) SJF
 - Round Robin
 - d) priority
2. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
3. Write a C program to implement the Producer – Consumer problem using semaphores.
4. Write a C program to simulate the concept of Dining-philosophers problem.
5. Write C programs to simulate the following memory management techniques
 - a) Paging
 - b) Segmentation
6. Write C programs to illustrate the following IPC mechanisms
 - a) Pipes
 - b) FIFOs
 - c) Message Queues
 - d) Shared Memory
7. Write a C program to simulate the following contiguous memory allocation Techniques
 - a) Worst fit
 - b) Best fit
 - c) First fit

HR22

B. Tech II Year–II Sem

L T P C

Subject Code: 22ES4CD03

2 0 2 3

Descriptive and Inferential Statistics

Pre-requisite:

Course Objectives: To provide the student with

MODULE I

Introduction to Statistics: Definition, Descriptive statistics, Inferential statistics, Data collection, population and samples, Types of data: qualitative and quantitative data, measurement scale, Describing Categorical data.

MODULE II

Data Visualization: Frequency tables, line graphs, bar graphs, frequency polygons, relative frequency graphs, pie charts, grouped data and histograms, scatter and profile plots

MODULE III

Descriptive Statistics: Measures of central tendency: Mean median and Mode. Measures of dispersion: Range, variance, standard deviation, percentiles, quartiles, interquartile range.

MODULE IV

Bi Variate data:

Relative frequencies, association between bivariate, covariance, correlation, descriptive methods in regression: fitting a straight line and second-degree polynomial by least square methods.

MODULE V

Hypothesis Testing:

Tests of Significance (Large Samples): test for single mean, difference of means, single proportion, difference of proportions.

Tests Of Significance (Small Samples): t-Test for single mean, difference of means, paired t-test, F-test, Chi-square test for goodness of fit and independence of attributes.

Text Books:

1. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, 6th Edition, Elsevier, 2021
2. Probability and Statistics for Engineers, Richard A Johnson, 8th edition, Pearson Education, 2011.

Reference Books:

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B.Tech

Subject Code: 22PC5CD03

L	T	P	C
3	0	0	3

Data Mining and Data Analytics

Course Objective

1. Understand the concepts of Data Mining
2. Familiarize with association rule mining
3. Familiarize various classification algorithms
4. Understand the concepts of Cluster analysis
5. Implement the Data mining concepts with various domains

Course Outcomes:

1. Discuss various Data Mining Principles.
2. Analyze the impact of data analytics for business decisions and strategy.
3. Apply the Association, Clustering rules for mining the data.
4. Design various classification techniques.

Module I

Introduction to Data warehouse, Difference between operational database systems and data warehouses. Data warehouse Characteristics, Data warehouse Architecture.

Introduction: What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity – Basics.

Module II

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

Module III

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

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

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B.Tech II Year II Sem
Subject Code: 22BS4EG03

L	T	P	C
1	0	2	2

English for Employability

Course Objectives:

1. To improve the communication skills, body language, facial expression and gesture.
2. To be able to understand the concept of employability skills (Quantum dexterity) and enhancing ones' behavior in the personal, professional and social forum.
3. To evaluate the LSRW (listening, speaking, reading and writing) through assessment.
4. To learn the basic grammar for improving spoken and written communication.
5. To become problem solver, analyze and apply critical and analytical skills.
6. To Identify the Employability skills, assigning tasks (Group Discussion, JAM, Role play etc.,) for day today evaluation.

Course Outcomes: After undergoing this course, the student will be able to;

1. **Understand** the explicit and implicit of importance of employability skills.
2. **Demonstrate** life skills like team work, learning skills, problem solving, attitude, adaptability and flexibility.
3. **Apply** critical and analytical skills to bring out the solution on problem/case study.
4. **Recognize** the need of appropriate words, Phrases & functional grammar and apply them in both spoken and written communication.

Module I: Wings of Fire

“Orientation” an extract from **Wings of fire**-An Autobiography of Abdul Kalam by Arun Tiwari.

Grammar

Vocabulary- Omission of Articles, Collective Nouns, Prepositions, Collocations.

Reading- Observation Passage, Survey Passage

Writing-Narrative & Descriptive writing.

Module II : 5 Points Someone

The Gift an extract from **5 Points Someone** by Chetan Bhagat

Grammar -

Vocabulary- Advanced Collocations, Proverbs, Idioms, One word Substitute

Reading – Complex passage, Reading Comparison,

Writing- Usage of Idioms and Proverbs in Passage

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Module III: Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose

“Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose” an extract from **From Smart to Wise: Acting and Leading with Wisdom** Kaipa, Prasad, and Navi Radjou.

Grammar

Vocabulary- Technical vocabulary, Auxiliaries and Modals,

Reading- Technical Comprehension,

Writing- Creative Resume.

Module IV: Variation Under Nature

“Variation Under Nature” an extract from **Origin of Species** by Charles Darwin

Grammar

Vocabulary- Coherence-Cohesive devices, Figures of speech

Writing- Story writing, Picture composition, Review of movie/match/book.

Reading- Inferring Reading, Reciting and Reviewing (SQ3R)

Module V: Let's Build a Company: A Start-up Story Minus the Bullshit

Let's Build a Company: A Start-up Story Minus the Bullshit by Harpreet Grover and Vibhore Goyal

Grammar

Vocabulary- Topic/Situation based Vocabulary, Tongue Twisters.

Reading- Critical Reading of known/unknown passages

Writing- Common Errors in Tenses, Description of hobbies, Future plans,

Reporting Speech: Direct & Indirect Speech, Email Writing, Formal letter writing (Enquiry, Apology, Leave, Request) Notice Writing, Information Transfer, Technical report writing

ACTIVITY IN LABS

Activity 1:

Narration (Historical places, events, Picture narration, Memorable incidents of life)

Self Intro, Daily Routine, Likes & Dislikes, Vocabulary, Triangular Activity (Person based- S-P), Imperatives & JAM

Targeted Skills- Listening- Speaking- Audio-Video clips

Activity 2: Quantum of Dexterity (QOD)

Ability (Personal, Behavioural & Professional) Request/Permission/Order, Survival kit, Career Objective Professional, Hidden Talents (Personal), Character Traits (Behavioural)

Targeted Skills- Reading-Writing – Concluding an open-ended Story, Creative Writing.

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Activity 3: Critical & Analytical Skills

SWOC- (Social & Cultural, Political, Economic, Legal Impact, Technical, Nuances of Pronunciation, Voice Modulation, Neutralizing Mother Tongue Interference, Tongue Twisters for practice,

Targeted Skills- Writing SWOC, Self-Introduction, Exposure to a structured talk.

Activity 4: Flick Flow/Extempore

Mind Mapping, Wh- questions, Steps of Presentation, Use of Visual Aids, Individual/Group Presentation for practice.

Targeted Skills- Speaking Skills

Activity 5: On Job Training

Formal & Informal communication, Resume E-mail Etiquette, Telephonic & Interview Etiquette, Situation based- Santa's Bag, topic/case study-based Group Discussion, Kicks me! (Job Consultancy/Role Play)

Targeted Skills- Listening-Writing- Speaking

Text Books

1. Azad, Abdul Kalam, Wings of Fire. Generic pub. 2009.
2. Kaipa, Prasad, and Navi Radjou. *From Smart to Wise: Acting and Leading with Wisdom*. Jossey-Bass, 2013.
3. Grover, Harpreet S., and Vibhore Goyal. *Let's Build a Company: A Start-up Story Minus the Bullshit*. Penguin Books, 2020.
4. Wren & Martin High School English Grammar & Composition. New Delhi: S. Chand. 1999.

References

1. Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.
2. Writing Skills Practice Book for EFL - English Teaching Forum Writing Skills Practice Book for EFL. Beginning/Intermediate Level.
3. Patricia Wilcox Peterson. Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.
4. Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
5. Murphy, R. *Intermediate English Grammar* English Grammar & Composition by S.C. Gupta. New Delhi: Cambridge, 2006

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CO-PO MAPPING:

CO-PO Mapping Chart												
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low												
Course Outcome s (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1									2			
CO2									2	2		
CO3		3								3		
CO4										3		3

Constitution of India

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368; however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States

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8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21