Basics of Internet of things and Python Programming
DSE (Electronics) Sem III
(For Physics and Electronics as core subjects)

Credit: 04 (Theory-02, Practical-02)

Course Learning Objectives:

The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects. The course will also help the student to develop python programming skills for IoT and examine programming with Raspberry PI.

Course Learning Outcomes:

At the end of this course, students will be able to achieve the following learning outcomes:

1. The student will be able to describe various IoT enabled technologies.

2. The student will be able to describe understand the concepts of M2M with necessary protocols

3. Illustrate Python Programming for IoT

4. Examine the Python Programming with Raspberry PI

Syllabus- Theory

Unit I : Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Business processes in IoT (like ;Supply chain management,Predictive maintenance, Data management, energy management etc) (**7 Lectures)**

Unit II : Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python) for Communication Protocols-MQTT, ZigBee, Bluetooth, TCP**. (7 Lectures)**

Unit III : Introduction to Python: Language Features of Python, data Types, data structures, control of flow, functions, modules, packaging, file handling, data/time operations and classes.(**9 Lectures)**

Unit IV : IoT Physical devices and Endpoints: Introduction to Raspberry PI- Interface(Serial, SPI) programming- Python program with raspberry PI with focus of interfacing external gadgets, controlling output and reading input from pins.(**7 Lectures**)

Reference Books:

1.Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, —A Hands on Approach‖, University Press

2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, —Introduction to Internet of Things: A practical Approach‖, ETI Labs

3. Pethuru Raj and Anupama C. Raman, —The Internet of Things: Enabling Technologies, Platforms, and Use Cases‖, CRC Press

4. Jeeva Jose, —Internet of Things‖, Khanna Publishing House, Delhi

5. Adrian McEwen, —Designing the Internet of Things‖, Wiley

6. Raj Kamal, —Internet of Things: Architecture and Design‖, McGraw Hill 7. Cuno Pfister, —Getting Started with the Internet of Things‖, O Reilly Media

7. Getting started with Raspberry PI, Matt Richardson and Shawn Wallace, O'Reilly (SPD), 2014, ISBN : 9789350239759

Practicals (Any five to be performed) :

1. To interface LED/Buzzer with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
2. To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
3. To interface DHT11 sensor with Raspberry Pi and write a program to print temperature and humidity readings.
4. To interface Bluetooth with Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
5. To interface Bluetooth with Raspberry Pi and write a program to turn LED ON/OFF when ‗1'/'0' is received from smartphone using Bluetooth.
6. Write a program on Raspberry Pi to publish temperature data to MQTT broker.
7. Write a program on Raspberry Pi to subscribe to MQTT broker for temperature data and print