

Chapter 1 – Introduction to Python

- History of Python
- Features of Python (simple, interpreted, portable, extensible, open-source, high-level)
- Applications: Web, Data Science, AI, Automation, Cybersecurity, etc.
- Installing Python (Windows/Linux/Mac)
- First Python Program:

```
print("Hello, World!")
```

Chapter 2 – Python Basics

- Variables, Data Types (int, float, str, bool, complex)
- Type Casting & type() function
- Operators: Arithmetic, Relational, Logical, Assignment, Bitwise
- Input/Output functions: input(), print()
- Example:

```
a = int(input("Enter number: "))  
print("Square:", a**2)
```

Chapter 3 – Control Structures

- Conditional Statements: if, if-else, if-elif-else
- Loops: for, while
- break, continue, pass
- Example:

```
for i in range(1,6):  
    if i == 3:  
        continue  
    print(i)
```

Chapter 4 – Functions

- Defining functions using def
- Function arguments (default, keyword, variable-length *args, **kwargs)
- Return values
- Lambda functions
- Recursion
- Example:

```
def factorial(n):  
    return 1 if n==0 else n*factorial(n-1)  
print(factorial(5))
```

Chapter 5 – Data Structures

- List (mutable, ordered)
- Tuple (immutable, ordered)
- Set (unique, unordered)
- Dictionary (key-value mapping)
- Comprehensions: List, Dict, Set
- Example:

```
squares = [x*x for x in range(1,6)]  
print(squares) # [1, 4, 9, 16, 25]
```

Chapter 6 – Strings in Python

- String creation, slicing, indexing
- String methods (upper(), lower(), find(), split(), join())
- String formatting: f-strings, format()
- Example:
name = "Rishi"
print(f"Hello, {name.upper()}")

Chapter 7 – File Handling

- Reading and writing text files (open, read, write, with)
- Working with CSV using csv module
- Example:
with open("data.txt", "w") as f:
f.write("Hello File!")

Chapter 8 – Object-Oriented Programming

- Classes and Objects
- __init__ constructor
- Inheritance (single, multiple, multilevel)
- Encapsulation, Polymorphism
- Example:
class Animal:
def sound(self):
print("Some sound")
class Dog(Animal):
def sound(self):
print("Bark")
Dog().sound()

Chapter 9 – Modules & Packages

- Importing modules (math, os, sys)
- Creating user-defined modules
- Installing external packages with pip
- Example:
import math
print(math.sqrt(25))

Chapter 10 – Exception Handling

- Errors vs Exceptions
- try, except, finally, raise
- Example:
try:
num = int("abc")
except ValueError:
print("Invalid number")

Chapter 11 – Python Advanced Concepts

- Iterators and Generators (yield)
- Decorators (@decorator)
- Context Managers (with)
- Regular Expressions (re module)

- Example:

```
def gen():  
    for i in range(3):  
        yield i  
for x in gen():  
    print(x)
```

Chapter 12 – Python Libraries

- NumPy: Arrays, matrix operations
- Pandas: DataFrames, data analysis
- Matplotlib: Data visualization
- Requests: Web API calls
- BeautifulSoup: Web scraping

Chapter 13 – Python for Automation

- Automating files with os & shutil
- Automating emails with smtplib
- Web scraping automation

- Example:

```
import os  
print(os.listdir("."))
```

Chapter 14 – Python for Web Development

- Flask / Django basics
- Routing, templates, simple web apps

Chapter 15 – Python for Data Science & AI

- NumPy + Pandas (data manipulation)
- Matplotlib + Seaborn (data visualization)
- Scikit-learn (machine learning intro)

Chapter 16 – Python in Cybersecurity

- Password hashing (hashlib)
- Simple port scanner using socket

Chapter 17 – Projects

1. Calculator GUI (Tkinter)
2. To-Do List App
3. Weather App using API

4. Student Database using SQLite
5. Web Scraper for News

Chapter 18 – Interview Questions

- Difference between list and tuple
- What is GIL in Python?
- Shallow vs Deep copy
- How memory management works in Python?
- Example coding questions:
 - Reverse a string
 - Find factorial
 - Sort dictionary by values

Chapter 19 – Exercises

- 100+ practice problems with increasing difficulty

Chapter 20 – Roadmap

- Start with basics → Practice problems
- Learn libraries (NumPy, Pandas, Matplotlib)
- Do projects → Apply for internships → Freelancing/Jobs