

# **Python From Fundamentals to Project Development**

**Duration:** 5 days

**Prerequisites:** Working knowledge of Python Programming

## **Day 1 – Advanced Functions, Iterables & Collections**

- Functions in Depth
  - Parameters, return values, \*args, \*\*kwargs
  - Anonymous Functions (lambda), Decorators
- Built-in Functions: map, filter, reduce, enumerate
- Iterables, Iterators & Generators
- List/Dict/Set Comprehensions (intermediate → advanced)
- Collections Module: Counter, defaultdict, namedtuple

### **Labs:**

- Build a reusable math utility library
  - Word frequency counter using collections.Counter
  - Fibonacci sequence generator with yield
- 

## **Day 2 – Strings, Regex, Dates, Files & Error Handling**

- String Operations & f-strings
- Regex with re module (pattern matching & validation)
- Date & Time Handling (time, datetime)
- File Handling (read, write, append, context manager)
- OS Module & File Navigation
- Exception Handling
  - Custom Exceptions, Exception Hierarchy

### **Labs:**

- Log file analyzer with regex
  - Birthday reminder app
  - File parser with robust exception handling
- 

## **Day 3 – OOP in Python & Numerical Computing**

- OOP in Depth
  - Classes, Objects, Methods, Constructors
  - Inheritance, Encapsulation, Method Overriding
  - Static & Class Methods, Polymorphism
- Math & Random Modules
- NumPy for Numerical Computing
  - Arrays, Indexing, Reshaping, Broadcasting
  - Matrix Operations

**Labs:**

- Student Management System using OOP
  - Random password generator
  - NumPy 2D Matrix Operations
- 

**Day 4 – Data Handling & Analysis**

- Working with JSON, XML & CSV
- Data Serialization & Deserialization
- Pandas Essentials
  - Series, DataFrames, GroupBy, Merge/Join/Concat
  - Data Cleaning & Missing Data Handling
  - Pivot Tables & VLOOKUP equivalent
- Mini-Project: Exploratory Data Analysis

**Labs:**

- JSON → CSV Converter
  - Data Analysis mini-project with Pandas
  - Small dashboard with summary tables
- 

**Day 5 – Testing, Debugging & Capstone Project**

- Debugging Techniques (print debugging, pdb, logging)
- Logging Module: levels, handlers, formatters
- Testing Frameworks: unittest basics
- Writing Test Cases & Running Test Suites
- Performance Testing Overview
- **Capstone Project**
  - End-to-End Python Application integrating:
    - File Handling + Exception Handling
    - Data Analysis with Pandas
    - Unit Testing & Logging

**Labs:**

- Write test cases for existing functions
- Debugging session with deliberate bugs