IV B.Tech – I Semester

(20EC7747) INDUSTRIAL IOT
(Minors)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	4

Pre-Requisites: Digital Electronics, Micro Processors and Micro Controllers

Course Objectives:

- To introduce the basic concepts of Industrial IoT and Industry 4.0.
- To provide an understanding of the IIoT business model and reference architecture, along with the layers involved in it.
- To equip students with the knowledge of big data analytics, software-defined networks, machine learning, data science, and programming required for IIoT.
- To provide an understanding of security and fog computing in IIoT, and the application domains of IIoT in various industries.
- To analyze and evaluate Digital Twin of IIoT applications.

Unit 1: Introduction

Introduction: Sensing & actuation, Communication, Networking, Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories. Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis, Cyber security in Industry 4.0

Unit 2: Business Model and Reference Architecture, Layers, Sensing, Processing Communication and Networking

Basics of Industrial IoT: Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems. Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.

Unit 3: Big Data Analytics and SDN, Machine Learning and Data Science, Programming

Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science, R and Julia Programming, Data Management with Hadoop.SDN in IIoT, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing in IIoT

Unit 4: Security and Fog computing and IIoT Application Domains

Security and Fog Computing - Fog Computing in IIoT, Security in IIoT, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry. Industrial IoT- Application

Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

Unit 5: Digital Twin

Introduction to Digital Twin, need for Digital Twin, Elements of Digital Twin, Digital Twin process design and information requirements, Digital twin conceptual architecture -create, communicate, Aggregate, Analyze, Insight, Act, driving business value through digital twin. Digital Twin for Asset: Digitalizing asset behavior using simulated mathematical modeling and building Digital Twin -Need, Benefits, Architecture, Models and Use cases -Predictive and Prescriptive maintenance.

COURSE OUTCOMES:

After successful completion of the course, the students can be able to

S. No	Course Outcome	BTL
1	Understand the concepts of sensing and actuation, communication and networking, the Fourth Revolution, LEAN production systems, and smart factories.	L2
2	Identify the different layers of IIoT and understand the business model and reference architecture of IIoT.	L3
3	Apply big data analytics, machine learning, and data science techniques in IIoT applications, and understand the use of programming languages.	L3
4	Understand the concepts of fog computing and security in IIoT, and identify the different application domains of IIoT in various industries.	L2
5	Analyze Digital Twin usage in IIoT applications.	L3

Correlation of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	1	3	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	-
CO3	3	2	3	1	-	-	-	-	-	-	-	1	2	-
CO4	3	2	1	2	-	-	-	2	-	-	-	1	3	-
CO5	3	3	2	1	-	-	-	1	-	-	-	2	2	-

Text Books:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. "Industrial Internet of Things: Cyber manufacturing Systems" by Sabina Jeschke, Christian Brecher, Houbing Song, and Danda B. Rawat.
3. "Industry 4.0: The Industrial Internet of Things" by Alasdair Gilchrist.

Reference Books:

1. "The Internet of Things (The MIT Press Essential Knowledge series)" by Samuel Greengard.

2. S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
3. "Smart Manufacturing: Applications and Case Studies" edited by Alokesh Pramanik and Sarbjeet Singh.