



# Python Certification Training

## Introduction To Python

**Goal :** Give brief idea of what Python is and touch on basics.

### Objectives:

- ✧ Define Python
- ✧ Know why Python is popular
- ✧ Setup Python environment
- ✧ Discuss flow control
- ✧ Write your first Python program

### Topics:

- ✧ Get an overview of Python
- ✧ Learn about Interpreted Languages
- ✧ List the Advantages/Disadvantages of Python
- ✧ Explore Pydoc
- ✧ Start Python
- ✧ Discuss Interpreter PATH
- ✧ Use the Interpreter
- ✧ Run a Python Script
- ✧ Discuss Python Scripts on UNIX/Windows
- ✧ Explore Python Editors and IDEs
- ✧ Use Variables, Keywords, Built-in Functions, Strings, Different literals, Math operators and expressions, Writing to the screen, String formatting, Command line parameters and Flow Control.

### Hands On:

- ✧ Data types - string, numbers, dates
- ✧ Keywords
- ✧ Variables
- ✧ Literals



## Sequence & File operations

**Goal :** Learn different types of sequence structures, related operations and their usage. Also learn diverse ways of opening, reading, and writing to files.

### Objectives:

- ✧ Define Reserved Keywords and Command Line Arguments
- ✧ Describe how to Get User Input from Keyboard
- ✧ Describe Flow Control and Sequences
- ✧ Practice Working with Files
- ✧ Define and Describe Dictionaries and Sets

### Topics:

- ✧ Lists
- ✧ Tuples
- ✧ Indexing and Slicing
- ✧ Iterating through a sequence
- ✧ Functions for all sequences
- ✧ Using enumerate()
- ✧ Operators and keywords for sequences
- ✧ The xrange()function
- ✧ List comprehensions
- ✧ Generator expressions
- ✧ Dictionaries and sets.
- ✧ Working with files
- ✧ Modes of opening a file
- ✧ File attributes
- ✧ File methods

### Hands On:

- ✧ List - properties, related operations
- ✧ Tuple - properties, related operations, comparison with list



- ✧ Dictionary - properties, related operations, comparison with list
- ✧ Set - properties, related operations, comparison with dictionary

## **Deep Dive - Functions, Sorting, Errors & Exceptions, Regular Expressions & Packages**

**Goal :** Learn how to create generic python scripts, how to address errors/exceptions in code and finally how to extract/filter content using regex.

### **Objectives:**

- ✧ Explain Functions and various forms of Function Arguments
- ✧ Explain Standard Library
- ✧ Define Modules
- ✧ Describe Zip Archives and Packaging

### **Topics:**

- ✧ Functions
- ✧ Function Parameters
- ✧ Global variables
- ✧ Variable scope and Returning Values
- ✧ Sorting
- ✧ Alternate Keys
- ✧ Lambda Functions
- ✧ Sorting collections of collections
- ✧ Sorting dictionaries
- ✧ Sorting lists in place
- ✧ Errors and Exception Handling
- ✧ Handling multiple exceptions
- ✧ The standard exception hierarchy using Modules
- ✧ The Import statement
- ✧ Module search path
- ✧ Package installation ways Module Aliases and Regular Expressions

### **Hands On / Demo :**

- ✧ Functions - syntax, arguments, keyword arguments, return values
- ✧ Lambda - features, syntax, options, comparison with functions



- ✧ Sorting - sequences, dictionaries, limitations of sorting
- ✧ Errors and exceptions - types of issues, remediation
- ✧ Packages and module - modules, import options, sys path

## Object Oriented Programming in Python

**Goal :** Understand the Object-Oriented Programming world in Python and use of standard libraries.

### Objectives:

- ✧ Implement Regular Expression and its Basic Functions
- ✧ Use Classes, Objects, and Attributes
- ✧ Develop applications based on Object Oriented Programming and Methods

### Topics:

- ✧ The sys Module
- ✧ Interpreter information
- ✧ STDIO
- ✧ Launching external programs
- ✧ Paths
- ✧ Directories and filenames
- ✧ Walking directory trees
- ✧ Math Function
- ✧ Random Numbers
- ✧ Dates and Times
- ✧ Zipped Archives
- ✧ Introduction to Python Classes
- ✧ Defining Classes
- ✧ Initializes
- ✧ Instance methods
- ✧ Properties
- ✧ Class methods and data
- ✧ Static methods
- ✧ Private methods and Inheritance

### Hands On:

- ✧ Regular expressions - regex library, search/match object, findall, sub, compile



- ✧ Classes - classes and objects, access modifiers, instance and class members
- ✧ OOPS paradigm - Inheritance, Polymorphism and Encapsulation in Python

## **Debugging , Databases and project Skeletons**

**Goal :** Learn how to debug, how to use databases and how a project skeleton looks like in Python.

### **Objectives:**

- ✧ Debug python scripts using pdb
- ✧ Debug python scripts using IDE
- ✧ Classify Errors
- ✧ Develop Unit Tests
- ✧ Create project Skeletons
- ✧ Implement Database using SQLite
- ✧ Perform CRUD operations on SQLite database

### **Topics:**

- ✧ Debugging
- ✧ Dealing with errors
- ✧ Using unit tests
- ✧ Project Skeleton
- ✧ Required packages
- ✧ Creating the Skeleton
- ✧ Project Directory
- ✧ Final Directory Structure
- ✧ Testing your set up
- ✧ Using the skeleton
- ✧ Creating a database with SQLite 3
- ✧ CRUD operations
- ✧ Creating a database object.

### **Hands On:**

- ✧ Debugging - debugging options, logging, troubleshooting
- ✧ Unit testing - TDD, unittest library, assertions, automated testing
- ✧ Project skeleton - industry standard, configurations, sharable libraries



- ✧ RDBMS - Python for RDBMS, PEP 49, CRUD operations on Sqlite

## **Statistics - Machine Learning Prerequisites**

**Goal :** Get familiar with basics of statistics, different types of measures and probability distributions, and the supporting libraries in Python that assist in these operations.

### **Objectives:**

- ✧ Statistics - data terminology, measurement scales, types of data
- ✧ Libraries - IPython, Matplotlib
- ✧ Measures, Moments, Variance, Std. Deviation using numpy
- ✧ Distributions, Probability and Bayes' Theorem using Scipy
- ✧ Numpy - arrays, matrices, related operations
- ✧ Scipy - overview, areas of application

### **Topics:**

- ✧ Data terminology
- ✧ Scales of measurement
- ✧ Types of data
- ✧ Ipython notebook installation
- ✧ Numerical measure
- ✧ Matplotlib introduction
- ✧ Deviation and variance
- ✧ Standard deviation
- ✧ Covariance and correlation
- ✧ Conditional probability
- ✧ Bayes theorem
- ✧ Distribution/Probability functions
- ✧ Installing Numpy
- ✧ Numpy arrays and matrices
- ✧ Installing Scipy
- ✧ Scipy Modules and stats

### **Hands On:**

- ✧ Statistics - scales of measurement, numerical measures, variance, standard deviation, covariance and correlation, probability, Bayes theorem and distribution functions



- ✧ Numpy - arrays, matrices and types of operations
- ✧ Scipy - stats modules, physical constants, skewness, kurtosis

## **Machine Learning Using Python - Essentials**

**Goal :** Learn in detail about Supervised and Unsupervised learning and examples for each category.

### **Objectives:**

- ✧ Define Machine Learning and understand Supervised vs Unsupervised
- ✧ Apply Supervised Learning process flow, regression analysis
- ✧ Apply Unsupervised Learning process flow, clustering
- ✧ Apply Linear Regression, Multivariate Regression
- ✧ Measure accuracy using Mean Squared Error, Cross Validation
- ✧ Analyze data using Pandas

### **Topics:**

- ✧ Introduction to Machine Learning
- ✧ Areas of implementation of Machine learning
- ✧ Why Python
- ✧ Major classes of Learning Algorithms
- ✧ Supervised vs. Unsupervised learning
- ✧ Inference models
- ✧ Linear regression and mean squared error
- ✧ Multivariate regression
- ✧ Cross validation
- ✧ Regression Summary
- ✧ Introduction to Pandas
- ✧ Creating Data frames
- ✧ Grouping
- ✧ Sorting
- ✧ Plotting Data
- ✧ Creating functions
- ✧ Converting different formats
- ✧ Combining data from various formats



- ✧ Slicing/Dicing operations

#### **Hands On:**

- ✧ Supervised learning - Linear Regression and RMSE, Multivariate Regression, Cross Validation
- ✧ Pandas - Series, DataFrames, data analysis involving grouping, sorting, filtering, munging, visualization/plotting and mesh up

## **Data Analysis and Machine Learning Deep Dive**

**Goal :** Tackle complex machine learning problems requiring classification or clustering.

#### **Objectives:**

At the end of this Module, you should be able to:

- ✧ Feature engineer datasets using PCA, Bias/Variance analysis
- ✧ Apply classifications algorithms like KNN, Random Forests, SVM etc.
- ✧ Apply clustering algorithms like K-Means, Hierarchical clustering etc.
- ✧ Compute classification and clustering metrics to ascertain model accuracy

#### **Topics:**

- ✧ Feature engineering
- ✧ Dealing with categorical data
- ✧ Dealing with text data
- ✧ Using encoders
- ✧ Count, TF-IDF Vectorizer
- ✧ Bias/Variance tradeoff
- ✧ Principal Component Analysis (PCA)
- ✧ KNN
- ✧ Decision Trees
- ✧ Random Forests
- ✧ Ensemble Learning
- ✧ Averaging and boosting algorithms
- ✧ Random Forest classifier
- ✧ Support Vector Machines (SVM)
- ✧ Support Vector Classifier
- ✧ Accuracy measures - AUC, ROC, Confusion Matrix, Log Loss
- ✧ Clustering algorithms and accuracy measures





- ✧ K-Means clustering
- ✧ Silhouette coefficient
- ✧ Hierarchical clustering using Dendrogram
- ✧ Density-based clustering using DBSCAN

**Hands On:**

- ✧ Data analysis activity using live datasets from Google Finance
- ✧ Encoders, vectorizers, PCA, KNN, CART, Random Forest Ensemble, SVM, Clustering, Accuracy measures using Metrics

## **Scalable Machine Learning using Spark**

**Goal :** Learn Spark basics and run machine learning models over Spark.

**Objectives:**

At the end of this Module, you should be able to discuss:

- ✧ Apache Spark - Concepts, RDD, MLLib, Data frames
- ✧ Transformations, Actions, Shuffling, Persistence and Data Removal
- ✧ Shared variables - accumulators and broadcast
- ✧ Spark SQL and Data frames
- ✧ Spark MLlib
- ✧ Regression, Classification & Clustering with PySpark

**Topics:**

- ✧ Apache Spark introduction
- ✧ Spark engine
- ✧ Spark core API
- ✧ Spark libraries
- ✧ SparkContext and SparkConf
- ✧ Concepts - RDD, Shuffling and Persistence
- ✧ RDD transformations and actions
- ✧ Shared variables - Accumulators, Broadcasts
- ✧ Spark SQL and Dataframes
- ✧ Spark MLlib
- ✧ Regression with PySpark
- ✧ Classification with PySpark



- ✧ Clustering with PySpark

**Hands On:**

- ✧ SparkContext and SparkConf
- ✧ RDDs, Accumulators, Broadcasts, data removal
- ✧ Spark SQL DataFrames
- ✧ Regression, Classification and Clustering using Spark MLlib

**Web Scrapping in Python and Project Work**

**Goal :** Discuss about the powerful web scraping using Python and discuss a real-world project.

**Objectives:**

- ✧ Discuss web scraping and its advantages
- ✧ Discuss Steps Involved in Web Scraping
- ✧ Use BeautifulSoup package and its functions
- ✧ Scrape IMDB webpage
- ✧ Fetch Streaming Tweets from Twitter
- ✧ Perform Sentiment Analysis on tweets Fetched from Twitter and determine which is more popular Ferrari or Porsche

**Topics:**

- ✧ Web scraping
- ✧ Introduction to Beautiful soup package
- ✧ How to scrape webpages
- ✧ A Real-world project showing scrapping data from Google finance and IMDB.

**Hands On:**

- ✧ Scraping - BeautifulSoup and its functions, pulling content using regex, restricting content using SoupStrainer
- ✧ Scraping IMDB, Reddit
- ✧ Tweet sentiment analysis using Twitter API for Python

**For more details  
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