# **Data Science Course Outline**

## Week 1-2: Python Fundamentals

- Introduction to Python

- Prerequisite Coding

- Basic Python Syntax

- Variables and Data Types

- Operators and Expressions

- Control Flow (if statements, loops)

- Functions and Modules

- Lists, Tuples, and Dictionaries

- File Handling in Python

- Exception Handling

- Introduction to NumPy and Pandas

This foundational week aims to ensure that all students possess a robust understanding of fundamental Python concepts, providing a solid base for the subsequent weeks.

## Week 3-5: Pandas and Exploratory Data Analysis (EDA)

- Pandas I: Introduction to Pandas

- Pandas II: Advanced Pandas Techniques

- Pandas III: Practical Applications

- Data Cleaning and EDA I: Exploring and Cleaning Data

- Data Cleaning and EDA II: Advanced EDA Techniques

## Week 6-8: Advanced EDA and Visualization

- EDA III: Exploring Patterns and Trends

- Regex (and finish EDA): Using Regular Expressions in Data Analysis

- Mini Project on EDA: Applying EDA Techniques to Real-world Data

- Visualization I: Introduction to Data Visualization

- Visualization II: Advanced Visualization with Matplotlib

- Sampling: Techniques for Data Sampling

- Visualization III: Using Seaborn and Plotly for Enhanced Visualizations

- Transformations: Data Transformations for Analysis

## Week 9-11: Modeling and Regression Techniques

- Intro to Modeling, Simple Linear Regression (SLR): Basics of Statistical Modeling

- Constant model, Loss, and Transformations: Model Evaluation and Improvement

- Sampling: Techniques for Data Sampling

- Modeling, Summary Statistics, and Loss Functions: Evaluating Model Performance

- Ordinary Least Squares: Linear Regression Method

- Gradient Descent: Optimization Technique for Model Training

- Cross-Validation and Regularization: Enhancing Model Robustness

- Logistic Regression: Binary Classification Modeling

## Week 12-15: Advanced Topics in Data Science & ML

- Neural Networks: Introduction to Neural Networks

- Convolutional Neural Networks (CNN): Image Recognition and Processing

- LSTM: Long Short-Term Memory Networks for Sequential Data

- Transformers: Attention Mechanisms in Data Science

- Nano ChatGPT from Scratch: Building a Simple Chatbot

## Week 16-18: Capstone Project

- Application of all Concepts Learned

- Data Analysis and Modeling

- Presentation and Documentation of Project

The final weeks will be dedicated to a comprehensive capstone project, allowing students to apply their knowledge and skills to solve a real-world data science problem.

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