

## 5.5 INTERNET OF THINGS

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### RATIONALE

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain like agriculture, space, healthcare, manufacturing, construction, water, and mining. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology. This introductory syllabus will enable learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- understand the concepts of Internet of Things.
- understand what constitutes an IoT design solution
- identify the sensors and other devices needed for different IoT solutions
- understand the component parts of an IoT network and its connections
- build small IoT applications.

### DETAILED CONTENTS

1. Introduction to Internet Of Things (IoT)

(10 Periods)

Introduction to IoT, Defining IoT, Things in IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, IoT Protocols, IoT communication Models, IoT communication API's, IoT enabling Technologies.

## 2. IoT Devices

(12 Periods)

How electronic devices fit with the Internet of Things, and why they are important

: Breadboard and its internal connections, ,LED and its connections ,Tri-color LED ,Resistor

Introduction to the many 'end devices', sensors and actuators, differentiate between different sensor types

## 3. IoT Networks

(12 Periods)

Introduction to the components of basic IoT networks, the types of network connections and how data travels through them, and the role of Internet Protocols. understanding of microcontrollers/Arduino and communication protocols

## 4.

(12 Periods)

,feature of arduino device ,Arduino device introductionComponents of Arduino boardC )Arduino Programming Language ,Understanding of basic of Arduino IDE, function ,control statement ,loops ,datatype ,variables : (Language

## 5. IoT and M2M

(10 Periods)

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization, IoT and WoT.

## **LIST OF PRACTICALS**

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13. Installation of Arduino IDE
14. Interfacing Light Emitting Diode (LED)- Blinking LED
15. Interfacing Button and LED – LED blinking when button is pressed.
16. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
17. Interfacing Temperature Sensor (LM35) and/or humidity sensor (e.g. DHT11)
18. Interfacing Liquid Crystal Display (LCD) – display data generated by sensor on LCD
19. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD, switch on LED when data sensed is higher than specified value.
20. Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD
21. Interfacing Relay module to demonstrate Bluetooth based home automation application. (using Bluetooth and relay).

## **INSTRUCTIONAL STRATEGY**

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss case studies with students , since this subject is practical oriented, the teacher should demonstrate functioning of various sensors and demonstrate building of IoT applications. Solution to various regression and classification problems should also be built

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests, mid-term and end-term written tests
- viva-voce
- Actual laboratory and practical work exercises
- Software installation, operation, development

## **RECOMMENDED BOOKS**

1. The Internet of Things: Connecting Objects to the Web, Wiley Publisher Hakima Chaouchi
2. Internet of Things: A Hands On Approach, University Press, Vijay Madiseti, Arshdeep Bahga.
3. 21 Internet Of Things (IOT) Experiments, BPB Publications Yashavant Kanetkar
4. Arduino Projects For Engineers ,BPB Publications ,Neerparaj Rai
5. Internet of Things – A Hands on Approach, By Arshdeep Bahga and Vijay Madiseti Universities Press, ISBN: 9788173719547
6. The Internet of Things , Pearson, By Michael Miller ISBN: 9789332552456
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

**Websites for Reference:** <http://www.spoken-tutorial.org> , <http://swayam.gov.in>

#### **LIST OF COMPONENTS**

1. One kit for 3-4 students : Arduino Uno, sensors (Bluetooth module (HC05), MQ135, DHT11, breadboard , LCD, 2-relay module etc)
2. Consumables : LED, button, connecting wires, LDR, LM35, battery, etc

#### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1.	10	16
2.	12	22
3.	12	22
4.	12	22
5.	10	18
<b>Total</b>	<b>56</b>	<b>100</b>

#### **5.6 MINOR PROJECT WORK**

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