NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	M.Tech. in Electronics & Instrumentation Engineering (Robotics and Artificial Intelligence)
Semester:	II
Course Code:	6EC861ME25
Course Title:	Wireless Sensor Networks and Internet of Things
Course Type:	Elective
Year of introduction:	2025 - 26

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

After successful completion of the course, student will be able to –

1. apply appropriate communication protocols in Wireless Sensor Networks (WSN) and the Internet of Things (BL3)
2. analyse the wireless sensor networks to optimize network design (BL4)
3. evaluate various strategies for integrating IoT devices with Cloud and Edge Computing (BL5)
4. develop IoT-based applications. (BL6)

Unit	Contents	Teaching Hours (Total 30)
Unit I	**Introduction and Overview of Wireless Sensor Networks** Introduction to ad-hoc networks, Sensor network architectural elements, Challenges and hurdles in sensor network design.	04
Unit II	**Communication Protocols in WSN** Medium access control protocols: CSMA and its types, CSMA/CD, CSMA for wireless, Routing protocols: Static and Dynamic Routing Protocols, Transport control in WSN, Energy-efficient communication.	09
Unit III	**Network Management for Wireless Sensor Networks** Network management requirements, Network management design issues, Example of management architecture: MANNA, naming, localization issues related to network management.	04
Unit IV	**Internet of Things (IoT) Fundamentals** Introduction to IoT: Definition, Features, and Applications, IoT architecture and protocols, IoT communication technologies (Bluetooth, ZigBee, LoRa, NB-IoT), Edge, Fog, and Cloud computing in IoT.	05
Unit V	**IoT Communication and Protocols** MQTT, CoAP, HTTP, AMQP, IPv6, 6LoWPAN, RPL, IoT Device Addressing and Identification, Wireless Technologies for IoT (Wi-Fi, LPWAN, RFID, NFC) **IoT Cloud Integration and Data Analytics** Cloud platforms for IoT: AWS IoT, Google IoT Core, Azure IoT	08

Self – Study:	The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/References:	1. Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless sensor networks, Technology, protocols, and applications, John Wiley Publications 2. Edgar H. Callaway, Wireless Sensor Networks: Architectures and Protocols, CRC Press 3. Anna Ha, Wireless Sensor Network Design, John Wiley Publications 4. David Hanes, Gonzalo Salgueiro, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases, Pearson. 5. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-on Approach, Universities Press

Suggested List of Tutorials:	1. To understand the concept of Adhoc Wireless Network and design challenges encountered. 2. To compare the performance of MAC protocols. 3. To evaluate the performance of routing protocols. 4. To evaluate the performance of transport protocols. 5. To analyze the localization techniques in WSN. 6. To understand the 4-layer IoT model. 7. To compare IoT communication technology – 1. 8. To compare IoT communication technology – 2. 9. To understand the concept of Edge, Fog and Cloud computing. 10. To compare IoT protocols for various test cases. 11. To understand the addressing methods for IoT. 12. To compare wireless technologies for IoT. 13. To choose correct cloud application for IoT – 1. 14. To choose correct cloud application for IoT – 2.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2025 - 26 and onwards