Mandsaur University, Mandsaur

Subject Name	L	T	P	Credit
Internet of Things (EEE500)	2	1	2	4

Course Objectives:
This course will expose students to –

- Describe what IoT is and how it works today
- Recognize the factors that contributed to the emergence of IoT
- Design and program IoT devices
- Use real IoT protocols for communication
- Secure the elements of an IoT device
- Design an IoT device to work with a Cloud Computing infrastructure.
- Transfer IoT data to the cloud and in between cloud providers
- Define the infrastructure for supporting IoT deployments

Unit 1
Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.
Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

Unit 2
Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

Unit 3
Sensor Technology, Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology

Unit 4
IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOT Privacy and security solutions, Raspberry Pi & Arduino devices. IOT Case studies: smart city streetlights control & monitoring.

Unit 5

Developing IoT solutions: Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Course Outcomes:
At the completion of this course, students will be able to:

- Understand the Concepts of IoT.
- Understand IoT Technologies behind intelligent and smart devices.
- Examine the IoT hardware.
- Examine the communication protocol.
- Gain the knowledge about developing IoT solution.

Reference Book:

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication

2. Vijay Madisetti and Arshdeep Bahga, "Internet of things (A-Hand-on-Approach)" 1st Edition, Universal Press

3. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.

4. Charless Bell "MySQL for the Internet of things", Apress publications.

5. Francis dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, Apress publications 2013.

6. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black", McGraw Hill publication.

7. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014. Syllabus for Bachelor of Technology Computer Engineering

8. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

Suggested List of Experiment:
Students have to register in Cisco Networking Academy (Netacad) for Internet of Things Course and Certificate.

1. Introduction to various sensors and various actuators & its Application

1 Hour

a) PIR Motion Sensor. Wokwi Simulator

b) Rain Drop Sensor. Theory Only

c) Moisture Sensor. Tinker Cad Simulator

d) Temperature Sensor. LM35 DZ sensor - Hardware Required

e) Touch Sensor. Theory Only

f) Infrared Sensor. Tinker Cad Simulator

g) RFID Sensor. Theory Only

h) Bluetooth Module. Theory Only

i) Wi-Fi Module. with ESP8266

1 Hour	2. Demonstrate Node MCU and its working	LED Blink and LED Switch Control
1 Hour	3. Getting Started with ESP8266 Wi-Fi SoC	Connect ESP8266 with WiFi Acess Point
2 Hours	4. Hands-on with on-board peripherals of ESP8266	2 Experiments A. PWM B. ADC
1 Hour	5. Demonstrate Arduino and its pins.	Tinker Cad
1 Hour	6. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.	Tinker Cad
	7. To perform LED Blink using Arduino.	Already Performed in Exp 2 with ESP8266, Not much change in code
2 Hours	8. Creating a webpage and display the values available through Arduino.	As most Arduino boards do not have WiFi Module so it would be difficult, It can be performed using ESP8266
2 Hours	9. Demonstration of Setup & Working of Raspberry Pi.	Wokwi SImulator
2 Hours	10. Home Temperature Monitoring System	LM35 + ESP8266
2 Hours	11. Push Temperature data to ThingSpeak Cloud using HTTP Protocol	
3 Hours	12. Capstone Project - Development of Home Automation system using Amazon Alexa and Arduino IoT Cloud	

Total 18 Lab Hours

Hardware Requirements

1. ESP8266 x 1 + USB Cable
2. LM35 Temperature Sensor
3. 2 Channel Relay 5 Volts
4. 2 Bulbs + 2 Bulb Holder + Wires
5. Jumper Wires 5 F2F, 5 M2M, 5 M2F

#Note:
Most Practical can be performed using Wokwi Simulator, But I would suggest using at least ESP8266 and few sensors and actuator for better understanding and feel. These are mentioned in Hardware Requirements.

Computer Lab with good internet connectivity with USB Ports