GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171716
Semester – VII
Subject Name: PYTHON FOR ENGINEERS

Type of course: Professional Elective Course-3

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, 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
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1.	**Introduction, Data Types and Operators:** Installation and working with Python, Variables and data types in python, Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple and string operations	06
2	**Python Decision making and Loops:** Write conditional statements using If statement, if ...else statement, elif statement and Boolean expressions, 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.	08
3	**Python Functions and Modules:** Defining custom functions, Organizing Python codes using functions, Create and reference variables using the appropriate scope, Basic skills for working with lists,	08

	tuples, work with dates and times, get started withdictionaries, Importing own module as well as external modules, Programming using functions, modules and external packages	
4	**Python File Operations:** 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	**06**
5	**MicroPython:** Introduction, main difference between MicroPython and Python, Installation of MicroPython on Hardware, MicroPython libraries, GPIO programming on MicroPython Hardware, Sensor Programming using MicroPython	**08**

Suggested Specification table with Marks (Theory):

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

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Course Outcome:

After learning the course the students should be able to:

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CO 1	To test and debug code written in python
CO 2	To create applications using Python Programming
CO 3	To perform file operations to read and write data in files
CO 4	To write programs for general purpose I/O devices using MicroPython

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 withWiFi 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:

- 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
- https://nptel.ac.in/courses/106/106/106106212/
- https://nptel.ac.in/courses/115/104/115104095/
- Python Software
- Turtle - https://docs.python.org/2/library/turtle.html
- PyLab - https://scipy.github.io/old-wiki/pages/PyLab
- Anaconda software