COURSE NAME:	Data Visualization Techniques
TOTAL DURATION:	45 Hrs
MODE OF DELIVERY	PHYSICAL CLASSROOM TRAINING AT RESPECTIVE COLLEGES
TRAINER TO STUDENT RATIO:	1:50
TOTAL MARKS:	75

Table 1	
OVERALL COURSE OBJECTIVE:	1. Design effective data collection frameworks and create preprocessing pipelines that address issues like missing values, outliers, and inconsistencies. 2. Develop advanced statistical analyses to identify patterns, correlations, and trends, supporting evidence-based decisions. 3. Construct compelling visual narratives using tools such as Python, Tableau, and Power BI, ensuring clarity and engagement. 4. Justify visualization choices to effectively communicate complex data insights to technical and non-technical audiences. 5. Evaluate the impact of data-driven insights on organizational goals and propose innovative solutions for real-world challenges.

LEARNING OUTCOME:	1. Evaluate various data sources and collection methods, ensuring relevance, reliability, and adherence to ethical standards in data handling and analysis. 2. Develop preprocessing pipelines to clean, transform, and prepare datasets by addressing issues like missing values, outliers, and inconsistencies for accurate analysis. 3. Perform exploratory data analysis (EDA) to summarize data features, uncover trends, and identify relationships using statistical techniques and visualization tools. 4. Construct effective visualizations and dashboards that communicate complex data insights clearly and support decision-making for both technical and non-technical audiences. 5. Design and execute comprehensive data analysis

	projects, combining data collection, cleaning, analysis, and visualization to deliver actionable insights and recommendations.

TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME				
SL. NO	**MODULE NAME**	**MODULE CONTENT**	**MODULE LEARNING OUTCOME**	**DURATION (HRS)**
1	Foundations of Data Analysis	- Overview of data types, sources, and collection methods - Importance of data analysis and visualization - Data lifecycle and key tools (Python, Tableau) - Ethical considerations in data handling	Evaluate data sources and methods to handle data collection and preparation. Apply statistical concepts to uncover patterns and ensure ethical data practices.	9
2	Data Cleaning and Preprocessing	- Identifying and resolving data quality issues (missing values, outliers, duplicates) - Data transformation (scaling, normalization) - Handling structured	Develop preprocessing pipelines to clean, transform, and structure data for analysis. Document and maintain records of cleaning efforts for	9

		and unstructured data - Automating cleaning workflows with tools	reproducibility and transparency.	
3	Exploratory Data Analysis (EDA)	- EDA techniques for summarizing and visualizing data - Analyzing distributions, correlations, and outliers - Handling multivariate data with techniques like PCA - Interpreting trends and relationships using visual tools	Perform EDA to summarize data features, uncover trends, and visualize relationships. Design actionable insights through clear statistical summaries and effective visualizations.	9
4	Data Visualization Techniques	- Principles of effective visualization (clarity, simplicity, accuracy) - Tools for static and interactive visualizations (Tableau, Python) - Visual storytelling techniques and dashboard design	Construct impactful visualizations and dashboards to present data insights. Evaluate the effectiveness of visuals in conveying clear and actionable messages to diverse audiences.	9
5	Capstone Project	- Framing and solving real-world data problems - End-to-end project: data sourcing, cleaning, analysis, visualization - Reporting findings and making recommendations - Presenting results to technical and non-technical audiences	Develop and execute a complete data project, addressing real-world problems. Propose recommendations based on data analysis, creating actionable reports and presentations for stakeholders.	9

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USE CASES			
LEARNING	**ASSESSMENT**	**Performance**	**USE CASES**

OUTCOME	CRITERIA	Criteria	
Fundamentals of Data Analysis and Visualization	Evaluate data sources and tools to identify appropriate methods for specific analytical tasks.	Judge the relevance of data sources and tools for solving analytical problems.	Demonstrates the ability to select appropriate tools and techniques for data analysis and visualization tasks.
Data Collection and Cleaning	Develop data pipelines to address issues such as missing values, outliers, and inconsistencies.	Recommend cleaning strategies and ethical considerations in data handling.	Effectively implements data cleaning processes and adheres to ethical data practices in various scenarios.
Exploratory Data Analysis (EDA)	Design EDA frameworks to uncover insights and prepare data for deeper analysis.	Prioritize key variables, test relationships, and summarize findings through visual and statistical methods.	Produces comprehensive EDA reports showcasing initial trends, correlations, and actionable insights.
Advanced Data Visualization Techniques	Construct compelling dashboards and visualizations tailored to diverse audiences and decision-makers.	Assess the clarity, accuracy, and engagement of visual storytelling using tools like Tableau, Power BI, or Python.	Demonstrates proficiency in creating dynamic dashboards and visualizations that meet professional and user requirements.
Capstone Project	Create an end-to-end data analysis and visualization project addressing a real-world problem.	Propose actionable insights, justify visualization choices, and support decision-making through interactive dashboards.	Synthesizes all course concepts into a professional-quality project, with clear insights and actionable recommendations.

TABLE 4: LIST OF FINAL PROJECTS (PROJECTS THAT

COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)	
SL.NO	**FINAL PROJECT**
1	A retail company wants to Implement customer purchasing behaviour.
2	Analysing Website Traffic for an Online Platform.
3	Customer Satisfaction Survey Analysis
4	Monitoring Environmental Data (Air Quality)
5	Financial Performance Analysis for a Start-up.
6	Business Intelligence and Reporting for Strategic Decision-Making.
7	Market Research Data Analysis from Survey Responses.
8	Integration of Health Data for Early Detection of Disease Outbreaks.
9	Forecasting Revenue and Expenses for Strategic Planning.
10	Healthcare and Medical Research Data Analysis
11	Demand Planning and Inventory Management
12	Employee Performance Analysis and Development.
13	Weather Data Analysis for Improved Decision-Making
14	Market Analysis and Competitive Research
15	Market Basket Analysis for Retail Optimization.
16	Car Price Prediction Analysis for Optimized Sales and Purchases.
17	Uber Trips Data Analysis for Operational Insights and Business Optimization.
18	Indian Election Data Analysis for Political Strategy and Voter Insights
19	Global COVID-19 Data Analysis and Visualizations for Public Health

	Insights and Policy Decisions.
20	iPhone Sales Analysis for Business Optimization and Market Insights.

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 75)					
ASSESSMENT CRITERIA	**Learning Outcome**	**Fair (1–5)**	**Good (6–10)**	**Excellent (11–15)**	**TOTAL MARKS**
Data Handling and Cleaning	Design preprocessing pipelines and handle inconsistencies	Limited identification of issues; basic cleaning	Addresses most issues with standard techniques	Proposes comprehensive cleaning strategies with innovation	15
Exploratory Data Analysis	Conduct detailed EDA and interpret insights	Uses basic statistics and tools	Applies advanced statistical methods	Creates complex EDA with actionable insights	15
Visualization Techniques	Develop engaging and accurate visualizations	Basic static charts with limited clarity	Functional charts with moderate interactivity	Dynamic dashboards with impactful narratives	15
Ethical and Strategic Application	Evaluate impact and propose recommendations	Limited ethical considerations; basic insights	Addresses key ethical aspects and actionable ideas	Proposes innovative, ethically sound strategies	15
Capstone Execution	Synthesize course concepts into a project	Partial implementation with minimal impact	Clear implementation meeting expectations	Exemplary project addressing real-world challenges	15