PRINCIPLES OF IOT

VI SEMESTER: CSE(AI & ML)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACIC10	**Elective**	3	0	0	3	30	70	100

Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes:45

Prerequisite: Computer Networks

I. COURSE OVERVIEW:

The course aims to deliver a sound understanding of the design and analysis of Internet of Things through lectures and practice. The lectures provide the foundational knowledge in sensors and actuators, fusion of data from multiple sensors, sensor data calibration and topics in sensor data analytics: pre-processing and extraction of features in time, series sensor data, and classification methods. The students conduct a major piece of coursework working in pairs to develop an IoT application using the Orient speck platform. Students will experience all the stages in the design and implementation of a complex system, from its specification to the demonstration of a working prototype. They will be exposed to aspects of embedded systems programming, networking algorithms, wireless protocols, user interface design, system integration and testing.

II. COURSE OBJECTIVES:

The students will try to learn:

I.   The IoT value chain structure (device, data cloud), application areas and technologies involved.
II.   The IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.
III. Market forecast for IoT devices with a focus on sensors.
IV.   Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.

III. COURSE SYLLABUS:

After successful completion of the course, students should be able to:

CO 1	**Relate** the characteristics and appropriate levels of IoT for reusing of deployed IoT resources across application domains.	Remember
CO 2	**Identify** the necessity of communication models, protocols and API's for accessing data from sensors and actuators to overcome issues like failure of any connected devices.	Apply
CO 3	**Compare** Machine to Machine with IoT and identifying the role of SDN,NFV, NETCONFG-YANG for data exchange between devices and management on network.	Understand
CO 4	**Select** an appropriate sensor to make sensitive measurements of physical parameters.	understand
CO 5	**Choose** raspberry Pi device and set up the environment for connecting other devices/sensors to communicate with raspberry piusing Python language.	Apply
CO 6	**Analyze** different cloud storage models and protocols that are scalable& available on demand for designing IoT applications.	Analyze

IV. COURSE SYLLABUS:

MODULE – I: INTRODUCTION TO INTERNET OF THINGS (10)
Introduction to Internet of Things, definition and characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT communication APIs, IoT enabled ttechnologies, wireless sensor networks, cloud computing, big data analytics, communication protocols, embedded systems, iot levels and templates; Domain Specific IoTs: Home, city, environment, energy, retail, logistics, agriculture, industry, health and lifestyle.

MODULE – II: IoT NETWORKS AND MANAGEMENT (08)
IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG, NETCONF, YANG, SNMP NETOPEER.

MODULE – III: CONTROLLING HARDWARE AND SENSORS (10)
Controlling Hardware, Connecting LED, buzzer, switching high power devices with transistors, controlling AC power devices with relays, controlling servo motor, speed control of DC motor, unipolar and bipolar stepper motors Sensors, Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, temperature and humidity sensor DHT11, motion detection sensors, wireless bluetooth sensors, level sensors, USB Sensors, embedded sensors, distance measurement with ultrasound sensor.

MODULE IV:IOT PHYSICAL DEVICES AND ENDPOINTS (09)
Introduction to Arduino and Raspberry Pi, Installation, Interfaces (serial, SPI, I2C), Programming – Python program with RaspberryPI with focus on interfacing external gadgets, controlling output, reading input from pins.

MODULE V: IOT PHYSICAL SERVERS AND CLOUD OFFERINGS (08)
Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.

V. TEXT BOOKS:
1. ArshdeepBahga and Vijay Madisetti , "Internet of Things: A Hands on Approach", Universities Press, 2015.
2. Matt Richardson and Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 2014.
3. Simon Monk, "Raspberry Pi Cookbook-Software and Hardware Problems and Solutions", O'Reilly (SPD), 2016.

VI. REFERENCE BOOKS:
1. Peter Waher, "Learning Internet of Things", Packt Publishing, 1st Edition, 2015.
2. Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment", River Publishers, 2014.
3. N. Ida, "Sensors, Actuators and Their Interfaces", SciTech Publishers, 2014.

VII. WEB REFERENCES:
1. http://www.drps.ed.ac.uk/20,21/dpt/cxinfr11150.htm
2. https://mrcet.com/downloads/digital_notes/EEE/IoT & Applications Digital Notes.pdf
3. https://www.coursehero.com/file/44580892/IOT,LECTURE,NOTES,CSE,0doc/
4. https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf
5. https://lecturenotes.in/subject/370/internet-of-things-iot