

# Python – Complete Beginner to ML & Development Notes

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## 1. Introduction to Python

Python is a high-level, interpreted programming language. It is easy to learn, easy to read, and widely used in many fields.

Key features:

- Simple and readable syntax
- Interpreted language (runs line by line)
- Open-source and free
- Large community support

Python was created by Guido van Rossum.

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## 2. Where Python is Used

Python is used in many domains:

- Web Development
  - Data Science
  - Machine Learning
  - Artificial Intelligence
  - Automation and Scripting
  - Software Development
  - Game Development
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## 3. Python Basics

### Variables

Variables are used to store data.

Example:

- `x = 10`

- `name = "Python"`

## Data Types

Common data types in Python:

- Integer (int): 10, 20
  - Float (float): 10.5, 3.14
  - String (str): "Hello"
  - Boolean (bool): True, False
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## 4. Operators in Python

- Arithmetic Operators: +, -, \*, /, %
  - Comparison Operators: ==, !=, >, <
  - Logical Operators: and, or, not
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## 5. Control Statements

### If-Else

Used for decision making.

Example:

- `if x > 0: print("Positive")`

### Loops

- for loop
- while loop

Loops are used to repeat tasks.

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## 6. Functions

Functions are blocks of reusable code.

Example:

- `def add(a, b): return a + b`
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## 7. Python Libraries

Libraries are pre-written code that helps developers work faster.

### Common Python Libraries

- NumPy: Used for numerical computations
  - Pandas: Used for data analysis
  - Matplotlib: Used for data visualization
  - Seaborn: Used for advanced charts
  - Scikit-learn: Used for machine learning
  - TensorFlow: Used for deep learning
  - PyTorch: Used for deep learning
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## 8. Object-Oriented Programming (OOP)

OOP is a programming style based on objects and classes.

Main concepts:

- Class
  - Object
  - Inheritance
  - Polymorphism
  - Encapsulation
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## 9. File Handling in Python

Python can read and write files.

Types of files:

- Text files (.txt)
- CSV files
- PDF files

File handling is useful in real-world applications.

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## 10. Python for Data Science

Python is very popular in data science.

Steps in Data Science:

- Data collection
- Data cleaning
- Data analysis
- Data visualization

Libraries used:

- NumPy
- Pandas
- Matplotlib

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## 11. Machine Learning with Python

Machine Learning allows systems to learn from data.

Types of Machine Learning:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

Popular ML algorithms:

- Linear Regression
- Logistic Regression
- Decision Tree
- KNN
- K-Means

Library used:

- Scikit-learn
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## 12. Deep Learning

Deep Learning is a subset of Machine Learning.

It uses neural networks.

Libraries:

- TensorFlow
  - PyTorch
  - Keras
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## 13. Python for Web Development

Python can be used to create websites.

Frameworks:

- Flask
  - Django
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## 14. Python for Automation

Python is used to automate repetitive tasks.

Examples:

- File automation
- Email automation
- Web scraping

Libraries:

- os
  - shutil
  - selenium
  - BeautifulSoup
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## 15. Python Development Tools

Tools used by Python developers:

- VS Code
  - PyCharm
  - Jupyter Notebook
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## 16. Python Projects

Examples of Python projects:

- Calculator
  - Chatbot
  - Data analysis project
  - Machine Learning project
  - RAG-based chatbot
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## 17. Python and RAG (Retrieval-Augmented Generation)

Python is widely used to build RAG systems.

RAG combines:

- Document retrieval
- Language models
- Vector databases

Libraries used in RAG:

- LangChain
  - FAISS
  - OpenAI
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## 18. Conclusion

Python is a powerful and flexible programming language. It is suitable for beginners as well as advanced developers. Python plays an important role in modern technologies like Machine Learning, Artificial Intelligence, and RAG systems.

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