Chapter 9: Introduction to Python

Introduction

Python is one of the most popular and beginner-friendly programming languages in the world. It is widely used in Artificial Intelligence (AI), Machine Learning (ML), Data Science, Web Development, and Automation. Due to its simple syntax and powerful capabilities, Python is an ideal first programming language for students of Class 11 pursuing the Artificial Intelligence course. This chapter introduces the basic concepts of Python, its applications, and foundational syntax necessary for building AI models in later stages.

9.1 What is Python?

Python is a **high-level**, **interpreted**, and **object-oriented programming language** developed by **Guido van Rossum** and released in 1991. It is known for:

- **Simple and readable syntax**
- **Extensive standard library**
- **Cross-platform compatibility**
- **Wide usage in data science and AI**

Key Features of Python:

- **Open-source** and free to use.
- **Easy to learn and code.**
- **Portable**: Runs on various platforms like Windows, Linux, Mac, etc.
- **Interpreted language**: No need for compilation.
- **Dynamic typing**: No need to declare the type of variable.
- **Large community support.**

9.2 Applications of Python

Python is used in multiple domains:

- **Artificial Intelligence (AI)** and **Machine Learning (ML)**
- **Web Development** (Django, Flask)
- **Data Analysis and Visualization** (Pandas, Matplotlib)
- **Automation and Scripting**
- **Internet of Things (IoT)**
- **Game Development** (Pygame)

- **Desktop Applications**

9.3 Installing Python

You can download and install Python from the official website: https://www.python.org

Steps:

1. Download the installer suitable for your OS.
2. Run the installer and check the box "Add Python to PATH".
3. Complete the installation.

Once installed, Python can be run using:

- **IDLE (Integrated Development and Learning Environment)**
- **Command Prompt/Terminal**
- **Jupyter Notebook** (for AI and ML applications)

9.4 Python IDEs and Editors

- **IDLE**: Comes with Python, suitable for beginners.
- **PyCharm**: Advanced IDE with many features.
- **Jupyter Notebook**: Preferred for AI, ML, and data analysis.
- **VS Code**: Lightweight editor with Python extension.

9.5 Writing and Executing Python Code

Hello World Program:

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

- `print()` is a built-in function to display output.

You can write this code in IDLE, terminal, or any Python IDE.

9.6 Basic Python Syntax

1. Comments

Used to describe the code.

- **Single-line comment:**

```
# This is a comment
```

- **Multi-line comment:**

```
'''
This is a
multi-line comment
'''
```

2. Variables and Data Types

- Variables store data.
- Python is dynamically typed.

```
name = "John"        # string
age = 18             # integer
height = 5.9         # float
is_student = True    # boolean
```

3. Input and Output

```
name = input("Enter your name: ")   # Takes input as string
print("Hello,", name)
```

4. Data Types

Data Type	Description
int	Integer numbers
float	Decimal numbers
str	String (text)
bool	Boolean (True/False)
list	Collection of items
tuple	Immutable list
dict	Key-value pairs

9.7 Python Operators

1. Arithmetic Operators

```
a + b    # addition
a - b    # subtraction
a * b    # multiplication
a / b    # division
a % b    # modulus
a ** b   # exponent
a // b   # floor division
```

2. Comparison Operators

```
a == b   # equal to
a != b   # not equal
a > b    # greater than
```

```
a < b    # less than
a >= b   # greater than or equal
a <= b   # less than or equal
```

3. Logical Operators

```
and, or, not
```

9.8 Conditional Statements

Used to make decisions in code.

```
if age >= 18:
    print("Eligible to vote")
else:
    print("Not eligible")
```

9.9 Looping Statements

1. For Loop

```
for i in range(5):
    print(i)
```

2. While Loop

```
i = 0
while i < 5:
    print(i)
    i += 1
```

9.10 Functions in Python

Functions are reusable blocks of code.

```
def greet(name):
    print("Hello", name)

greet("Ravi")
```

9.11 Lists and Tuples

List – Mutable

```
fruits = ["apple", "banana", "cherry"]
fruits.append("orange")
```

Tuple – Immutable

```
colors = ("red", "green", "blue")
```

9.12 Dictionary in Python

Stores data in key-value pairs.

```
student = {
    "name": "Amit",
    "age": 17,
    "grade": "11th"
}
print(student["name"])
```

9.13 Errors and Debugging

Types of Errors:

- **Syntax Errors** – Incorrect Python syntax.
- **Runtime Errors** – Errors during code execution.
- **Logical Errors** – Code runs but gives wrong result.

Use **`try and except`** blocks for handling errors.

```
try:
    x = int(input("Enter number: "))
except ValueError:
    print("Invalid input")
```

Summary

- Python is a versatile and powerful programming language ideal for beginners and AI applications.
- It is dynamically typed, easy to read, and has a vast community.
- Basic Python concepts include variables, data types, input/output, operators, conditionals, loops, functions, lists, tuples, and dictionaries.
- Understanding Python is the foundation for building AI applications in future chapters.