Internet of Things (IoT)

Course Code: PGMTH3E015T

Course Title: Internet of Things (IoT)

Semester: III

Credits: 04

Course Overview

Internet of Things (IoT) actually refers to uniquely identifiable objects or things and their virtual representations in an internet-like infrastructure. The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.

Course Objectives

- Able to understand the application areas of IoT.
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
- Able to understand building blocks of Internet of Things and characteristics.

Course Outlines

Contents	No of Lectures
Unit-I Evolution of Internet of Things, Enabling Technologies, IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects	10
Unit-II IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.	10
Unit-III Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.	10
Unit-IV Structured Vs Unstructured Data and Data in Motion Vs Data in Rest , Role of Machine Learning, No SQL Databases, Hadoop Ecosystem – Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django AWS for IoT,	10

System Management with NETCONF-YANG	
Unit-V Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant-wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control	10

Course Outcomes:

On completion of the course the student should be able to

- Understand the vision of IoT from a global context.
- Analyze various protocols for IoT.
- Determine the Market perspective of IoT
- Use of Devices, Gateways and Data Management in IoT.
- Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Teaching Plan

SN	Topic	No. of Lectures	Reference
Unit-I			
1	Evolution of Internet of Things	**1**	T1: Chapter 1
2	Enabling Technologies of IoT	**1**	T1: Chapter 1
3	IoT Architectures: oneM2M, IoT World Forum (IoTWF)	**2**	T1: Chapter 2
4	Alternative IoT models, Simplified IoT Architecture	**2**	T1: Chapter 2
5	Core IoT Functional Stack, Fog, Edge and Cloud in IoT	**1**	T1: Chapter 2
6	Functional blocks of an IoT ecosystem, Sensors, Actuators,	**1**	T1: Chapter 2
7	Smart Objects	**1**	T1: Chapter 3
8	Connecting Smart Objects	**1**	T1: Chapter 4
Unit-II			
9	IOT Access Technologies: Physical and MAC layers	**2**	T1: Chapter 5
10	Topology and Security	**1**	T1: Chapter 5
11	IEEE 802.15.4	**2**	T1: Chapter 5
12	802.15.4g	**1**	T1: Chapter 5
13	802.15.4e	**1**	T1: Chapter 5
14	1901.2a	**1**	T1: Chapter 5
15	802.11ah	**1**	T1: Chapter 5
16	LoRaWAN	**1**	T1: Chapter 5
Unit-III			
17	Embedded computing logic, Microcontroller, System on Chips	**2**	T2: Chapter 5
18	Design Methodology	**1**	T2: Chapter 5
19	IoT system building blocks	**1**	T2: Chapter 5

20	Arduino, Board details	**2**	T2: Chapter 6
21	IDE programming, Raspberry Pi	**2**	T2: Chapter 6
22	Interfaces and Raspberry Pi with Python Programming	**2**	T2: Chapter 6
Unit-IV			
23	Structured Vs Unstructured Data and Data in Motion Vs Data in Rest	**2**	T1: Chapter 7
24	Role of Machine Learning	**1**	T1: Chapter 7
25	No SQL Databases, Hadoop Ecosystem – Apache Kafka, Apache Spark	**2**	T1: Chapter 7
26	Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT	**2**	T1: Chapter 7
27	Python Web Application Framework, Django	**2**	T3: Chapter 7
28	AWS for IoT, System Management with NETCONF-YANG	**1**	T3: Chapter 8
Unit-V			
29	Cisco IoT system	**1**	T3: Chapter 7
30	IBM Watson IoT platform	**1**	T3: Chapter 7
31	Manufacturing	**1**	T1: Chapter 9
32	MAC Management, Future Development	**1**	T1: Chapter 5
33	Converged Plant-wide Ethernet Model (CPwE)	**1**	T1: Chapter 9
34	Power Utility Industry	**1**	T1: Chapter 11
35	Grid Blocks Reference Model	**1**	T1: Chapter 11
36	Smart Connected Cities: Layered architecture, Smart Lighting	**2**	T1: Chapter 12
37	Smart Parking Architecture and Smart Traffic Control	**1**	T1: Chapter 12

Evaluation Scheme

S.No	Exam	Marks	Duration of Exam.	Coverage/Scope of Examination
1	Mid Term Exam.	25	2 Hours	Two to Three Units
2	End Term Exam.	50	3 Hours	All Five Units
3	Teachers Continuous Assessment	25	Entire Semester	Assignments, Quizzes, Tests, Projects, Presentations etc.

Text/Reference Books

T1: David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2018.

T2: Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach".

T3: Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012.

T4: Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things, Springer, 2011.

T5: Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.