

Subject Code: 01CE0806
Subject Name: Internet of Things
B.Tech. Year - IV

Objective: In this course, student will explore various components of Internet of things such as Sensors, internetworking and cyber space. In the end they will also be able to design and implement IoT circuits and solutions.

Credits Earned: 05

Course Outcomes: After successful completion of this course, student will be able to

- Understand general concepts of Internet of Things (IoT) (Understand)
- Recognize various devices, sensors and applications (Knowledge)
- Apply design concept to IoT solutions (Apply)
- Analyze various M2M and IoT architectures (Analyze)
- Evaluate design issues in IoT applications (Evaluate)
- Create IoT solutions using sensors, actuators and Devices (Create)

Pre-requisite of course: Fundamentals of computer network, Network Security, internet technology.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
4	0	2	5	50	30	20	25	25	150



Contents:

Unit	Topics	Contact Hours
1	Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.	10
2	M2M to IoT -The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT,	8
3	M2M vs IoT An Architectural Overview –Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT.	8
4	IoT Reference Architecture - Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world - Introduction, Technical design Constraints.	8
5	Domain specific applications of IoT : Home automation, Industry applications, Surveillance applications, Other IoT application.	8
6	Developing IoT solutions : Introduction to Python, 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.	10
	Total Hours	52

References:

1. Jan Holler, Vlasios Tsiatsis, 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.



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2. Vijay Madiseti and Arshdeep Bahga, “**Internet of Things (A Hands-on-Approach)**”, 1st Edition, VPT, 2014
3. Francis daCosta, “**Rethinking the Internet of Things: A Scalable Approach to Connecting Everything**”, 1st Edition, Apress Publications, 2013
4. Cuno Pfister, Getting Started with the Internet of Things, O’Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
10%	10%	30%	25%	15%	10%

List of Experiments – Internet of Things

1. Introduction to various sensors and various actuators & its Application (Students have to prepare Report for the same). Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
 - a) PIR Motion Sensor.
 - b) Rain Drop Sensor.
 - c) Moisture Sensor.
 - d) Temperature Sensor.
 - e) Touch Sensor.
 - f) Infrared Sensor.
 - g) Servo Moto.
 - h) RFID Sensor.
 - i) Bluetooth Module.
 - j) Wi-Fi Module.
2. Demonstrate NodeMCU and its working
3. Getting Started with ESP8266 Wi-Fi SoC
4. Hands-on with on-board peripherals of ESP8266
5. Demonstrate Arduino and its pins.



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6. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
7. Create a circuit using Arduino and sensors. Perform experiment using Arduino Uno to Learn Working of Servo Motor
8. Creating a webpage and display the values available through Arduino.
9. Demonstration of Setup & Working of Raspberry Pi. (Students have to prepare the Report for the same.).
10. OPEN Ended problem: Students are required to submit an IOT based project using the Microcontroller or a Raspberry Pi and connecting various sensors and actuators. The data for the same should be displayed via a webpage or a web app.

Instructional Method:

- a) The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b) The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c) Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d) Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

References

Web

- a) <https://www.udemy.com/internet-of-things-iot-for-beginners-getting-started/>
- b) <http://playground.arduino.cc/Projects/Ideas>
- c) <http://runtimeprojects.com>
- d) <http://www.megunolink.com/articles/arduino-garage-door-opener>
- e) <http://www.willward1.com/arduino-wifi-tutorial>



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- f) <http://www.makeuseof.com/tag/pi-overdose-heres-5-raspberry-pi-alternatives>
- g) <http://www.electronicshub.org/arduino-project-ideas>
- h) <http://homeautomationserver.com>
- i) <http://www.toptechboy.com/arduino-lessons>
- j) <https://www.eprolabs.com>

YouTube

- a) <https://www.youtube.com/watch?v=dC2GdEWHRxQ&list=PLy6JR9IR8VKOZBpDcETsH9Tb6B4bcaTXf>
- b) https://www.youtube.com/watch?v=kLd_JyvKV4Y
- c) <https://www.youtube.com/watch?v=TkA2LJctU1c>