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SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech IV (Semester VII)

Subject Name: Data Visualization Skills **Subject Code:** BTEA19721
Type of course: Honors (Group: Data Science)
Prerequisite (if any): Python programming, Statistics and Data Preprocessing, Machine Learning and Deep Learning, Python and SQL for Data Science

List of Courses where this course will be prerequisite: -

Rationale: This course, the final part of our B.Tech (Minor/Honors) in Data Science track, covers the basics of data visualisation and exploratory data analysis using Excel, Matplotlib, Tableau, and Dashboard. Students will be able to develop visualisation skills for HTML and XML web pages by using Google Charts. The use of Google Maps API can assist students in learning how to import navigation and location information into real-time data science projects. Data visualisation is a powerful method for communicating data-driven results, inspiring analyses, and identifying flaws. This course will teach you how to analyses data in order to gain valuable insights and advance your career.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs
1	Introduction to Data Visualization : Types of Data Visualization, Data for Visualization: Data Types, Data Encodings, Retinal Variables, Mapping Variables to Encodings, Visual encodings, Data Visualization Best Practices, Ethical Considerations	4

2	Data Visualization with Excel : Data Visualizations using conditional formatting, sparklines and number formats, create charts in Microsoft Excel using various charting techniques with real-world examples, interactive Dashboard using Pivot Charts and Slicers, Basics of Macros	9
3	Visualization for time-oriented data: Introduction to Time Series, Types of Time Series Data, Ways for Time Series Data Visualization - Tabular Visualization, Temporal Aggregation Techniques, Time Series Decomposition Plots, Interactive Time Series Visualization, Anomaly Detection Visualization, Temporal Heatmaps and Calendar Heatmaps, Visualizing Seasonal Patterns:, tools Prophet for time series forecasting and analysis, Challenges in Time Series Visualization: 1D Plot of Measurement Times, 1D Plot of Measurement Values, 1D Color Plot of Measurement Values, Bubble Plot, Scatter Plot, Linear Line Plot, Linear Step Plot, Linear Smooth Plot, Area Chart, Horizon Chart, Bar Charts (univariate, bivariate and stacked bar charts), and Histogram,	8
4	Tableau : Getting to Know Tableau for Data Visualization, Tableau Data Sources, Tableau Worksheets, Tableau Calculations, Tableau Sort & Filters, Tableau Charts, Tableau Dashboard, Motion Charts, Tell the Story of Your Data	12
5	Advanced Concepts related to Plotting: 3D Plotting - 3D line plot, 3D scatter plot, 3D surface plot, 3D wireframe plot, 3D Contour Graphs, Building a compelling story around data insights	8
6	Case Study: Network graphs for visualizing relationships in complex systems, Netflix viewing Patterns graph, Visualizing Data to make Business Decisions.	4

Suggested Specification table with Marks (Theory): (For B.Tech only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
-	5	10	15	10	20

Legends: R: Remembrance; U: Understanding: A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr No	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	The Visual Display of Quantitative Information	E. Tufte.	Graphics Press,	2001	2nd Edition
2	Storytelling with Data: Let's Practice!	Cole Nussbaumer Knaflic	wiley		1st Edition
3	Microdsoft Excel 2016: All in one for Dummies	Greg Harvey	Wiley	2016	1st Edition
4	Now You See It: An Introduction to Visual Data Sensemaking	Stephen Few	Wiley	2021	1st Edition
5	Visual Analytics with Tableau	Alexander Loth	Wiley		1st Edition

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Comprehend various types of visualization practices for effective and correct representation of the data	10
CO-2	Apply various techniques and tools to real-time data to create informative and visually appealing visualizations in Microsoft Excel.	20
CO-3	Distinguish between common 3D visual presentations of data used for effective communication.	20
CO-4	Demonstrate data statistics through visualization using Tableau	20

CO-5	Create a story from appropriate data by highlighting the useful information	20
CO-6	Analyse time series data to visualize identified patterns, trends, and anomalies.	10

List of Open learning website:

List of Open Source Software:

1. Excel
2. Tableau
3. Matplotlib
4. Dashboards
5. Googel Charts and
6. Google Maps API
7. Network Analysis Tools - NodeXL graph analysis plug-in for Excel and NetworkX - graph analysis library for Python

FOR LAB SESSIONS: Prophet tool, MySQL, Python, DJango

List of Experiments:

Sr. No.	Practical
1	Develop Following Program Using Excel a. Develop the simple bar chart b. Read the data .txt file and draw Data Table c. Read the data .txt file and draw Simple Bar Chart d. Read the data .csv file and draw Data Table e. Read the data .csv file and draw Column Bar Chart F. Plot the speedo meter chart for the point e F. Explore basic functionalities of Macro
2	Develop Following Program Using HTML5 a. Develop the simple bar chart using TML5 CANVAS b. Read the data .txt file and draw Data Table c. Read the data .txt file and draw Simple Bar Chart d. Read the data .csv file and draw Data Table e. Read the data .csv file and draw Column Bar Chart f. Read the data XML file and draw Data Table g. Read the data XML file and draw Simple Bar Chart h. Read JSON Data and draw Data Table

	i. Read JSON Data and draw Simple Chart
3	Implement Tableau Dashboard for appropriate data
4	Develop different charts like Histograms, Line Plot, Density plot, Scatter plot, Boxplot, Pair plot, HeatMap, Pareto Charts, and Network Analysis using MatplotLib
5	Practice Google Charts for HTML and XML Web pages
6	Implement time series analysis using python library.
7	Mini Project to apply the visualization skills using various tools.