L	T	P	C
4	0	0	4

Course Code: CSE415R02

INTERNET OF THINGS

Course Objective:

This course will help the learner to describe the fundamental concepts of IoT, to create small low-cost embedded systems and illustrate the IoT concept in real world Scenarios.

UNIT - I **15 Periods**

Foundational Aspects: Emergence of IoT: Background & Vision - IoT as a disruptive Technology - Standardization. **Concept of Smart Things / Objects:** Things - Need - Commonly used smart things. WSN: Introduction - Characteristics - Types of WSN and Architecture - Network Topologies - Communication Protocols - Security in WSN. **IoT Standards and Protocols:** Overview - IoT Network Level - LPWAN - Wireless Technologies - Network Layer and encapsulation Protocols.

UNIT - II **15 Periods**

Domain Specific IoTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.
IoT and M2M: M2M - Difference between IoT and M2M - Software Defined Networks - Network Function virtualization - Need for IoT systems management - SNMP - Network Operator requirements – NETCONF – YANG – IoT system Management with NETCONF - YANG. **Developing IoT:** IoT Design Methodology: Purpose & Requirements Specification - Process Specification - Domain Model Specification - Information Model Specification - Service Specifications - IoT Level Specifications - Functional View Specification - Operational View Specification - Device & Component Integration - Application Development - Case study on IoT for Weather Monitoring.

UNIT - III **15 Periods**

IoT Hardware, Software and Middleware: Sensors and Actuators - **Open Hardware:** IoT hardware - Prototyping Boards for IoT - **IoT middleware:** Introduction - Architectures - State-of-the-art IoT Middleware - IoT software Platforms - **Prototyping IoT applications:** Benefits - Physical Design Considerations - Logical Design - API - Embedded Code Writing - Real World Prototype.

UNIT - IV **15 Periods**

Big Data Science and Analytics: Big IoT Data Science - Data Lake/Swamp - Relation between IoT and Big data - Big data Analytics in IoT - Tools - IoT in the Cloud - **Edge Analytics**: Near Real Time Sensor Stream Processing.
Cyber Security and Privacy: Introduction - Issues - Requirements - Technologies - System Security Controls - Best Practices for Securing IoT devices.

TEXT BOOKS

1. Surya Durbha, Jyoti Joglekar, Internet of Things, Oxford University Press, First Edition, 2021.
2. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands of Approach*, University Press, First Edition, 2015.

REFERENCES

1. Pethuru Raj, Anupama C.Raman, *The Internet of Things: Enabling Technologies, Platforms, and use cases*, CRC Press, First Edition, 2017.
2. HonbaZhou,*The Internet of things in the Cloud : A Middleware Perspective*, CRC Press, First Edition, 2012.
3. Adrian McEwen, Hakim Cassimally, *Designing the Internet things*, John Wiley and Sons, First Edition, 2014.

UNITWISE LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	● Explain the core components of an IoT ● Overview of various Wireless technologies for IoT
Unit II	● Describes a generic design methodology for IoT Platforms
Unit III	● Gain Knowledge on various sensors for IoT applications ● Classify IoT Middleware
Unit IV	● Assess Security issues for a given IoT application ● Gain Insight into data science aspects for IoT

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

CO No.	Course outcomes	HCL
CO1	Narrate the core components of an IoT	K2
CO2	Describes a generic design methodology for IoT Platforms	K2
CO3	Acquire knowledge of various actuators, sensors and different middleware for IoT applications	K3
CO4	Ability to prototype an IoT Product Idea	K6
CO5	Gain Insight into data science aspects for IoT	K2
CO6	Assess Security issues for a given IoT application	K6