



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)



Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

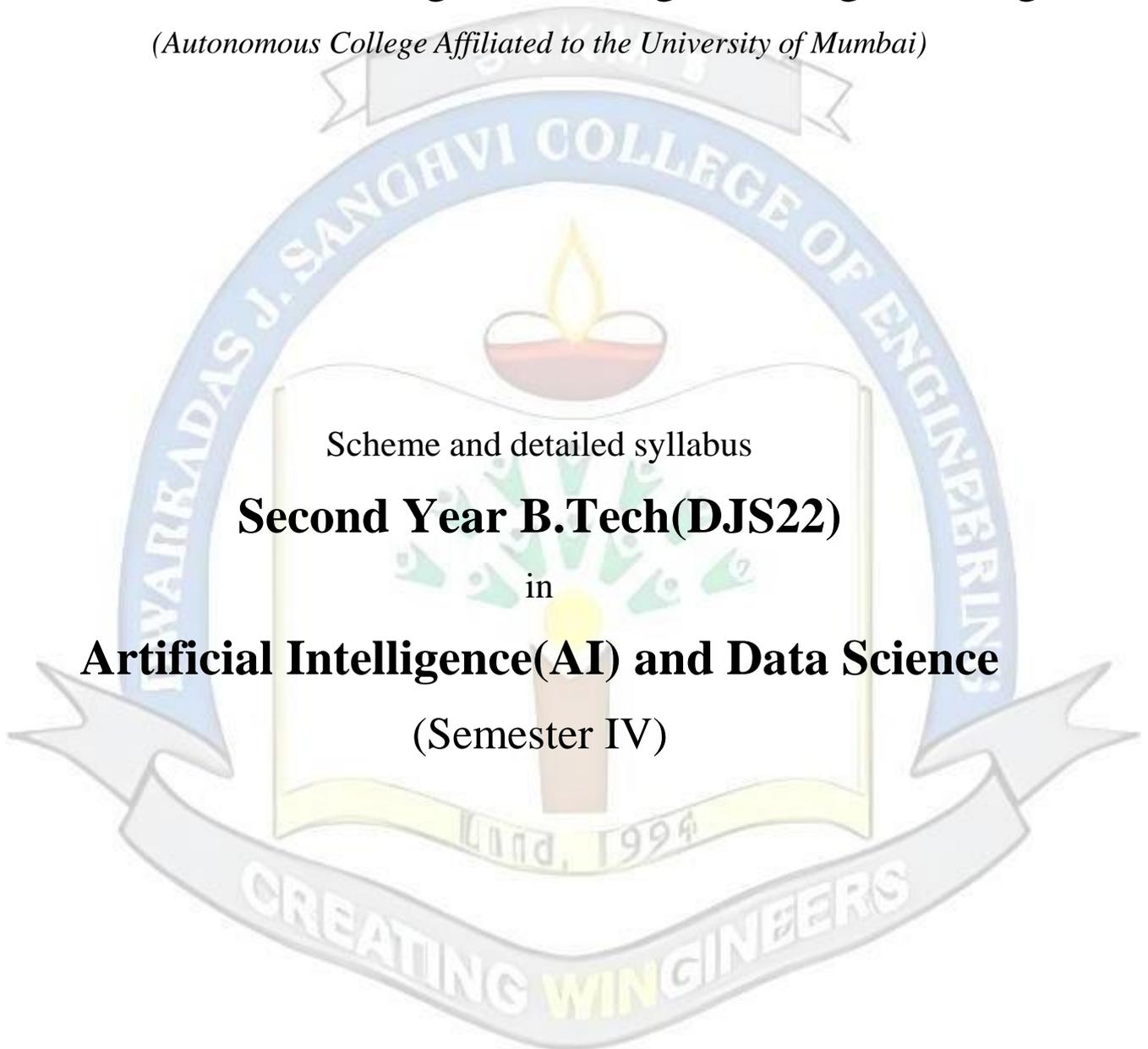
Scheme and detailed syllabus

Second Year B.Tech(DJS22)

in

Artificial Intelligence(AI) and Data Science

(Semester IV)





Proposed Scheme for Second Year Undergraduate Program in Artificial Intelligence (AI) and Data Science: Semester IV (Autonomous)

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	DJS22ADC401	Statistics for Engineers	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL401	Statistics for Engineers Laboratory	--	2	--	1	--	25	25	--	--	--	--	25		
2	DJS22ADC402	Artificial Intelligence	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL402	Artificial Intelligence Laboratory	--	2	--	1	--	25	25	--	--	25	25	50		
3	DJS22ADC403	Data Mining and Analytics	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL403	Data Mining and Analytics - Laboratory	--	2	--	1	--	25	25	--	--	25	25	50		
4	DJS22ADC404	Design and Analysis of Algorithms	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL404	Design and Analysis of Algorithms - Laboratory	--	2	--	1	--	25	25	--	--	25	25	50		
5	DJS22ADL405	Programming Laboratory-II (Web Programming)	--	4	--	2	--	25	25	--	--	25	25	50		2
6	DJS22ADL406	Design Thinking Laboratory	--	4	--	2	--	25	25	--	25	--	--	25	50	2
7	DJS22A2	Constitution of India	1	--	--	--	--	--	--	--	--	--	--	--	--	--
8	DJS22ILLA2	Innovative Product Development II (A)	--	2	--	--	--	--	--	--	--	--	--	--	--	--
Total			13	18	--	20	140	150	290	260	25	--	100	385	675	20

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

Prepared by

Checked by

Head of the Department

Principal

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence(AI) & Data Science					Semester : IV					
Course: Statistics for Engineers					Course Code: DJS22ADC401					
Course : Statistics for Engineers Laboratory					Course Code: DJS22ADL401					
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		25
				--	--		15	10	25	

Prerequisite:

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

Objectives:

To build strong foundation in statistics which can be applied to analyse data and make predictions.

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.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Detailed Syllabus: (unit wise)		
Unit	Description	Duration
1	<p>Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.</p> <p>Discrete Probability Distributions: Binomial Distribution, Poisson distribution.</p> <p>Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial.</p>	8
2	<p>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.</p>	5
3	<p>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.</p>	4
4	<p>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. Non-parametric Test: Test of independence, goodness of fit using chi-square statistics.</p>	11
5	<p>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.</p>	5
6	<p>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.</p>	6
	Total	39

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

List of Laboratory Experiments: (DJS22ADL401) (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.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence & Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

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

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.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 20 marks and 15 marks will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

1. Laboratory work (Performance of Experiments): 15 Marks
2. Journal documentation (Write-up and/or Assignments): 10 marks

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

Prepared by

Checked by

Head of the Department

Principal

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science				Semester : IV					
Course: Artificial Intelligence				Course Code: DJS22ADC402					
Course : Artificial Intelligence Laboratory				Course Code: DJS22ADL402					
Teaching Scheme (Hours / week)				Evaluation Scheme					Total marks (A+ B)
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)		
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total
				65			20	15	35
3	2	--	4	Laboratory Examination			Term work		Total Term work
				Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal	
				--	--	25	15	10	25

Prerequisite: Knowledge of

1. Basic Mathematics
2. Algorithms
3. Discrete Structure

Objectives:

1. Provide the basic ideas and techniques underlying the design of intelligent systems.
2. Impart the knowledge of various search techniques for problem solving.
3. Learn knowledge representation and reasoning.
4. Impart the knowledge of planning and forms of learning.

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

1. Classify given problem and identify the need of intelligent agent.
2. Apply appropriate search-based method for a given problem.
3. Analyze various AI approaches to knowledge– intensive problem solving, reasoning and planning.
4. Design an expert system for a given AI problem.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	Introduction to Artificial Intelligence: Introduction, History of Artificial Intelligence, Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Foundations of AI, Sub-areas of AI, Current trends in AI Intelligent Agents: Agents and Environments, concept of rationality, nature of environment, the structure of Agents, Types of Agents, Learning Agent.	6
2	Problem solving: Solving Problem by Searching: Problem Solving Agent, Formulating Problems, Example Problems. State Space Search Methods: Uninformed Search Methods: 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	8
3	Stochastic Local Search Algorithms: Hill climbing search, Simulated annealing. Adversarial Search: Introduction to Game Theory, Algorithm Minimax, Alpha-Beta Pruning	6
4	Knowledge and Reasoning: Knowledge based Agents, The Wumpus World, Inference in FOL, Forward chaining, Backward chaining, Knowledge Engineering in First-Order Logic, Unification, Resolution, Logic programming (PROLOG)	8
5	Planning: The planning problem, Planning with State Space Search, STRIPS, Goal Stack Planning, Planning graphs, Partial order planning, Hierarchical planning	6
6	Expert System: Introduction, Phases in building Expert Systems, ES Architecture, Case Study on MYCIN Rule based system.	5
	Total	39

List of Laboratory Experiments: (Minimum any eight using Python/PROLOG) (DJS22ADL402)

Sr.No.	Suggested Experiments
1	Select a problem statement relevant to AI. i) Identify the problem ii) PEAS Description iii) Problem formulation
2	Identify and analyze uninformed search Algorithm to solve the problem. Implement BFS/DFS/DFID search algorithms to reach goal state.
3	Identify and analyze informed search Algorithm to solve the problem. Implement A* search algorithm to reach goal state.
4	Program to implement Local Search algorithm: World Block Problem using Hill climbing search.
5	Experiment to illustrate Game playing.
6	Implementation on any AI Problem: Wumpus world, Tic-tac-toe, 8-Queens Problem.
7	The laboratory will emphasize the use of PROLOG. (For example, Program to implement Family Tree in Prolog)

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

8	The laboratory will emphasize the use of PROLOG.
9	Case study on Planning Problem. Identify and analyze a planning problem.
10	Case study on an AI Application.

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

Books Recommended:

Text books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence a Modern Approach", Fourth Edition, Pearson Education, 2022
2. Saroj Kaushik "Artificial Intelligence", First Edition, Cengage Learning, 2011
3. George F Luger "Artificial Intelligence" Low Price Edition, Pearson Education., Fifth edition, 2005
4. Deepak Khemani." A First Course in Artificial Intelligence", McGraw Hill Education (India), Sixth reprint 2018 edition (1 July 2017).

Reference Books:

1. Ivan Bratko "PROLOG Programming for Artificial Intelligence", Addison-Wesley, 4th edition, 2011
2. Elaine Rich and Kevin Knight "Artificial Intelligence" Third Edition, 2017
3. Davis E. Goldberg , "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley, Third Edition, 1992
5. Han Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, 3rd edition, 2011
6. N.P.Padhy , "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2005

Evaluation Scheme: Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 20+15 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

The distribution of marks for term work shall be as follows:

1. Laboratory work (Performance of Experiments): 15 Marks
2. Journal documentation (Write-up and/or Assignments): 10 marks

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



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**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science				Semester : IV						
Course: Data Mining and Analytics				Course Code:DJS22ADC403						
Course : Data Mining and Analytics Laboratory				Course Code: DJS22ADL403						
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)		Total marks (A+ B)	
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2		Total
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	
				Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project/ presentation/ Journal		
3	2	--	4	--	--	25	15	10	25	50

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.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Detailed Syllabus: (unit wise)		
Unit	Description	Duration
1	<p>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</p> <p>Data Pre-processing: 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</p>	7
2	<p>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.</p>	6
3	<p>Exploratory Data Analysis (EDA): Introduction to exploratory data analysis, Typical data formats. Types of EDA, Graphical/Non graphical Methods, Univariate/multivariate methods Correlation and covariance, Degree of freedom, Density plots and estimates Data Visualization (Matplotlib, Seaborn), Identifying Outliers and Anomalies</p>	7
4	<p>Mining Frequent Patterns: Market Basket Analysis – Apriori Algorithm – Mining Frequent Itemsets without Candidate Generation – 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</p> <p>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</p>	9
5	<p>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</p>	7
6	<p>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.</p>	3
	Total	39

Data Mining and Analytics Laboratory (DJS22ADL403)	
List of Laboratory Experiments	
Sr. No	Suggested Experiments
1	Data preparation using NumPy and Pandas I. Collect data from a specific source (e.g., CSV file, API, database) and inspect its structure. II. Generate summary statistics for a given dataset, including mean, median, standard deviation, and quartiles for numerical columns.
2	Data Pre-processing with pandas I. Identify the presence of missing values in a dataset and choose an appropriate method for handling them (e.g., removal, imputation). II. 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 modeling.
4	Data Transformation and Data Discretization I. Do the following for the any field. i. Standardize the variable. ii. Identify how many outliers there are and identify the most extreme outlier. II. Data Modeling 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 I. 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. II. 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

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

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 Mitchell —Machine Learning McGraw Hill,2017.

Reference Books:

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

Evaluation Scheme:

Semester End Examination (A):

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Theory:

1. Question paper based on the entire syllabus, summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

1. Oral & Practical examination will be based on **DJS22ADL403** the entire syllabus including, the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 20+15 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Laboratory work will be based on experiments to be performed in Python / R programming languages.

The distribution of marks for term work shall be as follows:

- i. Laboratory work (Performance of Experiments): 15 Marks
- ii. Journal Documentation (Write-up and Assignments): 10 marks

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

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**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science					Semester : IV					
Course : Design and Analysis of Algorithms					Course Code:DJS22ADC404					
Course : Design and Analysis of Algorithms Laboratory					Course Code:DJS22ADL404					
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		50
				--	--	25	15	10	25	

Prerequisite: Computer Programming, Data structure

Course Objectives: The objective of the course is to introduce important algorithmic design paradigms and approaches for effective problem solving in computing and how to use these paradigms efficiently to solve a given problem. To analyze the algorithm for its efficiency to show its effectiveness over the others. In addition, the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems 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.

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

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, Graph: Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), 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, NP Completeness problem using Travelling Salesman problem (TSP), Approximation algorithm using TSP	04
Total		39

Suggested List of Experiments (any 10 to 12):

Sr.No.	Title of experiments (DJS22ADL404)
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

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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

Books Recommended:

Text books:

1. S. Sridhar, Design and Analysis of Algorithms, 1st Edition, Oxford Education, 2018.
2. Design and Analysis of Algorithms, Goodrich M T, Wiley, New Delhi, 2021
3. Ellis Horowitz, Sartaj Sahni, S. Rajsekar. "Fundamentals of computer algorithms" University Press

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", 4TH Edition, The MIT Press, 2022.
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.
4. 4. Michael T. Goodrich, Roberto Tamassia, "Algorithm Design", Wiley Publication.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral & Practical examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 10 - 12 experiments and minimum 2 assignments.

The distribution of marks for term work shall be as follows:

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- i. Laboratory work (Performance of Experiments): 15 marks
- ii. Journal Documentation (Write-up and Assignments): 10 marks

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



Prepared by

Checked by

Head of the Department

Principal

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science					Semester : IV					
Course: Full Stack Development Laboratory					Course Code:DJS22ADL405					
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				--			--	--	--	--
				Laboratory Examination			Term work		Total Term work	
				Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
--	4	--	2	--	--	25	15	10	25	
									50	

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.

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Unit	Description	Duration
	Front End Web Development	
1	<p>HTML 5, CSS, Bootstrap</p> <p>HTML: Anatomy of HTML syntax, Lists. Images, hyperlinks, tables, forms, Div</p> <p>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</p> <p>Bootstrap: Introduction to Bootstrap, Bootstrap Grids, Bootstrap Themes, Bootstrap CSS, Bootstrap JS.</p>	8
2	<p>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, JavaScript Regular expression, Event Handling, Manipulating DOM elements dynamically with JavaScript, Introduction to error handling, debugging in JavaScript coding, Building interactive web pages with JavaScript</p> <p>TypeScript Overview, TypeScript Internal Architecture, TypeScript Environment Setup, TypeScript Types, variables and operators, Decision Making and loops, TypeScript Functions, TypeScript Classes and Objects, TypeScript Modules</p>	8
3	<p>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</p> <p>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</p>	12
4	<p>Back end web development</p> <p>Introduction to Django: Features of Django, Django 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</p> <p>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</p> <p>Forms and User Authentication in Django: Django's built-in form handling, Creating, validating and handling forms in Django, user authentication</p>	12
5	<p>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.</p>	6

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6	SESSIONS AND COOKIES <ul style="list-style-type: none"> • Difference between session and cookie • Creating sessions and cookies in Django 	6
	USING OTHER DATABASES IN DJANGO <ul style="list-style-type: none"> • Configuring MySQL database • Working with MySQL in Django 	
Total		52

Books Recommended

Text books:

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

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 Paperback-April 24,2023, Publisher:Rheinwerk, Computing Edition: First Edition, Publication Date: April 24,2023

Online Resources:

1. <https://www.udemy.com/course/crash-course-html-and-css/>
2. <https://nptel.ac.in/courses/106106156>
3. <https://www.coursera.org/learn/django-build-web-apps>
4. <https://www.coursera.org/learn/developing-applications-with-sql-databases-and-django>
5. <https://www.coursera.org/projects/django-for-beginners-creating-applications-and-views>
6. <https://www.coursera.org/specializations/django>
7. [LAB Manual python - - Studocu](#)

Suggested List of 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 contain 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.

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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

Evaluation Scheme:

Laboratory:

1. Oral and practical examination will be based on the entire syllabus of practical performed during laboratory sessions of course **DJS22ADL405**
2. Oral and practical examination will be of 25 marks.

Continuous Assessment (B):

Laboratory: (Term work)

Laboratory work will be based on the experiments.

The distribution of marks for term work shall be as follows:

Laboratory work (Performance of Experiments): 10 Marks

Miniproject: 10 Marks

Journal Documentation (Write-up and solution of selected problem statement): 5 marks

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

Prepared by

Checked by

Head of the Department

Principal

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science					Semester : IV					
Course: Design Thinking Lab					Course Code: DJS22ADL406					
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				--			--	--	--	--
			2	Laboratory Examination			Term work		Total Term work	50
				Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
--	4	--		25	---	--	15	10	25	

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.

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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, Analyze, 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

Design Thinking	
Sr. No	List of Laboratory Experiments
1	Use online survey tools like Type form or virtual collaboration tools like Zoom to assess students' understanding of the design thinking process.
2	Design relevant products/services using Smaply, Userforge, or Make My Persona 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 Session Lab/Storm board/Idea Flip
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

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Books Recommended

Text Books

1. “Design Your Thinking The Mindsets, Toolsets and Skill Sets for Creative Problem- solving” by Pavan Soni , 2020
2. Design Thinking Playbk: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems by Michael Lewrick, Patrick Link, Larry Leifer, 2018.
3. Design Thinking For Strategic Innovation: What They Can't Teach You at Business or Design 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://bwww.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.tcgen.com/design-thinking/#What is Design Thinking and How Does it Relate to Product Development>
 - g. <https://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://qpssoftware.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>

Evaluation Scheme:

Laboratory:

1. Oral and practical examination will be based on the entire syllabus of practical performed

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during laboratory sessions of course **DJS22ADL406**.
2. Oral and practical examination will be of 25 marks.

Continuous Assessment (B):

Laboratory: (Term work)

Laboratory work will be based on the experiments.

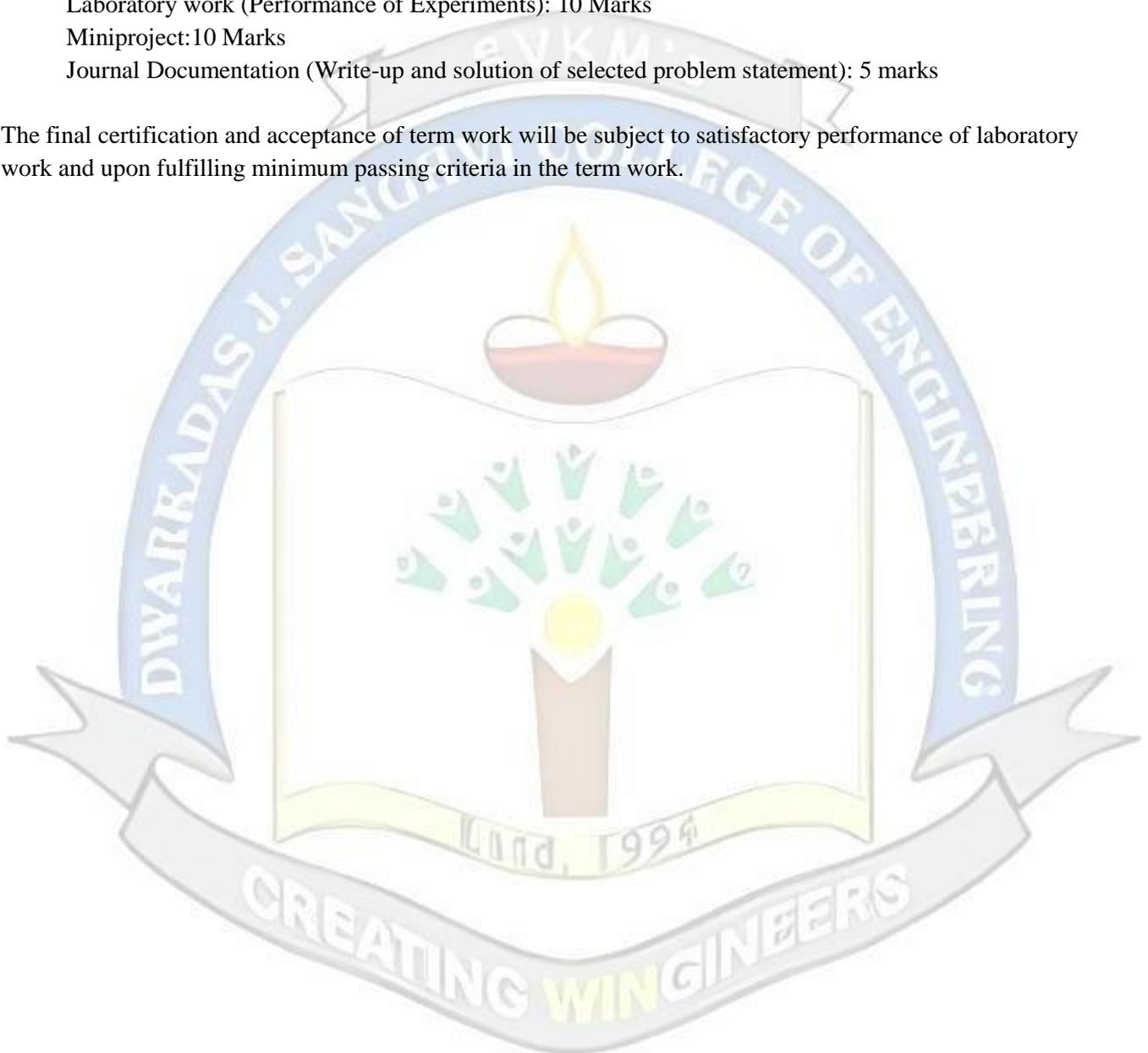
The distribution of marks for term work shall be as follows:

Laboratory work (Performance of Experiments): 10 Marks

Miniproject: 10 Marks

Journal Documentation (Write-up and solution of selected problem statement): 5 marks

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



Prepared by

Checked by

Head of the Department

Principal

**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Common for all Programs				Semester : IV					
Course : Constitution of India				Course Code: DJS22A2					
Teaching Scheme (Hours / week)				Evaluation Scheme					
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)		
Lectures	Practical	Tutorial	Total Credits	Theory	Term Test 1	Term Test 2	AVG	Total	
								--	--
				Laboratory Examination			Term work		--
				Oral	Practical	Oral & Practical	--		
01	--	--	--	--	--	--			

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.

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

1. Have general knowledge and legal literacy and thereby to 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.

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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, 86 th & 91 st 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. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics" Thompson Asia, 2003-08-05.

Reference Books:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice – Hall of India Pvt. Ltd. New Delhi, 2004
3. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
4. Latest Publications of Indian Institute of Human Rights, 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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Head of the Department

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**Syllabus for Second Year B.Tech. Program in Artificial Intelligence (AI) and Data Science- Semester IV (Autonomous)
(Academic Year 2023-2024)**

Program: Second Year B.Tech. in Artificial Intelligence (AI) and Data Science				Semester : IV					
Course: Innovative Product Development-II				Course Code: DJS22ILLA2					
Teaching Scheme (Hours /week)				Evaluation Scheme					
				Semester End Examination Marks (A)		Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	
				--	--	--	--	--	--
				Laboratory Examination			Semester review		--
				Oral	Practical	Oral & Practical	Review 1	Review 2	Total
--	2	--	--	--	--	--	--	--	

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 conceptualize 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 conceptualizing 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 analyses 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.

Demonstrate product/project management principles during the design and development work and also 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).
- Students should carry out a survey and identify the need, which shall be converted into conceptualization of a product, in consultation with the faculty supervisor/head of department/internal committee of faculty members.
- Students in the team shall understand the effective need for product development and accordingly select the best possible design in consultation with the faculty supervisor.
- Students shall convert the best design solution into a working model, using various components drawn from their domain as well as related interdisciplinary areas.
- Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 2 semesters, wherein the main focus shall be on self-learning.
- A record in the form of an activity log-book is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
- The design solution is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department. Efforts are to be made by the students to try and publish a technical paper, either in the institute journal, “Techno Focus: Journal for Budding Engineers” or at a suitable publication, approved by the department research committee/ Head of the department.
- The focus should be on self-learning, capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over two semesters, i.e. during the semesters III and 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 on a continuous basis, holding a minimum of two reviews in 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 the 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 the semester III, the entire design proposal shall be ready, including components/systemselection 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, buildingof 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;

- 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 ofthe external examiner is desirable only for the 2nd presentation in semester IV. Students arecompulsorily required to present the outline of the technical paper prepared by them duringthe final review in semester IV.

Prepared by

Checked by

Head of the Department

Principal