Data Analytics and Machine Learning with Python

1. **Introduction to Programming with Python**
 1.1 Variable and Data Types
   - Numbers
   - Strings
   - Variable and memory
   - List
   - Tuple
   - Dictionary
   - Sets

 1.2 Decision and loops
   - If, elif, else
   - For and while loops
   - Break and Continue

 1.3 Function and Recursion
   - Need of using function
   - Difference between for loops and recursion
   - Writing Quality codes

 1.4 File and exception handling
   - Streams with file operation
   - Interrupts
   - Exception handling

 1.5 **Object Oriented Programming (OOP**)
   - Procedural vs Object Oriented Programming
   - Introduction to Classes
   - Inheritance, Encapsulation, Polymorphism, Abstraction

2. **Basics to Data Science**

2.1 Numerical computation with numpy
- List revisited
- Need of alternative data structure
- Multidimensional array
- Numpy introduction
- Array operation and functions
- Numpy arithmetic
- Random module with numpy
- Indexing and slicing
- Mathematical operations
- Boolean and sorting
- Advanced array techniques
- Concatenation

2.2 Data analysis with pandas
- Introduction to pandas
- Series
- Dictionary revisited
- Data Frame
- Index and reindex
- Sorting and filtering
- GroupBy mechanisms
- Exploring datasets

2.3 Data visualization
- Matplotlib introduction
- Figure and subplots
- Line plots
- Bar plot
- Scatter plots
- Histogram
- Data visualization with pandas

2.4 Essential mathematics for Data Science
- Matrix Operations
- Random Variable and Probability Distributions
- Probability
- Properties of Probability Distributions
- Mean, Median, Mode
- Variance, Skewness, Kurtosis
- Multivariate Normal Distribution
- Co-Variance, Correlation

3. Machine Learning
3.1 Introduction to machine learning
- Introduction and application of machine learning

- Challenges of Machine Learning
- Introduction to scikit-learn library
- Data Preprocessing

3.2 Supervised Learning algorithms
- Linear Regression
- Logistic Regression
- Naive Bayes
- Decision Trees
- Support Vector Machines
- Evaluating and improving machine learning models

3.3 Unsupervised Learning
- K-means clustering
- Agglomerative clustering
- Dbscan
- Principal Component Analysis
- Improving the efficiency of clustering algorithms