COURSE TITLE	**INTERNET OF THINGS**
COURSE CODE	**01EE1610**
COURSE CREDITS	**1**

Objective:

1 To equip learners with comprehensive IoT skills, covering fundamentals to advanced concepts, including sensor integration, microcontroller programming, and wireless communication.

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

1 Apply knowledge of IoT architecture and key components to design basic IoT system models

2 Analyze sensor-microcontroller interactions to evaluate performance of application.

3 Apply wireless communication protocols in IoT-based applications.

4 Develop and test an end-to-end IoT prototype using appropriate hardware and software tools.

Pre-requisite of course: Basic Electronics, Computer Programming

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	2	0	0	0	25	25

Contents : Unit	Topics	Contact Hours
1	**Fundamentals of Internet of Things** Introduction to Internet of Things (IoT), Evolution, scope, and significance of IoT in modern technology, IoT system architecture: perception, network, and application layers, Overview of enabling technologies (embedded systems, communication networks, cloud computing), Key characteristics and features of IoT, Opportunities, challenges, and future trends	5
2	**Sensors and Actuators in IoT** Introduction to sensors and actuators, Classification of sensors (analog/digital, active/passive), Commonly used sensors in IoT applications (temperature, light, motion, etc.), Types of actuators (electrical, mechanical, hydraulic, etc.), Interfacing sensors and actuators with microcontrollers, Signal conditioning and data acquisition basics, Practical considerations: range, accuracy, calibration, and response time	9

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Contents : Unit	Topics	Contact Hours
3	**IoT Devices and Microcontrollers** Overview of IoT hardware platforms, Introduction to microcontrollers and development boards: Arduino, NodeMCU, ESP8266, ESP32, Raspberry Pi, GPIO operations and pin configuration, Basics of programming using Arduino IDE and MicroPython, Interfacing input/output devices, Power requirements and connectivity options, Selecting suitable hardware for specific IoT applications	8
4	**Communication Protocols and Networking** Importance of communication in IoT systems, Overview of IoT communication models and layers, Serial communication: UART, SPI, I2C, Wireless technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, Introduction to internet-based protocols: HTTP, MQTT, IP addressing and data routing basics in IoT, Setting up peer-to-peer and cloud-based communication, Practical implementation of wireless data exchange between devices	5
5	**IoT Security, Data Management, and Project Development** Fundamentals of IoT security: threats, vulnerabilities, and risk factors, Security principles: confidentiality, integrity, and availability, Common attacks in IoT systems (e.g., spoofing, eavesdropping, DDoS), Security measures: authentication, encryption, and secure data transmission, Basics of data storage, handling, and cloud integration, Best practices for IoT deployment and device updates, Planning, building, and testing a simple IoT project, Case studies and real-world applications, Project documentation and presentation	3
Total Hours		**30**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment No. 01** Introduction to Arduino IDE and uploading a basic blink code	2
2	**Experiment No. 02** Interfacing an LED and buzzer with Arduino/NodeMCU	2
3	**Experiment No. 03** Reading analog and digital data from sensor	2
4	**Experiment No. 04** Interfacing a motion sensor and triggering an output	2
5	**Experiment No. 05** Displaying sensor data on Serial Monitor and LCD screen	2
6	**Experiment No. 06** Interfacing of sensors for temperature and humidity measurement	2
7	**Experiment No. 07** Controlling devices using a relay module	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
8	**Experiment No. 08** Data transmission between local device and cloud using Wi-Fi	2
9	**Experiment No. 09** Sending sensor data to cloud platform	2
10	**Experiment No. 10** Displaying real-time sensor data on mobile app	2
11	**Experiment No. 11** Smart light control using IR sensor or smartphone	2
12	**Experiment No. 12** Monitoring environmental parameters with sensor and send data to IoT cloud.	2
Total Hours		**24**

Textbook :

1 Designing the Internet of Things, A. McEwen, H. Cassimally, Wiley, 2013

2 Internet of Things: A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Hands On Books Series, 2014

3 An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications, Rahul Dubey, Cengage India Publication, 2019

4 Internet of Things: Architecture and Design Principles, Raj Kamal , McGraw Hill Education, 2017

References:

1 The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, Donald Norris, McGraw-Hill Education, 2015

Suggested Theory Distribution:

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

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	30.00	25.00	15.00	10.00	0.00

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc18_cs08

2 https://www.microsoft.com/en-us/internet-of-things/

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Supplementary Resources:

3 https://www.scnsoft.com/blog/iot-architecture-in-a-nutshell-and-how-it-works