

Core Python Learning Roadmap

1. Introduction to Python

- Overview and History
- Installing Python
- Setting Up the Development Environment
- Choosing an IDE or Code Editor

2. Basic Syntax and Structure

- Python Syntax Rules
- Variables and Data Types
 - Integers, Floats, Strings, Booleans
- Basic Operators
 - Arithmetic, Comparison, Logical
- Input and Output
 - `print()`, `input()`

3. Control Flow

- Conditional Statements
 - `if`, `elif`, `else`
- Loops
 - `for`, `while`
- Loop Control
 - `break`, `continue`, `pass`
- Comprehensions
 - List, Dictionary, Set Comprehensions

4. Functions

- Defining Functions
 - `def` keyword
- Function Parameters and Arguments
 - Positional, Keyword, Default
- Return Values
- Lambda Functions
- Function Scope
 - Local and Global Variables
- Higher-Order Functions

5. Data Structures

- Lists
 - Creation, Access, Methods
 - List Comprehensions
- Tuples
 - Creation, Access, Methods

- Dictionaries
 - Creation, Access, Methods
 - Dictionary Comprehensions
- Sets
 - Creation, Access, Methods

6. String Manipulation

- String Operations
 - Concatenation, Repetition, Slicing
- String Methods
 - .upper(), .lower(), .strip(), .replace()
- String Formatting
 - f-strings, .format(), % formatting
- Regular Expressions
 - Basic Pattern Matching

7. File Handling

- File Operations
 - Opening, Reading, Writing, Closing Files
- File Methods
 - .read(), .write(), .seek()
- Handling File Paths
- Exception Handling in File Operations
- Working with Different File Formats
 - Text, CSV, JSON

8. Error Handling and Exceptions

- Understanding Exceptions
- Try, Except, Finally
- Raising Exceptions
- Custom Exception Classes
- Best Practices for Error Handling

9. Modules and Packages

- Importing Modules
 - import, from-import
- Standard Library Modules
 - math, datetime, os, sys
- Creating Custom Modules
- Package Management
 - pip, Virtual Environments (venv)

10. Object-Oriented Programming (OOP)

- Classes and Objects

- Attributes and Methods
- Inheritance
 - Base and Derived Classes
- Polymorphism
- Encapsulation
- Abstraction
- Special Methods
 - `__init__`, `__str__`, `__repr__`, `__len__`

11. Decorators and Generators

- Decorators
 - Understanding and Creating Decorators
 - Function Wrapping
- Generators
 - yield Keyword
 - Generator Expressions
 - next() Function

12. Context Managers

- Understanding Context Managers
- Using the with Statement
- Creating Custom Context Managers

13. Multithreading and Multiprocessing

- Threading
 - Creating and Managing Threads
- Multiprocessing
 - Creating and Managing Processes
- Synchronization
 - Locks, Events, Semaphores

14. Testing and Debugging

- Debugging Techniques
 - Using Print Statements, Debuggers
- Unit Testing
 - unittest Module
 - Writing Test Cases
- Test-Driven Development (TDD)

15. Best Practices and Coding Standards

- PEP 8 Guidelines
- Writing Clean and Readable Code
- Code Documentation
 - Docstrings and Comments

- Version Control
 - Using Git and GitHub

16. Practical Projects

- Small Applications
 - Calculator, To-Do List
- Real-World Projects
 - Web Scraping, Data Analysis
- Contributing to Open Source

17. Advanced Topics

- Coroutines and Asyncio
- Memory Management and Profiling
- Metaclasses