JADAVPUR UNIVERSITY
COMPUTER AIDED DESIGN CENTRE
Dept. of Computer Science & Engineering
Kolkata - 700 032

Certificate Course on
Data Analysis and Visualizations using Python

Background

In today's data-driven world, organizations rely on meaningful insights to make informed decisions. Python has become a preferred programming language for data science due to its simplicity and the power of libraries such as NumPy, Pandas, and Seaborn. Complementing these, tools like Power BI, Tableau, and KNIME empower users to create dynamic dashboards, automate workflows, and simplify data-driven decision-making. This course is designed for beginners and early professionals interested in developing practical data analysis and visualization skills, bridging technical programming with business intelligence platforms to meet the growing demand for data-savvy professionals.

Objective

The primary objective of this course is to equip learners with foundational and practical skills in data analysis and visualization using Python libraries and leading business intelligence platforms. This course bridges the gap between raw data and actionable intelligence by teaching participants how to extract, analyze, and visualize data effectively. The course has been designed to help students identify their professional strengths in data handling, visualization, and workflow automation, enabling them to pursue further specialization and establish themselves as future-ready data professionals.

Course Outcomes

On successful completion of the course, learners will be able to:

- Understand and apply Python basics for data analysis workflows.
- Use NumPy and Pandas to manipulate, clean, and analyse datasets effectively.
- Apply analytical techniques such as regression, clustering, and other data models.
- Gain hands-on experience with Power BI and Tableau to build interactive dashboards and reports.
- Develop beginner-level proficiency in KNIME for workflow automation and data integration.
- Interpret analytical outputs to support data-driven decision-making in real-world scenarios.

Course Duration:	20 weeks (Total 120 hrs.), (3 days/week)
Course fees:	Rs. 23,600/- (18% GST included)
Class Duration:	Theory and Lab both 2 hrs./ Class
Eligibility:	Ongoing degree/diploma students or professionals from Engineering/Science/ Business/Economics streams.

Sl. No.	Topic	No. of theory classes	No. of Lab classes	Total No. of classes
1	Fundamentals of data and analytics	1	-	1
2	Python basics, Working with Structured Data	4	7	11
3	NumPy: Numerical computation in Python	3	3	6
4	Data Preparation with Pandas	2	3	5
5	Graphical Python using Seaborn	1	3	4
6	Regression analysis	4	5	9
7	Clustering	2	4	6
8	Introduction to Microsoft Power BI	1	2	3
9	DAX with Power BI	1	2	3
10	Data Visualization with Tableau	--	3	3
11	KNIME Workflow Development	1	3	4
12	Project	--	5	5

Examination: *One theory test of 50 marks and one lab test of 50 marks at the end of the course.*

Total Class: 60 (Theory: 20, Practical: 40)

Course Coverage

- **Module 1: Foundations of Data and Analytics (5T + 7L)**

  Introduction to Data Analytics: Overview of data analytics, Types of data analytics (descriptive, diagnostic, predictive, prescriptive). The data analytics process. Overview of Business intelligence. Python Basics: Variables, data types, and operators. Control flow (loops, conditionals). Functions and modules.

- **Module 2: Python for Data Analysis (5T + 6L)**

  Data manipulation using Numpy, Data Manipulation with Pandas: Data Frames and Series. Data cleaning and transformation. Data aggregation and grouping.

- **Module 3: Python for Data Visualizations (1T+3L)**

  Data Visualization with Matplotlib and Seaborn: Creating basic plots (line, bar, scatter), Customizing plots for effective communication. Statistical visualizations.

- **Module 4: Data analysis techniques with Python (6T+9L)**

  Regression (Linear & Logistic), advanced regression (Multiple & Polynomial), Clustering.

- **Module 5: Power BI for Business Intelligence (2T+4L)**

  Power BI Desktop interface. Connecting to data sources. Data modeling and relationships. DAX (Data Analysis Expressions): Calculated columns and measures. Time intelligence functions, Creating Interactive Dashboards: Visualizations and reports. Dashboard design principles. Publishing and sharing dashboards.

- **Module 6: Tableau for Advanced Visualization (3L)**

  Tableau Basics: Tableau Desktop interface. Connecting to data sources, Creating worksheets and dashboards. Advanced Visualization Techniques: Calculated fields and parameters. Maps and geospatial analysis, Interactive dashboards and stories. Tableau Prep: Data cleaning within Tableau.

- **Module 7: KNIME for Data Workflows (1T+3L)**

  KNIME Fundamentals: KNIME Analytics Platform interface. Building data workflows. Data integration and transformation. Data Preprocessing and Modeling: Data cleaning and feature engineering. Basic statistical analysis. Workflow automation. KNIME for reporting. Creating reports from KNIME workflows.

- **Project Work**