

Introduction to Programming with Python

Day 1

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Course Overview

- 1 **Introduction**
- 2 **Lists, Tuples, Dicts**
- 3 **Conditional and Looping Statements**
- 4 **Errors and Error Handlers**
- 5 **Functional Programming**
- 6 **External Libraries, Numpy, Scipy, Matplotlib**
- 7 **Advanced Plotting**
- 8 **Working with Files (CSV, Excel, Text)**
- 9 **GUI creation with Tkinter**
- 10 **Useful Utilities and Way Forward!**

Introduction

Introduction to Programming?

- **What is programming?**
 - **developing sequence of commands to instruct a computer how to do a task!**
- **Why learn programming?**
 - **Computers are fast!**
 - **Computers can work 24 x 7**
 - **Automate work**
 - **It is Fun**
 - **Many More Reasons!**

Programming Language

- **Computers can only understand binary language!**

- 1010100, 10001001010, 01000100101, etc

- **Assembly Language**

- MOV r1,s1;

- MOV r2,s2;

- ADD s1,s2;

- OUT s3;

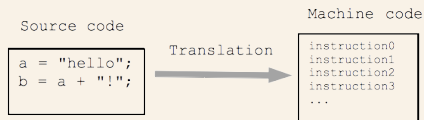
- **High Level Language**

- Human readable

- Easy to write/develop/understand

- Comes with own syntax, vocabulary

How Programs work?



The Translators can be of two types,

- 1 Compiler
- 2 Interpreter

Compiled Languages are **C, C++, Java, Kotlin** etc

Interpreted languages **Python, Ruby, Perl, Julia** etc

Then there are markup languages: **HTML, XML, YAML** etc

Introduction to Python

- **Developed by Guido Van Rossum and released in 1991**
- **General Purpose High Level language**
- **Interpreted, Object oriented, garbage collected**
- **It is dynamically typed, easier syntax**
- **Application of Python**
 - **Mathematical Calculations**
 - **Prototyping and Scripting**
 - **Web Development**
 - **Software Development**

Installing Python in Computer

■ Installing in Windows

- Go to : www.python.org/downloads/
- Click on the Download Python Button (Version will be different anything above 3.0 is good)
- Install the downloaded file

■ Installing Code Editor

- Go to: www.spyder-ide.org
- Download the latest version (currently 4.2)
- Install the downloaded file

■ Checking Installation

- Open Command Prompt
- Type `python --version`
- It will output the version number in the command prompt, if installed properly

Installing Python in Mobile

- Installing in Android

- Download the **Pydroid 3** (free) application from the Playstore

- Installing in iOS (iPhones and iPads)

- Download the **Pythonista** (paid) or **Pyto** (free) application from the iStore

Writing your First Program!

- **Open the Spyder Or any other Text Editor of your choice**
- **Type the following code**

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

- **Hit the Run button**
- **Voila! You should see the Output in the Console**

Variables Declaration

- 1** A variable name must start with a letter or the underscore character.
- 2** A variable name cannot start with a number.
- 3** A variable name can only contain alpha-numeric characters and underscores (A-z, 0-9, and _).
- 4** Variable names are case sensitive (name, Name and NAME are three different variables).
- 5** The reserved words(keywords) cannot be used naming the variable.

Basic Input and Output

- For asking the user input we can use, **input** function

```
x=input("Enter the Value of X")  
y=input("Enter the Value of Y")
```

- For printing the output we can use, **print** function

```
print("Hi There!")  
x=10.0  
print(x)  
print("Value of X is:",x)
```

Datatypes in Python

Python Supports the following Datatypes

- **int** - whole numbers
- **float** - decimal numbers
- **str** - Strings and texts
- **list** - List of items grouped together
- **duple** - List of items grouped together
- **dict** - Data stored in key value pairs
- Other datatype **boolean, sets, complex**

Python Automatically detects the data types and we don't need to mention it explicitly!

The datatype of the particular variable can be accessed by **type()** function

Casting Data Types

- Convert one form of data type to other form

```
raw_input=input("Enter a value")  
print(type(raw_input))  
converted=int(raw_input)  
print(type(converted))
```

```
list_one=[1,2,3,4,5,6]  
print(type(list_one))  
print(type(tuple(list_one)))
```

Operators in Python

Python Supports the following Operators

+	Addition
-	Subtraction
*	Multiplication
/	Division
//	Floor Division
%	Quotient

**	Raise to power
==	Equal to
>=	Addition
<=	Subtraction
and	Logical AND
or	Logical OR

Other mathematical functions are available in the **math** library

Try out!

■ Ideal gas equation

- Find the density of Air at 10 bar and 350K using the Ideal Gas Equation
- Expand the program to find the density at user given pressure and Temperature

■ Rocket equation

- Find the momentum imparted to the thruster by firing a thruster with specific impulse of 300 seconds for 45 seconds. The initial mass of the spacecraft is 100 Kg and mass flow rate is 0.5kg/s

■ Projectile Motion

- Find the Range, Maximum Altitude and Duration of a projectile launched with 50m/s velocity at 40 degree angle

Hints

■ Ideal gas equation

$$\rho = \frac{P}{RT}$$

■ Rocket equation

$$\Delta V = V_e \ln \frac{m_0}{m_f}$$

■ Projectile Motion

$$h = \frac{v_0^2 \sin^2 \theta}{2g}; \quad t = \frac{2v_0 \sin \theta}{g}; \quad d = \frac{v^2 \sin 2\theta}{g}$$

```
print("Thank You!")
```