

**V Semester**  
**Course 14 A: Internet of Things**  
Credits -3

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**Learning Objectives:**

To enable students to understand basic IoT constructs, create IoT solutions to real world problems using IoT

**Learning Outcomes:** On successful completion of the course, students will be able to

1. Understand various concepts, terminologies and applications of IoT
2. Learn how to build IoT devices with development boards
3. Understand various Wireless protocols for IoT
4. Learn how to use various sensors and actuators & develop IoT solutions using Arduino
5. Develop and Connect IoT with Cloud Platforms.

**UNIT - I**

**Fundamentals of IoT:** Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

**Applications of IoT:** Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

**UNIT - II**

**Sensors Networks :** Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

**Unit - III**

**Wireless Technologies for IoT:** WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet and Modbus.

**IP Based Protocols for IoT:** IPv6, 6LowPAN, LoRA, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols.

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## **Unit - IV**

**Arduino Simulation Environment:** Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD.

**Sensor & Actuators with Arduino:** Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

## **Unit - V**

**Developing IOT's:** Implementation of IoT with Arduino, Connecting and using various IoT Cloud Based Platforms such as Blynk, Thingspeak, AWS IoT, Google Cloud IoT Core etc. Cloud Computing, Fog Computing, Privacy and Security Issues in IoT.

### **Text Book(s)**

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547
2. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
3. Internet of Things- Dr Surya Durbha & Dr Jyoti Joglekar, Oxford University Press

### **Reference Books**

1. Daniel Minoli, — “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press

### **SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:**

**Unit 1: Activity:** Seminar on various applications of IoT through PPT

**Evaluation Method:** Content knowledge, organization, clarity, presentation skills, visualaids, audience engagement

**Unit 2: Activity:** Hands-on Lab activity on Arduino Development

**Evaluation Method:** Lab Performance and Correctness of Circuit Implementation

**Unit 3: Activity:** Group discussion on Future Wireless Technologies.

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**Evaluation Method:** Active participation, knowledge sharing, critical thinking, and demonstration of different wireless technologies for IoT

**Unit 4: Activity:** Peer activity on different types of Sensors

**Evaluation Method:** Peer evaluation of working principle of Sensor, use-cases of sensors.

**Unit 5: Activity:** Guest Lecture or Expert talk on Cloud based IoT platforms

**Evaluation Method:** Active Participation, Post Talk report presentation

### **V Semester**

### **Course 14 A: Internet of Things**

Credits -1

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#### **List of Experiments:**

1. Understanding Arduino UNO Board and Components
  2. Installing and work with Arduino IDE
  3. Blinking LED sketch with Arduino
  4. Simulation of 4-Way Traffic Light with Arduino
  5. Using Pulse Width Modulation
  6. LED Fade Sketch and Button Sketch
  7. Analog Input Sketch (Bar Graph with LEDs and Potentiometre)
  8. Digital Read Serial Sketch (Working with DHT/IR/Gas or Any other Sensor)
  9. Working with Adafruit Libraries in Arduino
  10. Spinning a DC Motor and Motor Speed Control Sketch
  11. Working with Shields
  12. Design APP using Blink App or Things peak API and connect it LED bulb.
  13. Design APP Using Blynk App and Connect to Temperature, magnetic Sensors.
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