Course Code	Course Name	Credits
26PH008	DIGITAL ELECTRONICS AND IOT	04

Course Objectives

- To grasp the fundamentals of logic gates, employing Boolean algebra and Karnaugh maps for the simplification and verification of logic circuit outputs.
- To become familiar with the roles and applications of encoders, decoders, multiplexers, and demultiplexers in digital systems.
- To master various number systems, focusing on the methodology for converting numbers from one system to another.
- To comprehend the operation of arithmetic circuits, emphasizing their significance in performing basic binary operations.
- To acquire an understanding of flip-flops' functionality and their critical use in analyzing and designing sequential circuits.

Learning Outcomes

Upon successful completion, students will have the knowledge and skills to:

- Understand the fundamentals of number systems, Boolean algebra, and logic gates used in digital electronic circuits.
- Analyzeand design basic combinational logic circuits such as adders, multiplexers, encoders, and decoders.
- Explain the working ofsequential circuits including flip-flops, registers, and counters.
- Understand the architecture, components, and communication technologies used in Internet of Things (IoT) systems**.**
- Apply digital electronics and IoT concepts to develop basic embedded and smart system applications**.**

Unit 1 - Number Systems And Logic Gates (12 Hrs.)

Binary, octal and hexadecimal number systems – Conversions – Binary arithmetic – Complements – BCD code – Gray code – Error detecting codes. Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR – Truth tables – Universal gates – De Morgan's theorems – Boolean algebra – Simplification of Boolean expressions – Karnaugh map (K-map) simplification.

Unit 2 – Combinational Logic Circuits (12 Hrs.)

Half adder and full adder – Half subtractor and full subtractor – Parallel adder – Multiplexer and demultiplexer – Encoder and decoder – Code converters – Parity generator and checker – Implementation of combinational circuits.

Unit 3 - Sequential Logic Circuits (12 Hrs.)

Flip-flops: SR, JK, D and T flip-flops – Master-slave flip-flop – Registers – Shift registers – Counters: ripple counter, synchronous counter – Ring counter – Applications of sequential circuits.

Unit 4 – Introduction To Internet Of Things (Iot) (12 Hrs.)

Concept of Internet of Things – Evolution of IoT – IoT architecture – Components of IoT systems – Sensors and actuators – Embedded systems – Microcontrollers and development boards (Arduino / Raspberry Pi) – IoT communication technologies: Wi-Fi, Bluetooth, ZigBee, RFID – IoT applications in smart homes, healthcare, agriculture and industry.

Unit 5 - Iot Applications And Data Communication (12 Hrs.)

IoT protocols and networking basics – Data acquisition and cloud connectivity – Introduction to IoT platforms – Basics of IoT security and privacy – Data monitoring and control systems – Case studies: smart city, environmental monitoring, industrial automation – Introduction to IoT data analytics.

Reference Books:

1. Leach, Donald P., Malvino, Albert Paul, Saha, Goutam, 2011, Digital Principles and Applications, 7th Edition, Tata McGraw – Hill Publishing Company Limited.
2. M. Morris Mano. "Digital Logic and Computer Design",
3. Digital Fundamentals, Thomas L. Floyd, 8th Edition (Universal BookStall, India, 2008).
4. Millman J. and Halkias C., Integrated Electronics, New Delhi, Tata McGraw Hill, 2001
5. Vijay Madisetti&ArshdeepBahga, *Internet of Things – A Hands-On Approach*, Universities Press.
6. Raj Kamal, *Internet of Things: Architecture and Design Principles*, McGraw Hill Education.
7. Adrian McEwen & Hakim Cassimally, *Designing the Internet of Things*, Wiley.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc26_ee54/preview
2. https://youtu.be/FFDMzbrEXaE?si=PcXeLmyRfmBGSWxn
3. https://youtu.be/lqN8xLTtdaA?si=UXC1LzJluSyHMDjP

COs and Bloom's Taxonomy Mapping – 26PH008		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Recall and explain number systems, Boolean algebra, and logic gate operations in digital circuits.	K1, K2
CO2	Apply Boolean algebra and K-map techniques to simplify and design combinational circuits.	K3
CO3	Analyze the operation of sequential circuits including flip-flops, registers, and counters.	K4
CO4	Evaluate IoT architecture, communication technologies, and their applications in real-world systems.	K5
CO5	Develop basic digital and IoT-based systems using embedded platforms and data communication concepts.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26PH008													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	1	1	2	1	3	2	1	1	2	1	1.67
CO2	3	3	2	1	2	1	2	3	3	2	2	1	2.08
CO3	3	3	2	2	2	1	2	2	3	2	2	1	2.00
CO4	2	2	3	2	3	2	2	2	3	3	3	2	2.42
CO5	2	2	3	3	3	3	2	2	3	3	3	3	2.67
												Total	2.17

Mean Score: 3- High, 2- Medium/Moderate, 1-Low