# GUJARAT TECHNOLOGICAL UNIVERSITY

**PDDC**
**Subject Code: 2931104**
**Semester – III**
**Subject Name: Python Programming**

**Type of course:** Open Elective Subject

**Prerequisite:** Fundamental knowledge about computer systems and positive aptitude to learn programming, Basic knowledge of C Programming.

**Rationale:**
Python is general purpose programming language becomes very popular in last decade. In this age, every Electronics, Electrical and Computer engineers must learn Python Programming to build applications in their core domain. Python is becoming popular in artificial intelligence and machine learning. MicroPython is sub-set of Python Programming useful to port in hardware for embedded and IoT applications.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 3 | 0 | 2 | 5 | 70 | 30 | 30 | 20 | 150 |

**Content:**

| Sr. No. | Content | Total Hrs | % Weightage |
|---|---|---|---|
| 1 | **Introduction, Data Types and Operators:**<br>Installation and working with Python, IPython, Represent data using Python's data types: integers, floats, Booleans, strings, lists, tuples, sets, dictionaries, compound data structures,<br><br>Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple, string operations | 10 | 20% |
| 2 | **Python Decision making and Loops:**<br>Write conditional statements using If statement, if ...else statement, elif statement and Boolean expressions.<br><br>While loop, For loop, Nested Loop, Infinite loop, Break statement, Continue statement, Pass statement, Use for and while loops along with useful built-in functions to iterate over and manipulate lists, sets, and dictionaries. Plotting data, Programs using decision making and loops. | 10 | 20% |
| 3 | **Python Functions and Modules:**<br>Define your own custom functions, Organising Python codes using functions, | 10 | 20% |

| | | | |
|---|---|---|---|
| | Create and reference variables using the appropriate scope, Basic skills for working with lists, tuples, work with dates and times, get started with dictionaries, Importing own module as well as external modules, Programming using functions, modules and external packages | | |
| **4** | **Python File Operations:**<br>An introduction to file I/O, use text files, use CSV files, use binary files, Handle a single exception, handle multiple exceptions, Illustrative programs, Exercises | 8 | 15% |
| **5** | **MicroPython:**<br>Introduction, main difference between MicroPython and Python, Installation of MicroPython on Hardware, MicroPython libraries, GPIO programming on MicroPython Hardware, Sensor Programming using MicroPython | 10 | 25% |

**Suggested Specification table with Marks (Theory): (For BE only)**

| **Distribution of Theory Marks** | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **20** | **20** | **25** | **15** | **10** | **10** |

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Python Programming Fundamentals- A Beginner's Handbook by Nischay kumar Hegde
3. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
4. Introduction to Python for Engineers and Scientists, By. Sandeep Nagar, Apress
5. MicroPython for the Internet of Things (A Beginner's guide to programming with Python on microcontrollers) By. Charles Bell, Apress

**Course Outcomes:**

**After completion of this course students will be able …**

| **Sr. No.** | **CO statement** | **Marks % weightage** |
|---|---|---|
| CO-1 | To test and debug code written in python | 25 |

| | | |
|---|---|---|
| CO-2 | To create applications using Python Programming | 20 |
| CO-3 | To perform file operations to read and write data in files | 25 |
| CO-4 | To write programs for general purpose I/O devices using MicroPython | 30 |

**List of Experiments:**

[1] Write Python programs to understand control structures

[2] Write Python programs to understand list and tuples

[3] Use conditional statements and loops in Python programs

[4] Write python programs to create functions and use functions in the program

[5] Import module and use it in Python programs

[6] Write python program to plot data using PyPlot

[7] To become familiar with MicroPython and NodeMCU. Configure NodeMCU for MicroPython.

[8] Write program in MicroPython to send digital data on GPIO pins of NodeMCU and glow LED connected with NodeMCU or any other MicroPython supported board.

[9] Connect Digital/Analog I/O module with NodeMCU and write program to display temperature in MicroPython.

[10] Connect NodeMCU with with WiFi Access Point and transmit data from NodeMCU to Cloud. Connect Digital/Analog I/O module with NodeMCU and send temperature and light data on cloud (Thingspeak, Firebase or any other cloud service)

**Major Equipment/software:**

- NodeMCU boards or any other microcontroller board supporting MicroPython firmware
- Digital analog Input Output boards consisting LEDs, Switches, LDR, Temperature sensor, POT

**List of Open Source Software/learning website:**

- NPTEL Video lecture on Python Programming
- https://www.coursera.org/learn/python-programming

- Python Software

- Turtle - https://docs.python.org/2/library/turtle.html
- PyLab - https://scipy.github.io/old-wiki/pages/PyLab