



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Computer Engineering / Computer Science & Engineering

Subject Code : DI05000151

Subject Name : Introduction to Internet of Things

w. e. f. Academic Year:	2026-27
Semester:	5 th
Category of the Course:	MOPEC

Prerequisite:	The Student need to have basic programming knowledge of C/C++,Python, along with Computer networking technology and Basic electronics concepts.
Rationale:	IoT (Internet of Things) is rooted in the transformative impact that IoT technologies are having on various industries and daily life. The course aims to provide students with a solid foundation in the principles, technologies, and applications of IoT, recognizing its significance as a key driver of technological innovation and societal advancement.

Course Outcome:

After completion of the course, student will able to:

No	Course Outcomes	RBT Level
01	Describe IoT architecture and components.	Understand
02	Demonstrate the interfacing of sensors and actuators with Arduino board.	Apply
03	Compare IoT communication technologies and protocols based on performance, range, and use cases	Apply
04	Apply IoT cloud platforms for data collection and visualization.	Apply

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA(M)	PA(I)	ESE (V)	
2	0	2	3	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
01	UNIT 1: Introduction to Internet of Things 1.1 Basics of IoT Definition and Evolution of IoT 1.2 Characteristics of IoT 1.3 IoT Architecture 1.4 Components of IoT 1.5 Applications of IoT	6	15%
02	UNIT 2: IoT Hardware: Working, Interfacing and Programming 2.1 Sensors: DHT sensor, LDR sensor, PIR motion sensor, Soil moisture sensor, Ultrasonic distance sensor, MQ-2 Gas sensor 2.2 Actuators: Servo motor, Stepper motor 2.3 Relays 2.4 Microcontrollers (Layout and Pin Configuration) Arduino NodeMCU (ESP8266) Raspberry Pi 2.5 Arduino Programming: Arduino Sketch structure Initialization and setup functions: setup(), pinMode(), I/O functions: digitalWrite(), digitalWrite(), analogRead(), analogWrite(), Serial Communication functions: begin(), print(), println(), write().	10	35%
03	UNIT 3: IoT Communication and Protocols 3.1 Communication Technologies Li-Fi BLE ZigBee LoRa 3.2 IoT Protocols MQTT CoAP 3.3 REST API Basics	8	30%



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	Working of RESTful API Methods like GET, POST, PUT, DELETE		
04	UNIT 4: IoT Cloud, Data visualization and Updates in IoT 4.1 IoT Cloud Platforms AWS IoT Core MS Azure IoT ThingSpeak ThingsBoard 4.2 Data Collection & Visualization Blynk app ThingView app 4.3 OTA (Over-the-Air) updates in IoT Concept of OTA Firmware and software updates in IoT devices Benefits of OTA updates	6	20%
	Total	30	100%

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
30	45	25	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Rajkamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Education.
2. David Hanes, Gonzalo Salgueiro, "IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press.
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons,
4. Rolando Herrero "Fundamentals of IoT Communication Technologies", Springer 2021
5. Arshdeep Bahga, Vijay Madisetti, "Internet of Things- Hands on Approach", Orient Blackswan Private Limited - New Delhi

(b) Softwares and websites:

1. www.tinkercad.com
2. www.wokwi.com



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3. Thing view android app:
https://play.google.com/store/apps/details?id=com.cinetica_tech.thingview&hl=gu
4. www.thingsboard.io
5. Blank android app:
https://play.google.com/store/apps/details?id=cloud.blynk&utm_source=appspage

Suggested Course Practical List:

1. Installation of Arduino IDE and blink built in LED and external LED interfaced with Arduino.
2. Read data from an LDR sensor and automatically control an LED based on light intensity using Arduino.
3. Interface the DHT sensor with Arduino and display temperature and humidity values on the serial monitor.
4. Interface an Ultrasonic distance sensor with Arduino to measure the distance from obstacles.
5. Interface a PIR motion sensor with Arduino to detect human movement and use a relay module with Arduino, Turn ON or Turn OFF AC Bulb based on the movement detection.
6. Interface and control both servo motor and stepper motor using Arduino for position and rotation control.
7. Installation & Configuration of Raspberry Pi, Blink interfaced LED using GPIO.
8. Read Temperature and Humidity data interfaced with Raspberry Pi.
9. Read sensor data (temperature or LDR) using NodeMCU and send it to the ThingSpeak cloud platform.
10. Control an LED remotely using the Blynk mobile app and implement basic MQTT publish/subscribe communication.
11. Build a real-time temperature monitoring system using Arduino/Raspberrypi/NodeMCU, log data to Firebase/ThingSpeak/Blynk, and visualize it on a cloud dashboard/Mobile App.

List of Laboratory/Learning Resources Required:

1. Arduino Uno/Mega board with a set of sensors and actuators.
2. NodeMcu (ESP8266), Raspberry Pi, Wi-fi Module for interfacing with Arduino.
3. Breadboard, Connecting wires, Power supply, Relay, resistors, potentiometer, LEDs, buzzer, push button switches.

Suggested Activities for Students:

1. Design Poster for the IoT project.



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2. Students are encouraged to register themselves in various MOOCs such as: Swayam to further enhance their learning.
 - a. Introduction to Internet of Things: Design Concept and Use cases by Prof. Maitreyee Dutta: https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed23
 - b. Introduction To Internet Of Things By Prof. Sudip Misra IIT Kharagpur
https://onlinecourses.nptel.ac.in/noc26_cs37/preview
3. Undertake micro-projects in teams.
4. Following are some of the suggested Microproject list:
 1. Smart Agriculture System
 2. Weather Reporting System
 3. Home Automation System
 4. Face Recognition Bot
 5. Smart Garage Door
 6. Smart Alarm Clock
 7. Air Pollution Monitoring System
 8. Smart Parking System
 9. Smart Traffic Management System
 10. Smart Cradle System
 11. Smart Gas Leakage Detector Bot
 12. Streetlight Monitoring System
 13. Smart Anti-Theft System
 14. Liquid Level Monitoring System
 15. Night Patrol Robot
 16. Internet of Things with Android and Arduino
 17. Automatic Street Lighting system using IoT
 18. Smart Building Project using PIR
 19. Smart Water Monitoring System using IoT
 20. Cloud-ready temperature sensor with the Arduino Uno
 21. An IoT Temperature Monitor for Balcony Garden
 22. Smart Irrigation System using IoT
 23. Temperature & Humidity Sensing using IoT
 24. IoT Remote Soil Moisture Monitor
 25. IoT based smart alert system for Heart Patients
 26. Body Temperature & Pulse Monitoring System
 27. Smart Doorbell with Camera Alert
