

As Per NEP 2020

University of Mumbai



Syllabus for Basket of OE Vertical 3

Faculty of Science and Technology

Board of Studies in Data Science

Second Year Programme

Semester

III

Title of Paper

Credits

Data Visualization

2

From the Academic Year

2025-26

Title of Paper: Data Visualization

Sr.No.	Heading	Particulars
1	Description of the course: Including but not limited to:	This course introduces students to the fundamentals of data visualization using Power BI and Tableau. Students will learn to create interactive dashboards, design compelling visual narratives, and analyze data effectively. Key topics include data connection, transformation, visualization techniques, and report publishing. By the end of the course, students will be proficient in leveraging these tools to derive actionable insights from data.
2	Vertical:	Open Elective
3	Type:	Practical
4	Credit:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	Hours Allotted:	60 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives (CO): CO1: To introduce students to data visualization concepts and techniques using either Tableau or Power BI. CO2: To develop proficiency in creating interactive dashboards, charts, and reports for data-driven decision-making. CO3: To equip students with advanced visualization techniques, including geospatial analysis, time-series forecasting, and parameter-based interactivity. CO4: To enable students to apply DAX (Power BI) or LOD Expressions (Tableau) for advanced analytics and automation in reporting.	
8	Course Outcomes (OC): OC1: Students will be able to connect and manipulate datasets from various sources, perform filtering, sorting, and aggregation in Tableau or Power BI. OC2: Students will create and customize various charts, maps, and dashboards, applying conditional formatting and interactivity for enhanced insights. OC3: Students will implement advanced visualization techniques, such as drill-throughs, parameter-based filtering, and predictive analytics using either DAX (Power BI) or LOD Expressions (Tableau). OC4: Students will develop and publish dynamic dashboards, automate reporting workflows, and apply security controls for professional business intelligence solutions.	

9	Modules:	
	Module 1: Fundamental Data Visualization Techniques	30 Hrs
	1. Connecting to Data Sources – Load and connect datasets from Excel, CSV, and databases in Tableau or Power BI. 2. Creating Basic Charts – Develop bar charts, line charts, and scatter plots using Tableau or Power BI visualization tools. 3. Filtering and Sorting Data – Apply filters and sorting techniques to refine data visualizations in Tableau or Power BI. 4. Building Interactive Dashboards – Combine multiple visual elements to create an interactive dashboard in Tableau or Power BI. 5. Using Slicers or Filters for Interactivity – Implement slicers in Power BI or interactive filters in Tableau to enhance reports. 6. Aggregations and Calculated Fields – Create custom calculations using DAX (Power BI) or Calculated Fields (Tableau). 7. Mapping Data – Visualize geographical information using maps in Tableau or Power BI. 8. Dual-Axis and Combo Charts – Create combined visualizations for trend comparisons in Tableau or Power BI. 9. Time-Series Analysis – Analyze trends over time using date fields and time-based visualizations in Tableau or Power BI. 10. Heatmaps for Data Density – Create heatmaps to visualize variations in datasets using Tableau or Power BI. 11. Hierarchies and Drill-Downs – Implement drill-down features using hierarchies in Tableau or Power BI. 12. Conditional Formatting – Use color scales and conditional formatting to highlight insights in Tableau or Power BI. 13. Adding Reference Lines and Forecasting – Apply trend lines, reference lines, and forecasts in Tableau or Power BI. 14. Designing KPI Dashboards – Build a KPI (Key Performance Indicator) dashboard for business analysis in Tableau or Power BI. 15. Pivoting and Unpivoting Data – Reshape data using pivot and unpivot transformations in Tableau or Power BI.	
	Module 2: Advanced Data Visualization Techniques	30 Hrs
	1. Data Blending and Joins – Combine multiple datasets using joins or relationships in Tableau or Power BI. 2. Custom Tooltips for Enhanced Insights – Create dynamic tooltips with additional data in Tableau or Power BI. 3. Advanced Calculations – Implement DAX (Power BI) or LOD Expressions (Tableau) for complex aggregations. 4. Drill-Through and Conditional Navigation – Enable drill-through pages for deeper insights in Tableau or Power BI.	

	5. Storytelling with Data – Develop an interactive data story using storyboards in Tableau or bookmarks in Power BI. 6. Parameter-Based Visualizations – Use parameters to dynamically change data views in Tableau or Power BI. 7. Advanced Mapping Techniques – Implement choropleth maps, filled maps, and heatmaps in Tableau or Power BI. 8. Dynamic Dashboards with Real-Time Data – Build dashboards that update automatically with live data in Tableau or Power BI. 9. Embedding Python or R Scripts – Use Python (Power BI) or R (Tableau) for predictive analytics and machine learning. 10. Row-Level Security (RLS) – Implement security controls to restrict data access based on user roles in Tableau or Power BI. 11. Automating Reports and Alerts – Set up automated report generation and data alerts in Tableau Server or Power BI Service. 12. Waterfall and Funnel Charts – Create specialized financial and sales performance visualizations in Tableau or Power BI. 13. Sankey and Sunburst Charts – Develop advanced flow and hierarchical visualizations using custom charts in Tableau or Power BI. 14. Building Interactive Reports for Business Insights – Design end-to-end dashboards with drill-downs and interactivity in Tableau or Power BI. 15. Publishing and Sharing Dashboards – Deploy reports using Tableau Public, Tableau Server, or Power BI Service.		
10	Textbooks: 1. Fundamentals of Data Visualization, Claus Wilke, O'Reilly Media, 2019. 2. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O'Reilly, 2016.		
11	Reference Books: 1. Data Analysis and Visualization Using Python, Ossama Embarak, Apress, 2018		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Students are expected to attend each practical and submit the written practical of the previous session. Performing Practical and writeup submission will be continuous internal evaluation. 2.5 marks can be awarded for each practical performance and writeup submission totaling to 50	Format of Question Paper: 30 marks practical exam of 2 hours duration	

	marks and can be converted to 20 marks.	
14	Format of Question Paper: Duration 2 hours. A certified copy of Journal is compulsory to appear for the practical examination Practical Slip: Q1. From Module 1 13 marks Q2. From Module 2 12marks Q3. Journal and Viva 05 marks	

Sd/-
Sign of the BOS
Chairman
Dr. Srivaramangai R
BOS in Data Science

Sd/-
Sign of the
Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science &
Technology

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Sign of the Offg. Dean
Prof. Shivram S. Garje
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Technology