Course Code: **23CS0921**

R23

SIDDHARTA INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road–517583
Subject with Code: Data Visualization (23CS0921) **Year & Sem:** III B.Tech. & I Sem
Course & Branch: CSM & CAI **Regulation:** R23

UNIT I: Introduction to Data Visualization & Perception

1	**a**	Define data visualization and discuss its importance in modern data analysis.	**[CO1, L2]**	**5M**
	b	Explain the scope of data visualization across multiple domains.	**[CO1, L2]**	**5M**
2	**a**	Explain various data types used in data visualization with suitable examples.	**[CO1, L2]**	**5M**
	b	What are the different sources of data for visualization?	**[CO1, L1]**	**5M**
3		Explain pre-attentive attributes with examples.	**[CO1, L2]**	**10M**
4		Explain Gestalt principles of perception with diagrams.	**[CO1, L2]**	**10M**
5		Define the concept of Data-Ink Ratio in data visualization. Discuss Edward Tufte's five Data-Ink Laws with suitable examples	**[CO1, L3]**	**10M**
6		Define Data Density in data visualization. Explain its different types with suitable examples. List out advantages and Disadvantages.	**[CO1, L3]**	**10M**
7		Describe the stages of the visualization process from raw data to insight.	**[CO1, L2]**	**10M**
8	**a**	List and explain key visualization design principles.	**[CO1, L1]**	**5M**
	b	Explain the Lie Factor in data visualization with one example.	**[CO1, L2]**	**5M**
9		List out various data visualization tools used in data analysis. Compare Tableau and Power BI.	**[CO1, L2]**	**10M**
10	**a**	Define data visualization.	**[CO1, L1]**	**2M**
	b	List two types of data used in visualizations.	**[CO1, L1]**	**2M**
	c	What is a pre-attentive attribute?	**[CO1, L1]**	**2M**
	d	State the purpose of the Data-Ink Ratio.	**[CO1, L1]**	**2M**
	e	Name tools used for data visualization.	**[CO1, L1]**	**2M**

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UNIT II: Visualization Techniques for Categorical & Quantitative Data

1	**a**	Discuss various types of bar charts with use cases.	**[CO2, L2]**	**5M**
	b	Write a short note on pie charts. Mention their applications, advantages, and disadvantages.	**[CO2, L2]**	**5M**
2	**a**	Explain the role of column charts in data comparison with diagram.	**[CO2, L2]**	**5M**
	b	Discuss various types of histogram plots with neat sketch.	**[CO2, L2]**	**5M**
3		Explain the construction of a boxplot and discuss its importance in spotting outliers.	**[CO2, L3]**	**10M**
4	**a**	Differentiate between line charts and bar charts with neat sketch.	**[CO2, L4]**	**5M**
	b	Write a short note on scatter plots.	**[CO2, L2]**	**5M**
5	**a**	What is a bubble chart? Describe its features and use cases with a diagram.	**[CO2, L2]**	**5M**
	b	Explain the advantages and limitations of a bubble chart.	**[CO2, L2]**	**5M**
6		Explain the purpose and use of heatmaps with examples.	**[CO2, L3]**	**10M**
7		What factors should be considered when choosing the right chart type for data visualization?	**[CO2, L2]**	**10M**
8	**a**	What are the best practices for axis titles, legends, and data labels?	**[CO2, L2]**	**5M**
	b	Discuss the role of coloring and scaling in charts.	**[CO2, L3]**	**5M**
9		Explain how to create an effective chart, including choosing the right type, labeling, using colors, and scaling. Give examples.	**[CO2, L3]**	**10M**
10	**a**	Define a bar chart and state the use cases.	**[CO2, L1]**	**2M**
	b	What is the main difference between a histogram and a bar chart?	**[CO2, L2]**	**2M**
	c	Write two advantages of using a scatter plot for quantitative data.	**[CO2, L2]**	**2M**
	d	What is the purpose of boxplots in data visualization?	**[CO2, L2]**	**2M**
	e	Mention two best practices in labeling and coloring charts.	**[CO2, L2]**	**2M**

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UNIT III: Multidimensional, Temporal and Hierarchical Data Visualization

1		Explain the concept of Parallel Coordinates with an example. How are they used for multivariate data analysis?	**[CO3, L3]**	**10M**
2		Describe the construction and interpretation of a Radar Chart. Discuss its advantages and limitations.	**[CO3, L2]**	**10M**
3		What are the key techniques for Time-Series Visualization? Explain with suitable diagrams.	**[CO3, L2]**	**10M**
4		How can Animation over Time improve temporal data visualization? Discuss with examples.	**[CO3, L3]**	**10M**
5		Explain the role of Geographic Data Visualization. Compare Maps and Choropleths with use cases.	**[CO3, L4]**	**10M**
6		Discuss the working and applications of Treemaps in hierarchical data visualization.	**[CO4, L3]**	**10M**
7		Explain the design principles and interpretation of Sunburst Charts for representing hierarchical structures.	**[CO4, L2]**	**10M**
8		Explain the importance of Network and Graph Visualization in analyzing relationships. Give examples of suitable tools or techniques.	**[CO4, L3]**	**10M**
9		Compare and contrast Multivariate, Temporal, and Hierarchical Data Visualization techniques with suitable examples.	**[CO4, L4]**	**10M**
10	**a**	What is a Parallel Coordinates Plot?	**[CO3, L1]**	**2M**
	b	What is the role of Animation in Time-Series Visualization?	**[CO3, L1]**	**2M**
	c	Differentiate between Maps and Choropleths.	**[CO3, L1]**	**2M**
	d	Mention some features of a Sunburst Chart.	**[CO4, L1]**	**2M**
	e	Write challenges in Network Visualization.	**[CO4, L1]**	**2M**

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UNIT IV: Data Visualization Using Python and Dashboards

1		Explain the features of Matplotlib, Seaborn, and Plotly in detail. Compare their advantages, limitations, and use cases with suitable examples.	**[CO5, L4]**	**10M**
2		Describe the process of creating static and interactive charts in Python.	**[CO5, L3]**	**10M**
3	**a**	Discuss the data visualization capabilities of Pandas.	**[CO5, L2]**	**5M**
	b	How can Pandas be used to generate quick plots for exploratory data analysis?	**[CO5, L3]**	**5M**
4		What are dashboards in data visualization? Explain the role of Dash, Streamlit, and Power BI in building dashboards.	**[CO5, L2]**	**10M**
5		Explain the step-by-step procedure to create an interactive dashboard using Dash framework.	**[CO5, L3]**	**10M**
6		Discuss the challenges in data visualization using Python and dashboarding tools. Suggest solutions and best practices with examples.	**[CO5, L4]**	**10M**
7		Discuss the role of Power BI in business reporting and dashboarding.	**[CO5, L2]**	**10M**
8		Explain key steps in transforming raw data into an interactive visual dashboard.	**[CO5, L3]**	**10M**
9		Illustrate with a case study how Python visualization libraries can transform raw datasets into meaningful visual insights.	**[CO5, L4]**	**10M**
10	**a**	What is the main difference between Matplotlib and Seaborn in Python visualization?	**[CO5, L1]**	**2M**
	b	Define a dashboard in the context of data visualization.	**[CO5, L1]**	**2M**
	c	Name two Python libraries used for creating interactive charts.	**[CO5, L1]**	**2M**
	d	List two types of charts that can be created using Panda's visualization capabilities.	**[CO5, L1]**	**2M**
	e	Mention one advantage of using Plotly over Matplotlib for data visualization.	**[CO5, L1]**	**2M**

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UNIT V: Storytelling with Data and Ethical Visualization

1		Define the concept of storytelling in data visualization and explain its significance in enhancing data interpretation.	**[CO6, L2]**	**10M**
2	**a**	Identify and describe the key narrative techniques used in data storytelling.	**[CO6, L2]**	**5M**
	b	Illustrate with a practical example how incorporating a narrative in data visualization improves user comprehension and insight.	**[CO6, L3]**	**5M**
3		Discuss the principles of dashboard design and their application in business reporting for effective decision-making.	**[CO6, L2]**	**10M**
4		Define misleading visualizations and their characteristics. Provide an example of a misleading visualization and critically analyze its potential impact on decision-making.	**[CO6, L4]**	**10M**
5		Examine the various types of bias that can occur in data visualizations and discuss strategies to minimize or prevent them.	**[CO6, L4]**	**10M**
6		Explain the ethical principles and best practices that should guide the creation and presentation of data visualizations.	**[CO6, L2]**	**10M**
7		Design a visual storytelling framework using a publicly available dataset and describe the structure and rationale behind your design.	**[CO6, L4]**	**10M**
8		Compare and contrast dashboards and infographics in terms of their effectiveness for storytelling and communicating data insights.	**[CO6, L4]**	**10M**
9		Outline a step-by-step approach for developing a comprehensive storytelling dashboard using real-world data, emphasizing design, functionality, and narrative flow.	**[CO6, L3]**	**10M**
10	**a**	Define storytelling in data visualization.	**[CO6, L1]**	**2M**
	b	Name two narrative techniques used in data storytelling.	**[CO6, L1]**	**2M**
	c	What is a dashboard in the context of business reporting?	**[CO6, L1]**	**2M**
	d	Give examples of a misleading visualization.	**[CO6, L1]**	**2M**
	e	Mention ethical principles to follow in data visualization.	**[CO6, L1]**	**2M**