| Course Type | Course Code | Name of the Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| DP | NMCC532 | Data Visualization With Python | 0 | 0 | 3 | 1.5 |

| **Course Objective** |
|---|
| The students shall be able to design, analyze, and implement effective data visualizations using Python, with emphasis on perception-aware design, exploratory analysis, and communication of insights for real-world applications. |
| **Learning Outcomes** |
| Visualization design principles, exploratory data analysis, statistical and multivariate visualization, interactive dashboards, and data storytelling shall be the main focus and upon completion of this course, one could critically evaluate visualizations, extract insights from complex datasets, and communicate findings effectively. |

| Unit No. | Topics to be Covered | Lecture Hours | Learning Outcome |
|---|---|---|---|
| 1 | Visualization Basics**:** Role of visualization in analysis and decision-making, types of data, data acquisition and preprocessing, visualization design principles, perception (color, position, scale), common pitfalls and misleading visuals, introduction to Python libraries (Matplotlib, Seaborn, Pandas). | 9 | The students shall be able to understand visualization principles, preprocess real-world data, and design correct and meaningful basic visualizations. |
| 2 | Distribution Analysis: Histogram, KDE, Boxplot, Violin plot, cumulative distributions, skewness, spread, outlier detection, normalization and scaling effects, exploratory data analysis (EDA) techniques. | 6 | The students shall be able to analyze data distributions, identify anomalies, and perform exploratory analysis for insight generation. |
| 4 | Comparisons & Time Series: Bar charts (grouped, stacked), categorical comparisons, line plots, trend and seasonality analysis, moving averages, handling missing and irregular time-series data. | 6 | The students shall be able to visualize comparisons and temporal variations effectively for analytical and forecasting tasks. |
| 5 | Interactive & Advanced Visualization: Multivariate visualization, faceting and subplots, interactive visualization using Plotly, dashboard design principles, geospatial visualization (maps, heatmaps), introduction to large-scale and high-dimensional data visualization | 9 | The students shall be able to design interactive dashboards and visualize complex, multi-dimensional datasets effectively. |
| 6 | Data Storytelling & Applications: Case studies on real datasets (scientific, financial, societal), critique and redesign of visualizations, integration of multiple plots, narrative building, practical lab examination | 6 | The students shall be able to synthesize analysis into coherent visual narratives and communicate insights effectively. |
| 7 | Practice session and Practical Lab Exam. | 6 | |
| | **Total** | **42** | |

Text Books:


1. Kieran Healy, Data Visualization: A Practical Introduction, Princeton University Press, 2019.
2. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly Media, 2019.


Reference Books:


1. Cole Nussbaumer Knaflic, Storytelling with Data, Wiley, 2015.
2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016.