Basic & Advanced Python

📖 **Complete Python Syllabus**

📌 Section 1: Basic Python

1️⃣ Introduction to Python

- What is Python?
- Features of Python
- Applications of Python
- Python 2.x vs Python 3.x
- Installing Python and Setting up the Environment
- Writing your first Python program
- Understanding the Python Interpreter and IDLE
- Python interactive and script mode

2️⃣ Python Syntax and Structure

- Indentation in Python
- Comments in Python
    - Single-line comments
    - Multi-line comments (using """ or ''')

3️⃣ Variables and Data Types

- Variable Declaration and Initialization
- Dynamic Typing in Python
- Standard Data Types:
    - Numeric Types
        - Integer

        - Float
        - Complex
    - String
    - Boolean
    - None Type
- Type Casting and Type Conversion

4️⃣ Input and Output Operations

- input() function
- print() function and its formatting
    - String concatenation
    - format() method
    - f-strings (formatted string literals)

5️⃣ Operators in Python

- Arithmetic Operators
- Comparison (Relational) Operators
- Logical Operators
- Bitwise Operators
- Assignment Operators
- Identity Operators (is, is not)
- Membership Operators (in, not in)
- Operator Precedence

6️⃣ Control Flow Statements

- Conditional Statements
    - if statement
    - if-else statement

    - if-elif-else ladder
- Looping Statements
    - while loop
    - for loop
    - range() function
- Nested loops
- Control statements:
    - break
    - continue
    - pass

7️⃣ Strings in Python

- String Creation and Declaration
- String Indexing and Slicing
- String Methods
- String Formatting
- Escape Sequences
- String Immutability

8️⃣ Lists

- Creating Lists
- List Indexing and Slicing
- List Methods
- Nested Lists
- List Operations
- List Comprehensions

9️⃣ Tuples

- Creating Tuples
- Tuple Indexing and Slicing
- Tuple Methods
- Immutability of Tuples

🔟 Sets

- Creating Sets
- Set Operations (Union, Intersection, Difference)
- Set Methods
- Set Comprehension

1️⃣1️⃣ Dictionaries

- Creating Dictionaries
- Accessing and Modifying Dictionary Values
- Dictionary Methods
- Nested Dictionaries
- Dictionary Comprehension

1️⃣2️⃣ Functions in Python

- Defining Functions using def
- Calling Functions
- return statement
- Arguments and Parameters
    - Required arguments
    - Keyword arguments
    - Default arguments
    - Variable-length arguments (*args, **kwargs)
- Recursive Functions

- Lambda (Anonymous) Functions
- Map, Filter, and Reduce Functions

1️⃣3️⃣ Modules and Packages

- Importing Modules
- Creating User-defined Modules
- from ... import statement
- dir() function
- __name__ variable
- Python Standard Libraries overview
- Installing external packages using pip

1️⃣4️⃣ Exception Handling

- Introduction to Exceptions
- try and except block
- else and finally block
- Multiple except clauses
- Raising exceptions using raise
- Built-in Exceptions
- User-defined Exceptions

📌 Section 2: Advanced Python

1️⃣5️⃣ File Handling

- Opening Files using open()
- Reading Files
    - read(), readline(), readlines()
- Writing and Appending Files

    - write(), writelines()
- Closing Files using close()
- with statement (Context Manager)
- File Methods
- Working with binary files

1️⃣6️⃣ Object-Oriented Programming (OOP)

- Classes and Objects
- __init__() Constructor
- Instance and Class Variables
- Methods:
    - Instance Methods
    - Class Methods
    - Static Methods
- Inheritance
    - Single Inheritance
    - Multiple Inheritance
    - Multilevel Inheritance
- Method Overriding
- Encapsulation
- Abstraction
- Polymorphism
- Magic (Dunder) Methods like __str__(), __len__(), __add__()

1️⃣7️⃣ Iterators and Generators

- Iterators
    - iter(), next()
    - Creating Custom Iterators

- Generators
    - yield statement
    - Generator Expressions

1️⃣8️⃣ Regular Expressions

- Importing re module
- Functions:
    - match()
    - search()
    - findall()
    - sub()
- Meta characters
- Special Sequences
- Pattern Compilation

1️⃣9️⃣ Date and Time

- Importing datetime module
- Current Date and Time
- Formatting Dates
- Parsing Strings to Dates
- Date Arithmetic

2️⃣0️⃣ Python JSON Handling

- JSON Basics
- Serializing Python Objects to JSON (json.dump, json.dumps)
- Deserializing JSON to Python Objects (json.load, json.loads)

2️⃣1️⃣ Advanced Modules

- os Module
- sys Module
- math Module
- random Module
- collections Module
- itertools Module
- shutil Module

2️⃣2️⃣ Multithreading and Multiprocessing

- Introduction to Threading
- Creating and Starting Threads
- Thread Synchronization
- Introduction to Multiprocessing
- Process class
- Process Synchronization

2️⃣3️⃣ Database Connectivity

- Working with SQLite / MySQL
- Connecting to a Database
- Executing Queries
- Fetching Data
- Closing Connections
- Using sqlite3 or mysql.connector module

2️⃣4️⃣ GUI Programming (Tkinter Basics)

- Introduction to Tkinter
- Creating Main Window
- Adding Widgets:

    - Label
    - Button
    - Entry
    - Text
- Geometry Management
- Event Handling
- Simple GUI Project

2️⃣5️⃣ Web Scraping

- Introduction to Web Scraping
- requests Module
- BeautifulSoup Module
- Parsing HTML Content
- Extracting Data

2️⃣6️⃣ Virtual Environment and Package Management

- Creating Virtual Environments
- Activating and Deactivating Virtual Environment
- Managing Dependencies with pip
- Creating requirements.txt

📌 Bonus Topics (Optional / Industry Use)

- API Integration (using requests)
- Unit Testing with unittest and pytest
- Logging Module
- Socket Programming
- Deploying Python Applications
- Working with CSV, Excel files (using csv, openpyxl, pandas)

- Basics of Pandas and Numpy

📌 Suggested Mini & Major Projects

Mini Projects:

- Calculator
- Contact Book
- Quiz App
- File Encryptor
- To-Do List Manager

Major Projects:

- Student Management System
- Library Management System
- GUI-based Billing System
- Blog Scraper
- Real-time Weather App
- Image Editor (Tkinter + PIL)
- Python Chat Application
