Here's a comprehensive course outline for **"Python for Data Analysis and Visualization"**:

**Course Title: Python for Data Analysis and Visualization**

**Course Duration: 6-8 Weeks**

**Prerequisites: Basic programming knowledge (preferred but not required)**

**Tools & Libraries: Python, NumPy, Pandas, Matplotlib, Seaborn, Plotly**

**Module 1: Introduction to Python for Data Analysis**

* Overview of Python for data analysis
* Setting up the environment (Jupyter Notebook, Anaconda, Google Colab)
* Introduction to Python basics (variables, loops, functions, list comprehensions)
* Working with Python libraries for data analysis

**Module 2: Handling Data with Pandas**

* Introduction to Pandas and DataFrames
* Reading and writing CSV, Excel, and JSON files
* Data selection, filtering, and indexing
* Handling missing data and duplicates
* Data transformation (groupby, pivot tables, merging, and concatenation)

**Module 3: Exploratory Data Analysis (EDA)**

* Understanding data distributions
* Summary statistics and descriptive analysis
* Data cleaning and preprocessing
* Handling outliers and categorical data

**Module 4: Data Visualization with Matplotlib and Seaborn**

* Introduction to Matplotlib and Seaborn
* Line plots, bar charts, histograms, and scatter plots
* Customizing visualizations (titles, labels, legends, styles)
* Multi-panel visualizations (subplots and facet grids)

**Module 5: Advanced Visualization with Plotly**

* Introduction to interactive visualizations
* Creating dynamic plots (scatter, bar, line, pie charts)
* Interactive dashboards with Plotly and Dash
* Geospatial visualizations (choropleth maps)

**Module 6: Time Series Analysis**

* Introduction to time series data
* Working with datetime objects in Pandas
* Rolling and moving averages
* Trend analysis and seasonality detection

**Module 7: Data Wrangling and Feature Engineering**

* Encoding categorical variables
* Feature scaling and normalization
* Handling imbalanced data
* Automating data processing pipelines

**Module 8: Case Studies and Real-World Projects**

* Exploratory Data Analysis on real datasets (e.g., COVID-19, stock market, social media data)
* Interactive dashboards for business insights
* End-to-end data visualization project

**Final Project & Certification**

* Capstone project: Apply all concepts learned
* Presentation and peer review
* Certification upon successful completion

Would you like to customize any part of this outline based on your needs? 😊