

Branch Name:	BCA (Bachelor of Computer Applications)
Program Code:	CS101
Course Title:	Data Visualization
Course Code:	24-DSE205-2C
Pre-requisite Course:	Basic familiarity with computers and logical thinking.

Course Objective:

This course is intended to make the students:

- To introduce concepts of data visualization and its importance in decision-making.
- To develop practical skills using MS Excel visualization tools.
- To help commerce and arts students understand data visually.
- To enable students to create meaningful charts and dashboards.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	
2	-	2	3	09	25	09	25	-	-	09	25	75

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1.	Introduction to Data Visualization : • Definition and Importance of Data Visualization • Role in Decision Making • Types of Data: ○ Numerical ○ Categorical ○ Temporal ○ Geographical • Data Visualization Process: ○ Data Collection ○ Exploration ○ Analysis ○ Visualization ○ Interpretation	12	25
2.	Visualization tools & Data Storytelling: • Overview of Tools: ○ MS Excel (Focus) ○ Power BI (Introduction) ○ Tableau (Basic awareness) ○ Python (Only awareness) • Comparison of Tools (Simple level) • Principles of Data Storytelling: ○ Narrative ○ Context • Best Practices for Dashboard Layout • Interactivity in dashboards	12	25

3.	Designing Effective Visualizations: Principles of good visualization design: clarity, simplicity, accuracy, choosing appropriate charts, understanding and proper use of colors, avoiding clutter and over-design, importance of labels, titles and legends, introduction to data modeling: organizing and structuring data for visualization, identifying patterns, trends and comparisons, improving poor visualizations with better design techniques.	12	25
4.	Excel-Based Advanced Visualization: Understanding insights from charts and graphs, identifying trends, patterns and relationships in data, comparison of datasets using visual methods, common errors in visualization and how to avoid them, evaluating effectiveness of visualizations, real-world applications in business, education, healthcare and government sectors, role of visualization in decision making, introduction to case studies: sales analysis, student performance analysis, social data visualization, basics of report writing using visual data, ethical considerations in visualization: avoiding bias and misrepresentation. • Advanced Charts (Combo, Area, Histogram) • Conditional Formatting • Slicers and Filters • Interactive Dashboard Creation • Case Study (Business / Rural Data)	12	25

Course Learning Outcomes (CLO):

At the end of this course, the student would be able

1. **CLO1:** Understand the concepts, importance, and process of data visualization along with different types of data.
2. **CLO2:** Identify and compare basic visualization tools and apply principles of data storytelling for effective communication.
3. **CLO3:** Apply design principles to create clear, simple, and accurate visualizations using appropriate charts and color usage.
4. **CLO4:** Analyze charts and visual data to identify trends, patterns, and relationships for decision making.
5. **CLO5:** Create interactive dashboards and advanced visualizations using tools like MS Excel with features such as filters, slicers, and conditional formatting.
6. **CLO6:** Interpret visual data and prepare reports based on real-world datasets while considering ethical aspects of data presentation.

List of Text book:

1. "Storytelling with Data: A Data Visualization Guide for Business Professionals" Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015.
2. "The Visual Display of Quantitative Information" by Edward Tufte, Graphics Press USA; 2nd edition, 2001.

List of Reference book:

1. "Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press, 2018.
2. "Analyzing Data with Power BI and Power Pivot for Excel", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017.
3. "Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition, 2018.

E-Resources/ Web Links:

1. <https://learn.microsoft.com/en-us/power-bi/>
2. <https://www.storytellingwithdata.com/>
3. https://jpsm.umd.edu/sites/jpsm.umd.edu/files/syllabi/Syllabus_Introduction%20to%20Data%20Visualization_Spring%202024.pdf

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

Practical List

No.	Program Description
1.	Identify and classify different types of data (numerical, categorical, temporal, geographical) from a dataset.
2.	Create basic charts such as bar, line, and pie charts using Excel.
3.	Perform data cleaning by removing duplicates and handling missing values.
4.	Apply sorting and filtering techniques to explore the dataset.
5.	Use basic Excel formulas like SUM, AVERAGE, COUNTIF, and IF for data analysis.
6.	Create a line chart to analyze trends over time.
7.	Use bar charts to compare different categories of data.
8.	Create a histogram to understand data distribution.
9.	Apply conditional formatting to highlight important values in data.
10.	Create Pivot Tables and Pivot Charts to summarize data.
11.	Design advanced charts such as combo and area charts.
12.	Use slicers and filters to make data interactive.
13.	Develop a simple interactive dashboard in Excel.
14.	Create basic visualizations using Tableau or Power BI.
15.	Perform a mini project by analyzing real-world data and presenting insights using a dashboard.

Mapping of CLO, PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M	M	L	H	L	L	L	M	L	L	L	L	M	L	M
CLO2	M	H	L	H	M	L	M	H	L	M	L	L	M	M	M
CLO3	L	H	L	H	H	M	M	L	L	L	L	L	M	L	H
CLO4	M	H	M	H	H	M	H	L	L	M	L	L	H	M	H
CLO5	M	H	L	H	H	H	M	M	M	M	L	L	H	M	H
CLO6	H	H	M	H	M	M	H	H	M	H	M	M	H	H	H

H: High, M: Medium, L: Low