

Department of Electronics and Communication Engineering

Course Code	Course Name	L	T	P	C
Value Added Course	Embedded with IoT	20	0	25	0

a. Preamble

This course provides a comprehensive and practical foundation in the Internet of Things (IoT) and Embedded Systems. Beginning with the fundamentals of Arduino and NodeMCU architecture, the curriculum advances to interfacing various analog and digital sensors, including environmental and motion sensors. Students will gain hands-on experience in industrial communication protocols (I2C, UART, SPI) and actuator control for automation. The course concludes with IoT cloud integration, enabling students to deploy real-time monitoring systems and smart automation projects with cloud dashboards and messaging alerts.

b. Course Outcome

Upon successful completion of the course, the students will be able to

Cos	Course Outcome	Knowledge Level
CO1	Understand the core principles of Embedded Systems, IoT architecture, and the GPIO functionalities of Arduino / NodeMCU	K2
CO2	Interface and program various digital and analog sensors to measure real-time environmental data.	K3
CO3	Implement industrial communication protocols like I2C, UART, and SPI for peripheral integration and data exchange.	K3
CO4	Design automation logic using relays and motors (DC/Servo) to create responsive smart systems.	K4
CO5	Deploy IoT solutions by integrating hardware with cloud platforms (ThingSpeak) and messaging services for remote monitoring.	K3

Fundamentals of IoT & Embedded Systems

9

Introduction to Embedded Systems & IoT - Overview of Arduino & NodeMCU (ESP8266) Architecture - Understanding GPIO, Sensors, Actuators, Communication Pins - Introduction to Arduino IDE / ESP Boards Installation- Basics of Embedded C & First Program (LED Blink)

Hands-On : LED Interfacing (Blink + Patterns) - Reading Digital & Analog Inputs from Arduino/NodeMCU.

Sensor Interfacing 9

Types of Sensors used in IoT -Analog vs Digital Sensor Interfacing- Basics of Communication Protocols (UART, I2C, SPI – Overview)-Hands-On: Ultrasonic Sensor Interfacing - IR Sensor Interfacing - Gas Sensor Interfacing -Buzzer & Basic Alarm System.

Sensor Interfacing -Advanced Inputs 9

I2C Protocol – Concept & Use in IoT - Real-Time Data Measurement Techniques- Hands-On: Soil Moisture Sensor Interfacing • LDR Sensor Interfacing - Temperature & Humidity Sensor (DHT11 / DHT22) - MEMS Accelerometer / Tilt Sensor-LCD Display with I2C.

Actuators & Basic Automation 9

Smart Automation Concepts- Relay Driver Circuits - Motor Driving (DC Motor, Servo Motor)- UART Protocol Details- Hands-On: Servo Motor Control- DC Motor Control using Motor Driver- Fire Sensor & Water Sensor Interfacing- Mini Automation: Smart Fan/Light Trigger using Sensors

IoT Cloud Integration , Messaging and Mini Projects 9

IoT Architecture (Device → Cloud → Dashboard)- Wi-Fi Programming on NodeMCU - HTTP & MQTT Basics (Simple Explanation)- IoT Cloud Platforms Overview - Hands-On : Connecting NodeMCU to Wi-Fi- Uploading Live Sensor Data to ThingSpeak Cloud - Creating Dashboards & Graphs- Sending Alerts via Telegram Bot. Project Architecture Development - Power Management in IoT Devices - Introduction to OTA (Over-the-Air Updates) – Basic Concept - Project Testing & Debugging- Mini Projects

SDG Mapping

CO's	SDG Mapping			
CO1	SDG – 09 Industrial Innovation and Infrastructure	SDG – 04 Quality Education	-	-
CO2	SDG – 13 Climate Action	SDG – 04 Quality Education	SDG – 15 Life on Land	-
CO3	SDG - 09 Industrial Innovation and Infrastructure	SDG – 04 Quality Education	-	-
CO4	SDG 7: Affordable and Clean Energy	SDG – 04 Quality Education	SDG – 11 Sustainable Cities and Communities	-

CO5	SDG-09 Industrial Innovation and Infrastructure	SDG – 04 Quality Education	SDG – 11 Sustainable Cities and Communities	SDG – 12 Responsible Consumption
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