FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **VIII**

Course Code: **202050806**

Course Title: **IoT IN ELECTRICAL SYSTEMS**

Course Group: **Professional Elective Course-VI**

Course Objectives: Internet of Things plays an important role in connecting the things i.e. variety of devices through the Internet. IoT market is growing rapidly from an installed base of about 30 billion devices in the year 2020 and expected to grow up to 75 billion devices by 2025. The IoT has emerged as a cutting-edge technology with applications in manufacturing, healthcare, Agriculture, transport, mining, smart cities and many more. This subject covers the fundamentals of IoT with its architecture, protocols and Applications. It also covers the overview and programming of two widely used IoT platforms Arduino and Raspberry Pi.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25/9	25/9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to Internet of Things:** Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling technologies, IoT challenges, IoT levels, IoT and cyber physical system, IoT and WSN	05
2	**Sensors, Microcontrollers, and Their Interfacing:** Sensor interfacing, Types of sensors, Controlling sensors, Actuators, Microcontrollers	05

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3	**Protocols for IoT :** Messaging protocols, Transport protocols, IPv4, IPv6, URI	**07**
4	**Cloud for IoT:** IoT and cloud, Fog computing, Security in cloud, Case study	**05**
5	**Arduino and Raspberry Pi:** Arduino : Architecture, Programming and Application Raspberry Pi : Architecture, Programming and Application	**07**
6	**IoT Security:** Various security issues and need, architecture, requirement, challenges and algorithms	**04**
7	**Application and Case Study of IoT:** Various application of IoT : Smart Grid, Smart Cities and Smart Home, Food, Healthcare, Lavatory maintenance, Water quality, Warehouse, Retail, Driver Assistance, Collision impact, Introduction to Industrial Internet of Things (IIoT) and Industry 4.0	**12**

List of Practicals / Tutorials:

1	Getting started with Node MCU and Arduino IDE.
2	GPIO Interfacing and programming
3	Digital on/off sensor Interfacing and programming
4	Analog sensor Interfacing and programming
5	Controlling devices remotely using Bluetooth link
6	Controlling devices remotely using WiFi link
7	Interfacing and programming of actuators, Controlling devices remotely
8	Web based device control
9	Development of Android applications suitable for IoT
10	IoT based home automation
11	Smart energy experiments
12	Smart city IoT applications

Reference Books:

1	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems Using Assembly and C”, Pearson Education, 2006.
2	David E. Simon. “An Embedded Software Primer” Addision Wesley Pearson Education, 1999.
3	Joseph Yiu, “The Definitive Guide to ARM® CORTEX®-M3 and CORTEX®-M4 Processors”, Newnes, Elsevier, 2014.
4	Trevor Martin, " The Designer's Guide to the Cortex-M Processor Family: A Tutorial Approach”, Newnes, Elsevier, 2016.

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5	Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication
6	Raj Kamal, "Internet of Things: Architecture and Design Principles, McGraw Hill Education
7	Hanes et al "IoT Fundamentals", Cisco Press
8	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", Paperback, 2015.

Supplementary learning Material:	
1	NPTEL online course on IoT: https://onlinecourses.nptel.ac.in/noc18_cs08
2	https://www.tutorialspoint.com/internet_of_things/index.htm
3	https://www.iotworldtoday.com/
4	https://aws.amazon.com/iot/
5	https://www.cisco.com/c/en_in/solutions/internet-of-things/overview.html

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10%	30%	20%	15%	15%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Demonstrate the architecture and functioning of IoT systems including the sensors and microcontrollers with their interfacing and software need considering application areas.	**20**
CO-2	Diagnose the various IoT protocols with detailing of their elements and overall functioning within IoT systems for efficient communication.	**20**
CO-3	Design an IoT system to take the benefit of the Clouds for computing and storage considering security issues.	**20**
CO-4	Leverage the benefits of IoT technologies for automating the various real-life challenges in various application areas.	**20**
CO-5	Develop the software components of IoT system using Arduino /Raspberry Pi Programming.	**20**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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