Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus

Scheme and Detailed Syllabus

of

Second Year B.Tech(DJS22)

in

Artificial Intelligence and Machine Learning

(Semester IV)

Academic Year 2023-24

Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)

Proposed scheme for Second Year B.Tech Program for Department of Artificial Intelligence and Machine Learning

Semester IV

(Academic Year 2023-2024)

Sr No	Course Code	Course	Teaching Scheme (hrs)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					Aggregate (A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th	O	P	O & P	Total SEA (B)		
1	DJS22AMC401	Statistics for Engineers	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22AML401	Statistics for Engineers Laboratory	--	2	--	1	--	25	25	--	--	--	--	--	25	
2	DJS22AMC402	Artificial Intelligence	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22AML402	Artificial Intelligence Laboratory	--	2	--	1	--	25	25	--	--	--	25	25	50	
3	DJS22AMC403	Data Mining and Analytics	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22AML403	Data Mining and Analytics Laboratory	--	2	--	1	--	25	25	--	--	--	25	25	50	
4	DJS22AMC404	Design and Analysis of Algorithms	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22AML404	Design and Analysis of Algorithms Laboratory	--	2	--	1	--	25	25	--	--	--	25	25	50	
5	DJS22AML405	Programming Laboratory-II (Web Development)	--	4	--	2	--	25	25	--	--	--	25	25	50	2
6	DJS22AML406	Design Thinking Laboratory	--	4	--	2	-	25	25	-	25	--	-	25	50	2
7	DJS22A2	Constitution of India	1	--	--	--	-	-	--	--	--	--	--	--	--	--
8	DJS22ILLA2	Innovative Product Development II	--	2	-	-	-	-	--	--	--	--	--	--	--	--
Total			13	18	0	20	140	150	290	260	25	--	100	385	675	20

Th	Theory	T/W	Termwork
P	Practical	O	Oral
T	Tutorial		

Prepared by

Dr. Nilesh R.

Checked by

Head of the Department

Principal

Evaluation scheme:

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (hrs.)
Theory	One Term test (based on 40 % syllabus)	35	1
	Second Term test (next 40 % syllabus) / presentation / assignment / course project / group discussion / any other.		as applicable
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	25	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Semester End Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	65	3
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	as applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	as per the scheme	2

Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester: IV
Course: Statistics for Engineers (DJS22AMC401)		
Course: Statistics for Engineers Laboratory (DJS22AML401)		

Prerequisite:

1. Calculus
2. Descriptive Statistics
3. Basics of probability

Course Objectives:
To build a strong foundation in statistics which can be applied to analyze data and make predictions.

Course Outcomes: On completion of the course, learner will be able to:

1. Apply the concepts of probability and distributions to some case studies.
2. Interpret and predict the basic statistical model for given data using simple linear regression.
3. Demonstrate sampling distributions and estimate statistical parameters.
4. Develop hypothesis based on data and perform testing using various statistical techniques.
5. Perform analysis of variance on data.
6. Apply the concept of Markov Process.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence. **Discrete Probability Distributions:** Binomial Distribution, Poisson distribution. **Continuous Probability Distributions**: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial.	8
2	**Simple Linear Regression and Correlation:** Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study.	5
3	**Sampling distribution**: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central limit theorem, population distribution, Z - distribution, Student's t-distribution, F-Distribution, Chi-square distribution.	4
4	**Statistical Estimation and Test of Hypothesis:** **Estimation Theory**: Characteristics of estimators, consistency, unbiasedness, unbiased estimates, efficient estimates, sufficient estimators, point estimates, interval estimates, determination of sample size for estimating mean and proportions, estimates of population parameters, probable error. **Confidence interval**: Population mean, difference between two population means, population proportion, difference between two population proportions, variance, ratio of variances of two populations. **Test of Hypothesis**: Test of significance, null and alternative hypothesis, type I and type II error, factors affecting Type II error, probability of Type II error, power of test, p Value, critical region, level of significance. **Parametric Test:** Test the difference between sample proportion and population proportion, difference between two sample proportion, difference between sample mean and population mean with known σ and unknown σ, difference between two sample means, one tailed and two tailed tests using z-statistics and t-statistics. Test the equality of population variance using F-statistics.	11

	Non-parametric Test: Test of independence, goodness of fit using chi-square statistics.	
5	**Analysis of Variance (ANOVA) for data analysis:** Sample size calculation, one way ANOVA, POST-HOC Analysis (Tukey's Test), randomized block design, two-way ANOVA.	5
6	**Stochastic Processes and Markov Chains:** Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n step transition probabilities, Markov chain, Steady state condition, Markov analysis.	6
		39

Books Recommended:

Text books:

1. Statistical Methods, S. P. Gupta, Sultan Chand, 2021, 46th revised edition.
2. Probability - Statistics and Random Processes by T. Veerarajan, McGraw Hill Education. 3rd edition, 2017.
3. Think Stats: Probability and Statistics for Programmers, Allen B. Downey, Green Tea Press, 2011.
4. Testing Statistical Hypotheses, E. L. Lehmann, Joseph P. Romano, Springer, 2008, third edition.
5. An Introduction to Statistics with Python, Thomas Hasalwanter, Springer, 2016.

Reference Books:

1. Fundamentals of mathematical statistics, S. C. Gupta, V. K. Kapoor, Sultan Chand, 2020. 12th edition.
2. Practical Statistics for data scientists 50+ Essential Concepts Using R and Python, Peter Bruce, Andrew Bruce,Peter Gedeck, Orelly, second edition, 2020.
3. Statistics, Freedman, David, Robert Pisani, Roger Pervis, W. W. Norton, 2007.
4. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M Ross, Elsevier, fifth edition, 2014.

List of Laboratory Experiments: (Minimum any eight using Python)	
Sr. No.	**Suggested Experiments**
1	To perform descriptive statistics on data.
2	To visualize descriptive statistics on data.
3	To calculate probability using probability distribution.
4	To perform correlation and simple regression analysis on given data.
5	To verify central limit theorem.
6	To study sampling distributions and their parameters.
7	To perform statistical estimation tests on data.
8	To calculate confidence interval for different parameters.
9	To perform hypothesis test using Z statistics and t statistics.
10	To perform hypothesis test using F statistics.
11	To perform hypothesis test using Chi square.
12	To perform ANOVA on given data.
13	To perform POST-HOC Analysis (Tukey's Test) on given data.
14	To perform Markov Analysis on given data.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Prepared by

Checked by

Head of the Department

Principal

Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester: IV
Course: Artificial Intelligence (DJS22AMC402)		
Course: Artificial Intelligence Laboratory (DJS22AML402)		

Pre-requisite: --

1. Basic knowledge of any programming language

Objectives:

1. To expose the student to the fundamental concepts of Artificial Intelligence and Machine Learning with its applications

Outcomes: On completion of the course, the learner will be able to:

1. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2. Understanding about the basic concepts of Intelligent agent's ad representation of knowledge
3. Demonstrate awareness and a fundamental understanding of various applications of AI techniques.
4. Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Introduction to Artificial Intelligence:** Introduction to AI, Components of AI, AI Problems and AI Techniques, solving problems by searching, Problem Formulation, State Space Representation, Applications of AI. Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent	07
2	**Problem solving:** Solving problems by Searching: Problem Solving Agent, Formulating Problems, Example Problems. Search Methods: Uninformed search: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods: Greedy best first Search, A* Search, Memory bounded heuristic Search.	07
3	**Local Search Algorithms and Optimization Problems:** Hill climbing search, Simulated annealing, Local beam search, Genetic algorithms, Ant Colony Optimization. Adversarial Search: Games, Optimal strategies, The minimax algorithm, Alpha-Beta Pruning.	07
4	**Knowledge Representation and Reasoning:** A Knowledge Based Agent, Knowledge representation technique: Logical Representation, Semantic Network Representation Frame Representation, Production Rules. Overview of Propositional Logic, First Order Predicate Logic, Inference in First Order Predicate Logic: Forward and Backward Chaining, Resolution.	07
5	**Uncertain Knowledge and Reasoning:** Acting under uncertainty, - Conditional Independence, Bayes Rule, Naïve Bayes Classifier, Bayesian Belief network, Inference in Bayesian Belief network, making decision in Complex environments, Markov decision processes.	06
6	**Planning:** Domain independent planning, Forward and Backward search, Goal Stack Planning, Plan Space Planning, Means Ends Analysis, Graph plan, algorithmAO*.	05
	Total	39

Books Recommended

Textbooks:

1. ARTIFICIAL INTELLIGENCE: A MODERN APPROACH, 4TH EDITION, Russell/Norvig, 2022
2. Artificial intelligence a modern approach, Mikan Ltd ISBN- No 978-1914063183, 2020.
3. Deepak Khemani." A First Course in Artificial Intelligence", McGraw Hill Education (India), 2013.

Reference Books:

1. Artificial Intelligence, Ela Kumar, Dreamtech Press. Ltd, 2020.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition, 2017
3. Gerhard Welss, - Multi Agents Systems, Publisher , MIT Press, Second Edition, 2013.
4. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009
5. M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and BartlettPublishers Inc.; First Edition, 2008.

Online References:

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview

Artificial Intelligence Laboratory (DJS22AML402)	
Sr. No	**Suggested Experiments**
1	Tutorial exercise for a. Design of Intelligent System using PEAS. b. Problem Definition with State Space Representation
2	Identify and analyze uninformed search Algorithm to solve the problem. Implement BFS/DFS/DFID search algorithms to reach goal state.
3	Program to implement Local Search algorithm: Hill climbing search.
4	Implement A* search algorithm to reach goal state.
5	Implement minimax algorithm for a two-player game
6	Program on any nature inspired algorithm to solve a optimization problem in AI
7	Program on Genetic Algorithm to solve a optimization problem in AI.
8	Implement examples of Predicate Logic, for forward and backward reasoning and resolution
9	Identify, analyze, implement a planning problem/Rule based Expert System in a real-worldscenario.
10	Implementation on any AI Problem: Tic-tac-toe, 8-Queens Problem
11	A literature survey on any Intelligent system based on IEEE/Scopus-Indexed Publication)

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Prepared by Checked by Head of the Department Principal

Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester: IV
Course: Data Mining and Analytics (DJS22AMC403)		
Course: Data Mining and Analytics Laboratory (DJS22AML403)		

Prerequisite: Knowledge of basic probability and statistics

Course Objectives:

1. To understand the significance of data preprocessing, EDA, and feature selection in machine learning.
2. To acquire the knowledge and skills needed to prepare, clean, and transform data.
3. To introduce students to the fundamental concepts and terminology of machine learning.

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

1. Apply data preprocessing techniques to clean and prepare datasets for machine learning.
2. Conduct exploratory data analysis to understand data distributions, relationships, and outliers.
3. Effectively use graphical representations to visualize data and communicate insights.
4. Implement dimensionality reduction techniques to manage and analyze high-dimensional data.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Review of Probability**: Populations and samples, Parameters describing distributions, Central tendency: mean, median and mode, Spread: variance and standard deviation, Skewness and kurtosis, Covariance and Correlation, sampling distributions, Central limit theorem **Data Preprocessing:** Data Quality, Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process. Data Integration: The Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Detection and Resolution of Data Value Conflicts Data Transformation and Data Discretization: Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis	7
2	**Introduction to visualization:** Quantitative vs. Qualitative data, Types of Quantitative data: Continuous data, Discrete data, Types of Qualitative data: Categorical data, Binary data, Ordinary data, plotting data using Bar graph, Pie chart, Histogram, Stem and Leaf plot, Dot plot, Scatter plot, box plot, Time-series graph, Exponential graph, Frequency distribution graph, Quantile Plots.	6
3	**Exploratory Data Analysis (EDA):** Introduction to exploratory data analysis, Typical data formats. Types of EDA, Graphical/Non graphical Methods, Univariate/multivariatemethods Correlation and covariance, Degree of freedom, Density plots and estimates Data Visualization (Matplotlib, Seaborn), Identifying Outliers and Anomalies	7
4	**Mining Frequent Patterns:** Market Basket Analysis – Apriori Algorithm – Mining Frequent Itemsets without Candidate Generation –	9

	Mining Frequent Itemsets Using Vertical Data Format – Mining Closed Frequent Itemsets – Mining Multilevel Association Rules – Mining Multidimensional Association Rules – Correlation Analysis –Constraint-Based Association Mining **Spatial and Web Mining:** Spatial Data, Spatial Vs. Classical Data Mining, Spatial Data Structures, Mining Spatial Association and Co-location Patterns, Spatial Clustering Techniques: CLARANS Extension, Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining, Applications of Web Mining	
5	**Introduction to Tableau:** Features of Tableau, Installation of Tableau Desktop/Public, Interface of Tableau (Layout, Toolbars, Data pane, Analytics pane etc), connecting to the various file type, Tableau Charts, Tableau Calculations & Filters, Joins in Tableau, Tableau Advanced Reports, Dashboard Design	7
6	**Introduction to Machine Learning:** Machine Learning, Types of Machine Learning, Issues in Machine Learning, Application of Machine Learning, Steps in developing a Machine Learning Application.	3
	Total	**39**

Books Recommended:

Text books:

1. Practical Statistics for Data Scientists, 2edition by Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly Publisher, 2020.
2. Experimental Design and Analysis by Howard J. Seltman, July 11, 2018
3. Tom Mittchell —Machine Learning McGraw Hill,2017.

Reference Books:

1. Data Mining for Business Analytics, (An Indian Adaptation): Concepts, Techniques and Applications in Python, Cambridge University Press, ISBN NO. 978-1108727747, 2019.
2. Andreas C. Müller and Sarah Guido- Introduction to Machine Learning with Python: A Guide for Data Scientists, O'reilly,2016
3. Stephen Marsland, —Machine Learning an Algorithmic Perspective CRC Press, 2015
4. Han Kamber, —Data Mining Concepts & Techniques, Morgann Kaufmann Publishers, 2012.
5. Kevin P. Murphy, Machine Learning — A Probabilistic Perspective, 2012.

Web Links:

https://onlinecourses.nptel.ac.in/noc21_cs06/preview
https://www.datacamp.com/tutorial/tableau-tutorial-for-beginners
https://www.kaggle.com/code/ekami66/detailed-exploratory-data-analysis-with-python

Data Preprocessing and EDA Laboratory (DJS22AML403)	
Sr. No	**Suggested Experiments**
1	**Data preparation using NumPy and Pandas** Collect data from a specific source (e.g., CSV file, API, database) and inspect its structure. Generate summary statistics for a given dataset, including mean, median, standard deviation, and quartiles for numerical columns.
2	**Data Preprocessing with pandas** Identify the presence of missing values in a dataset and choose an appropriate method for handling them (e.g., removal, imputation). Remove duplicate records from a dataset and assess the impact on data quality.
3	**Handling Categorical Data: One-Hot Encoding** Implement one-hot encoding using Pandas to convert categorical variables into a format suitable for modelling.
4	**Data Transformation and Data Discretization** Do the following for the any field. i. Standardize the variable. ii. Identify how many outliers there are and identify the most extreme outlier. Data Modelling a. Partition the data set, for example 75% of the records are included in the training data set and 25% are included in the test data set
5	**Outlier detection** Obtain a listing of all records that are outliers according to the any field. Print out a listing of the 10 largest values for that field. Outlier detection with BoxPLot
6	Data Visualization using matplotlib
7	**Implement association rule mining**
8	**Perform Web Mining Analysis**
9	**Tableau installation and basic data analysis with charts and filters**
10	**Design interactive dashboard using tableau**

Prepared by

Checked by Rajiv Mishra

Head of the Department

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Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester: IV
Course: Design and Analysis of Algorithms (DJS22AMC404)		
Course: Design and Analysis of Algorithms Laboratory (DJS22AML404)		

Pre-requisite: Computer Programming, Data structures

Course Objectives:

1. The course's objective is to introduce important algorithmic design paradigms and approaches for effectiveproblem solving.
2. To analyze the algorithm for its efficiency to show its effectiveness over the others.
3. In addition, the concepts of tractable and intractable problems and the classes P, NP and NP-completeproblems will be introduced.

Course Outcomes: On successful completion of this course, student should be able to:

1. Analyze the performance of algorithms using asymptotic analysis.
2. Solve the problem using appropriate algorithmic design techniques.
3. Able to prove that certain problems are NP-Complete.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Introduction:** Introduction to Asymptotic Analysis, Analysis of control statements and loops, solving recurrence relations using tree, substitution, master method, analysis of quick sort and merge sort. Problem Solving using divide and conquer algorithm - Max-Min problem, Strassen's Matrix Multiplication.	08
2	**Greedy Method:** Introduction, control abstraction, Problem solving using - fractional knapsack problem, activity selection problem, job sequencing with deadline, find and union, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Single source shortest path (Dijkstra's algorithm), coin change problem.	07
3	**Dynamic Programming:** Introduction, principle of optimality, Components of dynamic programming, characteristics of dynamic programming, Fibonacci problem, Coin Changing problem, 0/1 knapsack (table and set method), Multistage graphs, All pairs shortest paths (Floyd Warshall Algorithm), Single source shortest path (Bellman- Ford Algorithm), Matrix Chain Multiplication, Optimal binary search tree (OBST- successful and unsuccessful search), Travelling salesperson problem, Johnson' algorithm for Flow shop scheduling, Longest Common Subsequence (LCS), analysis of all algorithms.	10
4	**Backtracking:** Introduction, Basics of backtracking, N–queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles Generating permutation, Analysis of all algorithms **Branch-and-Bound:** Introduction, Control abstraction-LC BB, FIFO BB, LIFO BB, Properties, FIFO BB, LIFO BB, LC BB, Fifteen Puzzle problem, 0/1 Knapsack problem, Travelling Salesman problem, Job Sequencing with Deadline	07

5	**String Matching Algorithms:** Introduction, The naive string-matching algorithm, The Rabin Karp algorithm, String matching with finite automata, The Knuth Morris Pratt algorithm	**03**
6	**Basics of Computational Complexity:** Complexity classes: The class P and NP, Polynomial reduction, NP Completeness Problem, NP-Hard Problems, NPCompleteness problem using Travelling Salesman problem (TSP), Approximation algorithm using TSP	**04**
	Total	**39**

Books Recommended:

Textbooks:

1. S. Sridhar, Design and Analysis of Algorithms, 1st Edition, Oxford Education, 2018.
2. Ellis Horowitz , Sartaj Sahni, S. Rajsekaran. "Fundamentals of computer algorithms" University Press

Reference Books:

1. 1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", 3rd Edition, The MIT Press, 2009.
2. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, "Algorithms", Tata McGraw- Hill Edition. 2. S. K. Basu, "Design Methods and Analysis of Algorithm", PHI.
3. John Kleinberg, Eva Tardos, "Algorithm Design", Pearson.
4. Michael T. Goodrich, Roberto Tamassia, "Algorithm Design", Wiley Publication

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Design and Analysis of Algorithms Laboratory (DJS22AML404)	
Sr. No	**Suggested Experiments**
1	Implementation of Min Max algorithm
2	Implementation of Strassen's Matrix Multiplication.
3	Implementation of Karatsuba algorithm for long integer multiplication.
4	Fractional Knapsack implementation using greedy approach.
5	Implementation of Activity selection using greedy approach.
6	Implementation of Kruskal's/ Prim's algorithm using greedy approach.
7	Implementation of job sequencing with deadline using greedy approach.
8	Implementation of other greedy algorithms eg: tree vertex split, subset cover, container loading, coin changing, optimal; merge patterns (Huffman tree).
9	Implementation of Single source shortest path (Dijkstra's algorithm).
10	Implementation of Bellman Ford algorithm using Dynamic programming.
11	Implementation of Longest Common Subsequence algorithm using Dynamic programming
12	Implementation of Travelling Salesperson problem using Dynamic programming.
13	Implementation of multistage graphs/ all pair shortest path using dynamic programming.
14	Implementation of N-queen problem using Backtracking.
15	Implementation of 15 Puzzle problem using Backtracking
16	Implementation of Knuth Morris Pratt string matching algorithm.

Prepared by Checked by Head of the Department Principal

Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester: IV
Course: Programming Laboratory-II (Web Development) DJS22AML405		

Prerequisite: -Python

Course Objectives:

1. To get familiar with the basics of Web fundamentals
2. To acquire knowledge and skills for creation of web site considering both client and server-side programming.
3. To gain ability to develop responsive web applications.
4. To understand REST API and DB for Frontend and Backend Connectivity.

Outcomes: Students will be able to

1. Implement interactive web page(s) using HTML5, CSS3 and Bootstrap.
2. Apply JavaScript to add functionality to web page and construct front end development using React JS
3. Construct back-end development using Django
4. Apply the knowledge of different libraries to establish connections with databases and perform CRUD operations.
5. Implement API endpoints, handle incoming requests, validate data, and generate suitable responses.

Sr. No	Unit	Hours
	Front end web development	
1	**HTML 5, CSS, Bootstrap** HTML: Anatomy of HTML syntax, Lists. Images, hyperlinks, tables, forms, Div CSS: CSS selectors and properties, inline, internal and external CSS. CSS sizing methods, Class vs. Ids, layout. CSS static, relative and absolute positioning systems. Font styling, typography, combine CSS selectors and understand selector priority, Media Queries Bootstrap: Introduction to Bootstrap, Bootstrap Grids, Bootstrap Themes, Bootstrap CSS, Bootstrap JS.	8
2	**Java Script:** Introduction to JavaScript Language: Overview and Syntax JavaScript: Variables and Control Statements JavaScript: Functions and Prototypes JavaScript APIs Client-Side JavaScript: with HTML Client-Side JavaScript: with DOM JavaScript DOM Objects, Java script Regular expression, Event Handling, Manipulating DOM elements dynamically with JavaScript, Introduction to error handling, debugging in JavaScript coding, Building interactive web pages with JavaScript. TypeScript: Overview, TypeScript Internal Architecture, TypeScript Environment Setup, TypeScript Types, variables and operators, DecisionMaking and loops, TypeScript Functions, TypeScript Classes and Objects, TypeScript Module	8

3	**Angular :**Introduction to Angular, Angular Application Architecture, what is Ng Module, Angular Components, Angular Templates, Data Binding, Types of Data Binding Modules, Directives, Structure Directives. Advanced Angular: Template Routing, Theme Implementation in Angular Framework, Angular Forms, Services,Inject Services, Angular Server Communication with Backend Server. Working of API's (GET, POST,PUT, DELETE), Complete Web application in Angular Framework JavaScript library	**10**
	Back end web development	
4	**Introduction to Django:** Features of Django, Dhango web server, understanding Django environment, Understanding Django the model-view-Template (MVT) architectural pattern, Django project directory, Creating a Django Project, Defining models in Django using Python classes, ORM, Django's built-in database migration functionality to create and apply database schema changes, Using and Customizing the admin interface. Building Views and Templates in Django: Django CRUD function based views, handle HTTP requests and generate HTTP responses in Django, Django URL mapping, GET Vs POST, Templates. Forms and User Authentication in Django: Django's built-in form handling, Creating, validating and handling forms in Django, user authentication	**16**
5	**Building RESTful APIs with Python:** Understanding RESTful architecture, Using Django to build RESTful APIs using JSON, including handling requests, routing, authentication, and authorization, writing tests for APIs to ensure their functionality and documenting APIs using Postman.	**6**
6	**SESSIONS AND COOKIES:** Difference between session and cookie, Creating sessions and cookies in Django, USING OTHER DATABASES IN DJANGO, Configuring MySQL database, Working with MySQL in Django	**4**
	Total	**52**

Books Recommended

Textbooks:

1. Django for APIs: Build Web APIs with python and Django (Welcome to Django), publication date: August 10. Publisher:WelcomeToCode, ,2020
2. John Dean, "Web Programming with HTML5, CSS3 and JavaScript", Jones & Bartlett Learning Edition, 2019.
3. Rediscovering JavaScript, Master ES6, ES7, and ES8, By Venkat Subramaniam · 2018

Reference Books:

1. Glenn Johnson, "Programming in HTML5 with JavaScript and CSS3", Microsoft Press, 2013 Edition.

2. "Django for beginners: Build websites with Python & Django" William Vincent(2018).
3. HTML and CSS: The Comprehensive Guide, Publisher: Rheinwerk, Computing Edition: First Edition, Publication Date: April 24,2023

Online Resources: 1.
https://www.udemy.com/course/crash-course-html-and-css/
https://nptel.ac.in/courses/106106156
https://www.coursera.org/learn/django-build-web-apps
https://www.coursera.org/learn/developing-applications-with-sql-databases-and-django
https://www.coursera.org/projects/django-for-beginners-creating-applications-and-views
https://www.coursera.org/specializations/django

Programming Laboratory-II (Web Development) DJS22AML405	
Sr. No	**Suggested Experiments**
1	Using HTML5 layout tags develop informative page with sections which include various images, links to other pages for navigation, make use of all possible formatting (for example font, color etc.).
2	Develop and demonstrate the usage of inline, internal and external style sheet using CSS
3	Design a web page using Bootstrap
4	Design a web page showing applicability of DOM
5	Write JavaScript to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty).
6	Design a web page using Type script.
7	Create an application for Students Record using AngularJS.
8	Set up a Django development environment: Install Django, create a new Django project, and set up a virtual environment.
9	Creating a Django app: Learn how to create a new app within a Django project, configure the app's settings, and add the app to the project's URL configuration.
10	Building views and templates: Build a set of views and templates for your app, including a homepage, an about page, and a detail page for the blog post model you created
11	Handling user authentication and authorization: Add user authentication to your app, allowing users to create accounts, log in, and log out.
12	Building RESTful APIs with Django
13	Program to manage the session.
14	Creating a Django App with Database Connection
15	Mini project

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept

Prepared by Checked by Head of the Department Principal

Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Semester:IV
Course: Design Thinking Laboratory (DJS22AML406)		

Course Objectives:

1. To familiarize students with fundamentals of design thinking and principles.
2. To ensure students can practice the methods, processes and tools of design thinking.
3. To emphasize the role of design thinking in creating innovative and socially impactful solutions using design thinking tools.

Outcomes: Students will be able to

1. Develop an application using fundamentals of Design Thinking.
2. Acquire hands-on proficiency in applying design thinking methodologies, processes
3. Develop a proactive attitude towards addressing societal challenges using design thinking
4. Work efficiently as a team member.

Unit	Description	Duration
1	**Foundation of Design Thinking:** Introduction to Design Thinking, Introduction to Design Thinking, Significance of Design Thinking, Key Tenets of Design Thinking, Design Thinking Process- 4 Critical Questions, Design Thinking Process, Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate or Empathize, Analyse, Solve and Test.	10
2	**Stage 1 Empathy:** Foundation and Tools of Empathy Foundation of Empathy, Purpose of empathy, Observation as a tool of empathy, Methods of Observation Empathetic Interview, Stakeholder maps, Jobs to be done, Empathy Maps	09
3	**Define- Foundation and tools:** Rules of Defining, Importance of Defining, Models of Framing Problem, Customer Journey Map, Customer experience, Persona, big picture thinking through function modelling.	09
4	**Ideate:** Introduction to Ideation, Double Diamond, Silent brainstorming, Rules for Brainstorming, Mind Mapping, metaphors for ideation, CREATE and What-If tool for ideation, introduction to TRIZ, Inventive principles and their applications	09
5	**Prototype & Test -Foundation:** Concept of Prototyping, Paper prototype, Story Board prototype, Scenario prototype, Low fidelity and high fidelity, Test Assumptions during the design thinking **Testing phase**: Necessity to test, user feedback, conducting a user test, guidelines for planning a test, how to test, desirable, feasible and viable solutions, iterate phase.	10
6	**Design Innovation:** Benefits of iteration in the design thinking process, taking the idea to the market, introduction to innovation management in a company.	05
	Total	**52**

Books Recommended

Text Books

1. "Design Your Thinking The Mindsets, Toolsets and Skill Sets for Creative Problem- solving" by
2. Pavan Soni , 2020
3. Design Thinking Playbk: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems by Michael Lewrick, Patrick Link, Larry Leifer, 2018
4. Design Thinking For Strategic Innovation: What They Can't Teach You at Business or Design
5. School by Idris Mootee, 2014.

Reference Books.

1. Dr. Bala Ramadurai, Karmic Design Thinking - A Buddhism-Inspired Method to Help Create Human- Centered Products & Services, Self-Published (1 January 2020).
2. Michael G. Luchs, Scott Swan, Abbie Griffin, Design Thinking: New Product Development Essentials from the PDMA, Wiley-Blackwell; 1st edition (25 September 2015).
3. Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley and David Kelley
4. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days by Jake Knapp, John Zeratsky, and Braden Kowitz

Online Reference:

1. https://onlinecourses.nptel.ac.in/noc22_mg32/preview
2. https://archive.nptel.ac.in/courses/110/106/110106124/
3. **Design and Innovation:**
   a. https://openstax.org/books/entrepreneurship/pages/4-suggested-resources
4. **Overview of Design Thinking:**
   a. https://www.interaction-design.org/literature/topics/design-thinking
   b. https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular
   c. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
   d. https://www.karelvredenburg.com/home/2016/8/29/design-vs-design-thinking-explained
   e. 10 Models for Design Thinking. In 2004, business consultants Hasso… | by Libby Hoffman | Medium
   f. https://www.tegen.com/design- t
   g. thinking/#What_is_Design_Thinking_and_How_Does_it_Relate_to_Product_Developmentht tps://www.interaction-design.org/literature/topics/wicked-problems
5. **Understand, Observe and Define the Problem:**
   a. https://uxdesign.cc/the-purpose-of-a-journey-map-and-how-can-it-galvanize-action-9a628b7ae6e
   b. https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them
   c. https://userpilot.com/blog/empathy-map-vs-persona/
6. **Ideation and Prototyping:**
   a. https://www.interaction-design.org/literature/topics/prototyping
   b. https://www.uxmatters.com/mt/archives/2019/01/prototyping-user-experience.php
   c. https://qpsoftware.net/blog/pros-and-cons-prototyping-complex-projects
7. **Testing and Implementation:**
   a. https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather-feedback-and-maximise-learning
   b. https://www.futurelearn.com/info/courses/ux-design-fundamentals-management-business-model/0/steps/245286
8. **Design Thinking in Various Sectors:**
   a. https://online.hbs.edu/blog/post/design-thinking-examples

Design Thinking	
Sr. No	**List of Laboratory Experiments**
1	Use online survey tools like Typeform or virtual collaboration tools like Zoom to assess students' understanding of the design thinking process.
2	Design relevant products/services using Smaply, Userforge, or MakeMyPersona to understand user needs
3	Thirty circle Exercise ---ideation
4	Implement Human-Centered Design (HCD) methodology for developing AI-ML products or services
5	Apply Ideation Techniques with SessionLab/Stormboard/IdeaFlip
6	Exercise: Rewarding Creativity and Risk Taking
7	Construct empathy maps for a given case study-1
8	Perform the steps for practical prototyping in AI-ML projects using digital tools **like Boords/Mockingbird/POP**
9	Test and validate AI-ML solutions using user testing and feedback with HotJar/PingPong
10	Design thinking using sprint base software

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept

Prepared by | Checked by | Head of the Department | Principal

Program: Artificial Intelligence & Machine Learning	S.Y B.Tech	Semester: IV
Course: Constitution of India (DJS22A2)		

Course Objectives:

1. To provide basic information about Indian constitution.
2. To identify individual role and ethical responsibility towards society.
3. To understand human rights and its implications.

Course Outcomes: On completion of the course, learner will be able to

1. Have general knowledge and legal literacy and thereby take up competitive examinations.
2. Understand state and central policies, fundamental duties.
3. Understand Electoral Process, special provisions.
4. Understand powers and functions of Municipalities, Panchayats and Co- operative Societies.
5. Understand Engineering ethics and responsibilities of Engineers.
6. Understand Engineering Integrity & Reliability.

Detailed Syllabus: (Unit wise)

Unit	Description	Duration
1	**Introduction to the Constitution of India** The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution Fundamental Rights & its limitations.	02
2	**Directive Principles of State Policy:** Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India.	03
3	**State Executives:** Governor, Chief Minister, State Legislature High Court of State. Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.	03
4	**Special Provisions**: For SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. **Human Rights:** Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co– Operative Societies.	03
5	**Scope & Aims of Engineering Ethics**: Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering	03
	Total	14

Books Recommended:

Text books

1. Brij Kishore Sharma, PHI Learning, ISBN- 978-9391818326, 2022.
2. You Must Know Your Constitution, Fali S. Nariman, Hay House Publishers India, 2023
3. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics" Thompson Asia, 2003-08-05, 2008.
4. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice –Hall EEE, 19th, 20th Edn., 2001

Reference Books:

1. Introduction to the Constitution of India, CA. Ashish K Agrawal, Aditi Agrawal, CA. (Dr.) Girish Ahuja Aditi Law House,ISBN- 978-9355268068, 2021
2. Brij Kishore Sharma," Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
3. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice – Hall of India Pvt. Ltd. New Delhi, 2004
4. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
5. Latest Publications of Indian Institute of Human Rights, Journal, New Delhi

Website Resources:

1. www.nptel.ac.in
2. www.hnlu.ac.in
3. www.nspe.org
4. www.preservearticles.com

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Program: Artificial Intelligence & Machine Learning	S.Y. B.Tech.	Sem: IV
Course: Innovative Product Development II (DJS22A4)		

Objectives:

1. To acquaint the students with the process of identifying the need (considering a societal requirement) and ensuring that a solution is found out to address the same by designing and developing an innovative product.
2. To familiarize the students with the process of designing and developing a product, while they work as part of a team.
3. To acquaint the students with the process of applying basic engineering fundamentals, so as to attempt at the design and development of a successful value added product.
4. To inculcate the basic concepts of entrepreneurship and the process of self-learning and research required to conceptualise and create a successful product.

Outcome: Learner will be able to:

1. Identify the requirement for a product based on societal/research needs.
2. Apply knowledge and skills required to solve a societal need by conceptualising a product, especially while working in a team.
3. Use standard norms of engineering concepts/practices in the design and development of an innovative product.
4. Draw proper inferences through theoretical/ experimental/simulations and analyse the impact of the proposed method of design and development of the product.
5. Develop interpersonal skills, while working as a member of the team or as the leader.
6. Demonstrate capabilities of self-learning as part of the team, leading to life-long learning, which could eventually prepare themselves to be successful entrepreneurs.
7. Demonstrate product/project management principles during the design and development work and excel in written (Technical paper preparation) as well as oral communication.

Guidelines for the proposed product design and development:

- Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).
- In semester IV, the expected work shall be procurement of components/systems, building of the working prototype, testing and validation of the results based on work completed in semester III.
    - First review is based on readiness to build the working prototype.
    - Second review shall be based on a presentation as well as the demonstration of the working model, during the last month of semester IV. This review will also look at the readiness of the proposed technical paper presentation of the team.

The overall work done by the team shall be assessed based on the following criteria;

1. Quality of survey/ need identification of the product.
2. Clarity of Problem definition (design and development) based on need.
3. Innovativeness in the proposed design.

4. Feasibility of the proposed design and selection of the best solution.
5. Cost effectiveness of the product.
6. Societal impact of the product.
7. Functioning of the working model as per stated requirements.
8. Effective use of standard engineering norms.
9. Contribution of each individual as a member or the team leader.
10. Clarity on the write-up and the technical paper prepared.

- The semester reviews (III and IV) may be based on relevant points listed above, as applicable.

Guidelines for Assessment of Semester Reviews:

- The write-up should be prepared as per the guidelines given by the department.
- The design and the development of the product shall be assessed through a presentation and demonstration of the working model by the student team to a panel of Internal and External Examiners, preferably from industry or any research organizations having an experience of more than five years, approved by the Head of the Institution. The presence of the external examiner is desirable only for the 2nd presentation in semester IV. Students are compulsorily required to present the outline of the technical paper prepared by them during the final review in semester IV.

Guidelines for Assessment of the work:

- The review/ progress monitoring committee shall be constituted by the Head of the Department. The progress of design and development of the product is to be evaluated continuously, holding at least two reviews each semester.
- In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.
- Distribution of marks individually for the both reviews as well as for the first review during the subsequent semester shall be as given below:
    - Marks awarded by the supervisor based on log-book 20
    - Marks awarded by review committee 20
    - Quality of the write-up 10
- In the last review of semester IV, the marks will be awarded as follows.
    - Marks awarded by the supervisor(Considering technical paper writing) 30
    - Marks awarded by the review committee 20

Note- A Candidate needs to secure a minimum of 50% marks to be declared to have completed the audit course.

Review/progress monitoring committee may consider the following points during the assessment.

- In semester III, the entire design proposal shall be ready, including components/system selection as well as the cost analysis. Two reviews will be conducted based on the presentation given by the student's team.
    - First shall be for finalization of the product selected.
    - Second shall be on finalization of the proposed design of the product.
- In the semester IV, the expected work shall be procurement of components/systems, building of the working prototype, testing and validation of the results based on work completed in semester III.

- First review is based on readiness of building the working prototype.
- Second review shall be based on a presentation as well as the demonstration of the working model, during the last month of semester IV. This review will also look at the readiness of the proposed technical paper presentation of the team.

The overall work done by the team shall be assessed based on the following criteria;

- Quality of survey/ need identification of the product.
- Clarity of Problem definition (design and development) based on need.
- Innovativeness in the proposed design.
- Feasibility of the proposed design and selection of the best solution.
- Cost effectiveness of the product.
- Societal impact of the product.
- Functioning of the working model as per stated requirements.
- Effective use of standard engineering norms.
- Contribution of each individual as a member or the team leader.
- Clarity on the write-up and the technical paper prepared.
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