GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 3rdSemester
Subject Name: Internet of Things
Subject Code: 639409

With effective from academic year 2020-21

1. Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	-	2	4	70	30	30	20	150

2. Course Outcomes:-

Course Outcome Component	Course Outcome (Learner will be able to)
CO1	• Understand the concept of Internet of Things (IoT)
CO2	• Understand and compare various sensors and will be able to select sensors for IoT application
CO3	• Design IoT applications in different domain and be able to analyze their performance
CO4	• Identify real life problem and suggest solution using IoT
CO5	• Understand security issues in IoT Application

3. Course Duration: The course duration is of **40 sessions of 60 minutes each.**

4. Course Contents:

Unit No:	Contents	No. of Sessions	70 Marks (External Evaluation)
I	• **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 & WSN.	06	10
II	• **Sensors, Microcontrollers, and Their Interfacing:** Characteristics of Sensor, Sensor interfacing, Types of sensors, Controlling sensors, Actuators, Types of Actuators, Microcontrollers, ARM.	06	10
III	• **Protocols for IoT& Connectivity Technology:** Messaging protocols, Transport protocols, IPv4, IPv6, URI, MQTT, CoAP, XMPP, AMQP. IEEE 802.15.4, Zigbee, 6LoWPAN, RFID, NFC, Bluetooth.	08	15
IV	• **Application Building with IoT:** Various application of IoT: Food, Healthcare, Lavatory maintenance, Water quality, Warehouse, Retail, Driver Assistance, Collision impact.	06	10
V	• **Arduino and Raspberry Pi:** **Arduino:** Architecture, Component, IDE, Programme Element, Function Library, Random Number, Interrupts. **Raspberry Pi:** Architecture, Compatible Peripherals, Add-Ons, and Accessories, PIN Configuration, Case Study, Programming and Implementation of IoT with Raspberry Pi.	08	15

VI	• **Security and Privacy in IoT:** Various security issues and need, Security architecture, Network & Transport Layer Challenges, Authorization Mechanism, Security Framework for IoT, Privacy in IoT Networks.	06	10

5. Pedagogy:

- ICT enabled Classroom teaching
- Case study
- Practical / live assignment
- Interactive class room discussions

6. Evaluation:

Students shall be evaluated on the following components:

A	**Internal Evaluation**	**(Total - 20 Marks)**
	• Continuous Evaluation Component	10 marks
	• Class Presence & Participation	10 marks
B	**Mid-Semester examination**	**(30 Marks)**
C	**End –Semester Examination(Theory)**	**(70 Marks)**
D	**End –Semester Examination(Practical/Viva)**	**(30 Marks)**

7. Text Books:

No.	Author	Name of the Book	Publisher
1	Vasudevan, Nagrajan and Sundaram	Internet of Things	WileyIndia
2	Dr. Jeeva Jose	Internet of Things	Khanna Book Publishing
3	Rajkumar Buyya, Amir Vahid, Dastjerdi	Internet of Things Principles and Paradigm	ELSEVIER

8. Reference Books:

No.	Author	Name of the Book	Publisher
1	David Hence at el,	IoT Fundamentals	CiscoPress
2	Yashavant Kanetkar, Shrirang Korde	21 IoT Experiments,	BPB
3	Adrian McEwen, Hakim Cassimally	Designing the Internet of Things	Wiley
4	Raj Kamal	Internet of Things Architecture and Design Principles	McGraw Hill

9. Sample Practical List

Students are expected to

1. Understand architecture of Arduino and Raspberry PI.
2. Understand various sensors and integration of sensors with Arduino/Raspberry PI.
3. Design an application like Smart Home using interfacing of various sensors and Arduino/Raspberry PI module.

List of suggestive practical list is as follows.

1. Introduction to various sensors and various actuators & its Application. Example are as under
    a) PIR Motion Sensor.
    b) Rain Drop Sensor.
    c) Moisture Sensor.
    d) Temperature Sensor.
    e) Touch Sensor.
    f) Infrared Sensor.
    g) Servo Motor.
    h) RFID Sensor.
    i) Bluetooth Module.
    j) Wi-Fi Module.

2. Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
3. Create a circuit using Arduino and sensors. Perform experiment using Arduino to Learn Working of Servo Motor.
4. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
5. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
6. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
7. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
10. To install MySQL database on Raspberry Pi and perform basic SQL queries.
11. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
12. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.