

Branch Name:	M.Sc. (Artificial Intelligence & Data Science)
Program Code:	ET214
Course Title:	Data Visualization & Modelling
Course Code:	1ET2140104
Pre-requisite Course:	Basic knowledge of Statistics, Database Management Systems, and Programming for Data Analysis (Python/R).

Course Objectives:

1. To familiarize students with the fundamental concepts, principles, and techniques of data visualization and storytelling.
2. To enable transformation of raw data into meaningful visual insights for analytical decision-making.
3. To introduce visual design principles, chart selection methods, and cognitive aspects of visualization.
4. To develop skills in creating interactive dashboards and business intelligence reports.
5. To apply storytelling techniques to communicate analytical findings effectively for real-world decision making.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	50	25	25	150

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Foundations of Data Visualization & Storytelling: Introduction to Data and Types of Data, Importance of Visualization in Analytics, Principles of Effective Data Visualization, Types of Graphs and Charts, Common Visualization Mistakes, Introduction to Data Storytelling	9	22%
2	Visual Design Principles & Data Preparation: Data Collection and Cleaning Techniques, Selecting Appropriate Visualization Methods, Visual Perception and Cognitive Principles, Colour Theory and Visual Hierarchy, Comparison, Distribution and Relationship Visualization, presentation and Reporting Strategies	9	22%
3	Interactive Visualization & Dashboard Design: Interactive Visualization Concepts, Dashboard Design Principles, Key Performance Indicators (KPIs), Time-Series and Trend Analysis, Geographic Information Systems (GIS), Ethical Considerations in Data Display	10	24%
4	Advanced Visualization & Emerging Trends: Big Data Visualization Challenges, AI-driven Visualization and Automated Insights, Business Intelligence and Decision Support Systems, Predictive and Real-Time Visualization, Data Governance and Privacy in Visualization	8	20%
5	Case Studies in Applied Data Visualization: Academic Performance Analytics, Retail and Sales Dashboard Analysis, Healthcare Data Visualization, Financial Data Reporting, Storytelling for Strategic Decision Making	6	12%

Text Books:

1. Cole Nussbaumer Knaflitz – *Storytelling with Data*, Wiley.
2. Edward Tufte – *The Visual Display of Quantitative Information*, Graphics Press.
3. Alberto Cairo – *The Truthful Art*, New Riders.

Reference Books:

1. Claus O. Wilke – *Fundamentals of Data Visualization*, O'Reilly.
2. Andy Kirk – *Data Visualisation: A Handbook for Data Driven Design*, Sage.
3. Stephen Few – *Information Dashboard Design*, Analytics Press.
4. Tamara Munzner – *Visualization Analysis and Design*, CRC Press.

Recommended Tools

MS Excel, Power BI, Tableau, Python (Matplotlib, Seaborn, Plotly), Google Data Studio

LIST OF EXPERIMENTS / PRACTICALS:

1. Install and set up Excel, Tableau Public, Power BI Desktop, and Python (Anaconda) and learn how to import CSV/Excel datasets to explore data structure.
2. Open datasets in Excel/Tableau/Python and identify rows, columns, and data types to understand structured data organization.
3. Perform data cleaning by removing duplicates, handling missing values, filtering data, and creating calculated fields.
4. Create basic visualizations such as bar, line, pie, histogram, and scatter charts using suitable tools.
5. Select appropriate visualization techniques based on data type and justify the chart choice using real datasets.
6. Develop interactive visualizations using filters, slicers, drill-down features, and tooltips in Tableau or Power BI.
7. Design a single-page dashboard including KPIs, charts, and trend indicators using proper layout and visual hierarchy.
8. Create geographic visualizations such as location maps and choropleth maps using Tableau, Power BI, or Python.
9. Develop a data storytelling presentation by extracting key insights from a dataset and supporting them with appropriate visualizations.
10. Conduct an ethical review of visualizations by identifying misleading charts and improving clarity and accuracy.
11. Execute a mini project using a real-world dataset that includes data cleaning, visualization creation, dashboard development, and analytical reporting.

Course Learning Outcomes (CLO):

CO	Statement	Bloom's Level
CO1	Understand principles, techniques, and importance of data visualization and storytelling	L2 – Understand
CO2	Apply appropriate visualization methods for different types of datasets	L3 – Apply
CO3	Analyze interactive dashboards and visual reports for data-driven insights	L4 – Analyze
CO4	Evaluate visualization effectiveness considering design, ethics, and user cognition	L5 – Evaluate
CO5	Develop complete data storytelling dashboards and presentations for real-world decision making	L6 – Create

Mapping of CLO with 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	PSO4
CLO1	M	M	–	–	M	–	–	–	L	H	–	M	M	M	L	M
CLO2	M	H	M	M	H	–	–	–	M	H	–	M	H	H	M	M
CLO3	M	H	M	H	H	–	–	–	M	H	M	M	H	H	M	M
CLO4	M	M	H	H	H	M	M	M	M	H	M	M	H	H	M	H
CLO5	M	H	H	H	H	M	L	M	H	H	H	H	H	H	H	H

H:High, M:Medium, L:Low