# **Course Outline on Python Programming**

**Section – 1 (Python Essentials)**

* **Introduction to Python:**
  + Installation and Working with Python
  + Understanding Python variables
  + Python basic Operators
  + Understanding the Python blocks
* **Introduction to Variables:**
  + Variables, expression condition and function
  + Global and Local Variables in Python
  + Packing and Unpacking Arguments
  + Type Casting in Python
  + Byte objects vs. string in Python
  + Variable Scope
* **Python Data Type:**
  + Declaring and using Numeric data types
  + Using string data type and string operations
  + Understanding Non-numeric data types
  + Understanding the concept of Casting and Boolean.
  + Strings
  + List
  + Tuples
  + Dictionary
  + Sets
* **Introduction Keywords and Identifiers and Operators**
  + Python Keyword and Identifiers
  + Python Comments, Multiline Comments.
  + Python Indentation
  + Understating the concepts of Operators
* **Control Flow**
  + Loops
  + Loops and Control Statements (Continue, Break and Pass).
  + Looping techniques in Python
  + How to use Range function in Loop.
  + Programs for printing Patterns in Python
  + How to use if and else with Loop
  + Use of Switch Function in Loop
  + Elegant way of Python Iteration
  + Generator in Python
  + How to use nested IF and Else in Python
  + How to use nested Loop in Python
  + Use If and Else in For and While Loop
  + Examples of Looping with Break and Continue Statements
  + How to use IN or NOT keyword in Python Loop.
* **Python Function, Modules and Packages**
  + Python Syntax
  + Function Call
  + Return Statement
  + Write an Empty Function in Python – pass statement.
  + Lambda / Anonymous Function
  + \*args and \*\*kwargs
  + Help function in Python
  + Scope and Lifetime of Variable in Python Function
  + Nested Loop in Python Function
  + Recursive Function and Its Advantage and Disadvantage
  + Organizing python codes using functions
  + Organizing python projects into modules
  + Importing own module as well as external modules
  + Understanding Packages
  + Programming using functions, modules & external packages
  + More example of Python Function
* **Data Structure - List**
  + What is List.
  + List Creation
  + List Length
  + List Append
  + List Insert
  + List Remove
  + List Append & Extend using “+” and Keyword
  + List Delete
  + List related Keyword in Python
  + List Reverse
  + List Sorting
  + List having Multiple Reference
  + String Split to create a List
  + List Indexing
  + List Slicing
  + List count and Looping
  + List Comprehension and Nested Comprehension
* **Data Structure - Tuple**
  + What is Tuple
  + Tuple Creation
  + Accessing Elements in Tuple
  + Changing a Tuple
  + Tuple Deletion
  + Tuple Count
  + Tuple Index
  + Tuple Membership
  + Tuple Built in Function (Length, Sort)
* **Data Structure - Dictionary**
  + Dict Creation
  + Dict Access (Accessing Dict Values)
  + Dict Get Method
  + Dict Add or Modify Elements
  + Dict Copy
  + Dict FromKeys.
  + Dict Items
  + Dict Keys (Updating, Removing, and Iterating)
  + Dict Values
  + Dict Comprehension
  + Default Dictionaries
  + Ordered Dictionaries
  + Looping Dictionaries
  + Dict useful methods (Pop, Pop Item, Str, Update etc.)
* **Data Structure - Sets**
  + What is Set
  + Set Creation
  + Add element to a Set
  + Remove elements from a Set
  + Python Set Operations
  + Frozen Sets
* **Python Exception Handling**
  + Python Errors and Built-in-Exceptions
  + Exception handing Try, Except and Finally
  + Catching Exceptions in Python
  + Catching Specific Exception in Python
  + Raising Exception
  + Try and Finally
* **Python File Handling**
  + Opening a File
  + Python File Modes
  + Closing a File
  + Writing to a File
  + Reading from a File
  + Renaming and Deleting Files in Python
  + Python Directory and File Management
  + List Directories and Files
  + Making New Directory
  + Changing Directory

**Section – 2 (Python Advanced)**

* **Python Object Oriented Programming (OOP)**
  + Concept of Class, Object and Instances
  + Constructor, Class attributes and Destructors
  + Real time use of class in live projects
  + Inheritance, Overlapping and Overloading operators
  + Adding and retrieving dynamic attributes of classes
  + Programming using Oops support
* **Python Database Interaction**
  + SQLite Database connection using Python
  + Creating and searching tables
  + Reading and Storing config information on database
  + Programming using database connections
* **Python Date Time and Calendar:**
  + Day, Month, Year, Today, Weekday
  + Date Time
  + Time, Hour, Minute, Sec, Microsec
  + Time Delta and UTC
  + StrfTime, Now
  + Time Stamp and Date Format

**Section – 3 (Python Data Processing and Visualization)**

* **NumPy**
  + What is NumPy?
  + NumPy Array Creation
  + NumPy Array Indexing
  + Transposing of NumPy Array
  + Processing NumPy Arrays
  + Summary
* **Pandas**
  + Read data from Excel File using Pandas
  + How to get record specific records Using Pandas
  + Using the Excel File class to read multiple sheets
  + Exploring the Data
  + Getting statistical information about the data
  + Reading files with no header and skipping records
  + Reading a subset of columns
  + Applying formulas on the columns
  + How to Create Pivot Table in Pandas
  + Under sting the Properties of Pivot Table in Pandas
  + Exporting the results to Excel
  + Python | Pandas DataFrame
  + Under sting the properties of DataFrame
  + Indexing and Selecting Data with Pandas
  + Pandas | Merging, Joining and Concatenating
  + Pandas | Find Missing Data and Fill and Drop NA
  + Pandas | How to Group Data
  + Other Very Useful concepts of Pandas in Python
* **MatPlotLib**
  + Bar Chart using Python MatPlotLib
  + Column Chart using Python MatPlotLib
  + Pie Chart using Python MatPlotLib
  + Area Chart using Python MatPlotLib
  + Scatter Plot Chart using Python MatPlotLib
  + Play with Charts Properties Using MatPlotLib
  + Export the Chart
  + Understanding plt.subplots() notation
  + Legend Alignment of Chart using MatPlotLib
  + Create Charts as Image
  + Other useful Properties of Charts.

**Section – 4 (AI and Machine Learning with Python)**

* **Introduction to Artificial Intelligence and Machine Learning**
  + Introduction to Data Science
  + Machine Learning introduction
  + Introduction to Correlation and Regression
  + Linear Regression and Implementation
  + Concept of Ridge & Lasso and Implementation
  + Logistic Regression and Implementation
  + Decision Tree Construction and Implementation
  + Random Forest Classifier and Implementation
  + Naïve Byes Classification and Implementation
  + KNN Algorithm and Implementation
  + Machine Learning Model Evaluation and Performance Calculations