

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Electrical Engineering
Semester:	VII
Course Code:	2EEDE63
Course Title:	IoT in Electrical Systems
Course Type:	(<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course / <input checked="" type="checkbox"/> Department Elective / <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/ <input type="checkbox"/> Open Elective/ <input type="checkbox"/> Any other)
Year of Introduction:	2021 – 22

Credit Scheme

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

At the end of the course, students will be able to-

1. comprehend about the basics and architectural components of IoT
2. apply appropriate access technology and protocols as per the application requirement
3. appreciate the role of big data, cloud computing and security in a IoT system
4. design IoT applications in different domain and be able to analyze their performance

Syllabus:

Total Teaching hours: 30

Unit	Syllabus	Teaching hours
Unit-I	Introduction to Internet of Things (IoT) Concept, importance, challenges, structure of IoT, major players, types- consumer IoT and industrial IoT (IIoT).	05
Unit-II	Devices in IoT Sensors - working and types, sensitivity, error, actuators - working & types; transducers, RFID, overview of micro-controllers (Arduino, Raspberry Pi, Node MCU and SparkFun) and real time simulator, introduction to Python programming.	08
Unit-III	Architecture of IoT Architecture design: hardware layer / perception, sensing and actuation, networking - wireless sensor networking (WSN), low power wide area networks (LPWAN), information & communication technology (ICTs) -wifi, Zigbee, Bluetooth, Communication criteria, IoT access technologies – IEEE 802.15.4.	07
Unit-IV	Data Analytics for IoT Cloud systems (brain of IoT)-storage, data management and data processing, big data analytics.	05
Unit-V	Applications of IoT in Electrical Smart Systems Home energy automation, SCADA using IoT, smart metering, smart grid- structure, challenges (energy management/asset management), electric transportation, wide area monitoring, cyber security and relevant case studies of electrical systems.	05

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.

Laboratory Work:

This shall consist of at least 10 laboratory experiments / simulations based on the syllabus.

Suggested Readings/ References:

8. Peter Waher, Learning Internet of Things, Packt Publishing.
9. Arshdeep Bahga and Vijay Madisetti, Internet of Things: A Hands-on Approach.
10. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.
11. David Hanes, G. Salgueiro, IoT Fundamentals - Networking Technologies, Protocols, and Use Cases for Internet of Things, Cisco Press
12. Olivier Hersent, David Boswarthick and Omar Elloumi, The Internet of Things key applications and protocols, Wiley.
13. Michael Miller, The Internet of Things, Pearson.
14. Zach Shelby and Carsten Bormann, LoWPAN: The Wireless Embedded Internet, Wiley
15. Kostas Siozios, Dimitrios Anagnostos, Dimitrios Soudris and Elias Kosmatopoulos, IoT for Smart Grids: Design Challenges and Paradigms, Springer
16. Application notes on Node MCU
17. Application notes of SparkFun
18. Recent publications from referred journals and relevant standards

Suggested List of Experiments:

1. To familiarize with Arduino and Raspberry Pi.
2. To interface push button/digital sensor with Arduino/Raspberry Pi.
3. To implement Zigbee protocol using Arduino/Raspberry Pi.
4. To interface Bluetooth with Arduino/Raspberry Pi.
5. To implement IoT based smart street light system.
6. To interface motor using relay with Arduino/Raspberry Pi.
7. To implement wireless home automation.
8. To implement IoT based security system.
9. To perform battery management using intelligent controller.
10. To perform wireless operation of relay using Node MCU / SparkFun.
11. To acquire sensor data and update it on the web portal using Node MCU.

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

w.e.f. academic year 2021 - 22 and onwards