



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Computer Applications /
Bachelor of Computer Applications (Honours/Honours with Research) /
Master of Computer Applications (Integrated)

Level: Under Graduate

Course / Subject Code: BC05001071

Course / Subject Name: Internet of Things

w. e. f. Academic Year:	2026-27
Semester:	5
Category of the Course:	Discipline-Specific Elective-3

Prerequisite:	Basic knowledge of Computer Fundamentals, Programming, Computer Networks, Operating System, and Digital Electronics is required to understand the concepts of Internet of Things.
Rationale:	The Internet of Things (IoT) is one of the most important emerging technologies that connect physical devices, sensors, and software through the Internet to enable smart communication and automation. With the rapid growth of smart systems, cloud computing, and embedded devices, knowledge of IoT has become essential for computer application students. This course is designed to provide fundamental understanding of IoT architecture, sensors, communication protocols, cloud integration, and security issues. The subject helps students to understand how real-world devices interact with software systems and how data is collected, processed, and used in modern applications such as smart homes, healthcare, agriculture, and industrial automation. The course also includes practical exposure to basic IoT tools and platforms such as microcontrollers, sensors, and cloud services, which will help students develop problem-solving skills and prepare them for industry-oriented applications.

Course Outcome:

After Completion of the Course, Student will able to:

CO No	Course Outcome	RBT Level
CO1	Understand the fundamentals, architecture, and components of IoT systems.	Understand
CO2	Explain the role of sensors, actuators, and embedded platforms in IoT.	Understand
CO3	Apply networking and communication protocols for IoT connectivity.	Apply
CO4	Use cloud and data processing techniques for IoT applications.	Apply
CO5	Analyze security, privacy, and challenges in IoT environment.	Analyse
CO6	Design and implement basic IoT applications.	Apply

**Revised Bloom's Taxonomy (RBT)*



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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 / CA (M)	PA/CA (I)	ESE (V)	
4	0	2	5	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to IoT Definition of IoT, Evolution of IoT, IoT architecture, Characteristics of IoT, IoT applications, Smart home, Smart city, Smart agriculture, Healthcare, Challenges in IoT	10	20
2.	Sensors, Devices & Embedded Systems Sensors and actuators, Types of sensors, Microcontrollers basics, Arduino introduction, Raspberry Pi basics, Embedded systems overview, RFID and NFC	13	20
3.	IoT Communication & Networking Communication models, TCP/IP basics, Wireless communication: WiFi, Bluetooth, Zigbee IoT protocols: MQTT, HTTP, CoAP IoT gateway	15	20
4.	Cloud & Data Processing in IoT Cloud computing basics, IoT cloud platforms, Data collection, Data storage, Edge computing, Fog computing, IoT analytics	11	20
5.	Security issues Privacy problems, Authentication, Encryption basics, Industrial IoT, Smart devices, Future of IoT	11	20
Total		60	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	60	30	0	0	0

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



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References/Suggested Learning Resources:

(a) Books:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things – A Hands-On Approach, Universities Press.
2. Raj Kamal, Internet of Things – Architecture and Design Principles, McGraw Hill.
3. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media.
4. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, IoT Fundamentals: Networking Technologies, Protocols and Use Cases, Cisco Press.

(b) Open source software and website:

1. IoT Platforms:
Thing Speak, DeviceHive, SiteWhere, Sentilo, ThingsBoard, Kaa IoT, OpenRemote, Home Assistant
2. IoT Frameworks / Middleware:
Node-RED, Eclipse IoT (Kura, Kapua), FIWARE, OpenIoT, Mainflux, IoTivity, Zetta
3. IoT Messaging / Brokers: Eclipse Mosquitto, EMQX, RabbitMQ, Apache Kafka
4. IoT Operating Systems: RIOT OS, Apache Mynewt, Contiki OS, FreeRTOS
5. IoT Firmware / Device: Mongoose OS, NodeMCU, MySensors
6. IoT Dashboard / Visualization: Freeboard, Grafana
7. IoT Database: Apache *IoTDB*, *InfluxDB*

(c) Online Resources (SWAYAM/NPTEL):

1. Title: “Introduction to Internet of Things”, IIT Kharagpur,
https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. Title: “Internet of Things: Design Concepts and Use Cases”, NITTTR Chandigarh,
https://onlinecourses.swayam2.ac.in/ntr24_ed01/preview

Suggested Course Practical List:

Exp. No.	Title of Experiment / Activity	Objective / Learning Outcome	Tools / Platforms (Open Source / Free)
1.	Arduino LED program	To understand basic Arduino programming and control digital output by turning an LED ON/OFF	Arduino IDE, Arduino Uno
2.	Sensor reading using Arduino	To read data from sensors (analog/digital) and display it on Serial Monitor	Arduino IDE, Arduino Uno, basic sensors
3.	Temperature sensor project	To measure temperature using sensors (LM35/DHT11) and understand real-time data monitoring	Arduino IDE, DHT11 / LM35 sensor



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4.	IoT using ESP8266 / WiFi module	To connect a device to the internet using WiFi module and understand IoT communication	Arduino IDE, ESP8266 (NodeMCU)
5.	Send data to cloud (ThingSpeak / Firebase)	To upload sensor data to cloud platforms and enable real-time monitoring	ThingSpeak / Firebase, ESP8266, Arduino IDE
6.	Raspberry Pi basic commands	To learn basic Linux commands and operate Raspberry Pi environment	Raspberry Pi OS, Terminal

Suggested Project List:

1. Smart Home Automation: Control lights and appliances using mobile via WiFi (ESP8266 + Relay)
2. Smart Temperature Monitoring System: Measure temperature and send data to cloud (DHT11 + ThingSpeak)
3. Smart Irrigation System: Automatically control water pump based on soil moisture level
4. IoT Based Attendance System: Use RFID to mark attendance and store data in database
5. Smart Street Light System: Turn ON/OFF street lights using motion sensor
6. Gas Leakage Detection System: Detect gas leakage and trigger buzzer/alert
7. IoT Weather Monitoring System: Monitor temperature, humidity, and pressure online
8. Smart Dustbin (IoT): Detect garbage level and send alert when full
9. IoT Based Water Level Indicator: Monitor water tank level and provide alerts

CO- PO Mapping:

Sem. 5	Course Name : Internet of Things POs											
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	2	-	-	-	-	-	-	-
CO2	3	3	2	1	2	-	-	-	-	-	-	-
CO3	3	2	3	2	3	-	-	-	1	-	-	1
CO4	2	3	3	2	3	1	-	-	2	-	-	1
CO5	2	2	3	3	3	1	1	-	2	1	-	2
CO6	1	2	2	2	2	1	1	1	2	2	1	3

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.
