GUJARAT TECHNOLOGICAL UNIVERSITY

Minor Degree : Internet of Things
Subject Code: 114AI01
Semester – IV
Subject Name: Introduction to Internet of Things (IoT)

Prerequisite:
The students should be having knowledge of Basics of Electronics, Analog Electronics, and Electronics Measurements.

Rationale:
Internet of Things (IoT) is going to play the key role in the upcoming years during the technological revolution taking place in the field of Engineering and Technology. It will be really advantageous for students to learn this subject for making their selves compatible with the upcoming technological era and to be a future ready Engineer. This course will provide students knowledge of IoT fundamentals, Protocols, Sensors and Actuators used in field of IoT.

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	0	2	4	70	0	30	0	100

Content:

Sr. No	Content	Total Hrs
1.	Introduction to IoT-Concepts and Terminology of The Internet of Things (IoT), History of IoT, Applications, Requirements of IoT, M2M/IoT standards, Components of IoT, IoT Enabling, Technologies – Gateways, Local & Global Connectivity , IOT Platforms, Business Inferences IoT Building blocks – Architecture, Sensing, Connectivity ,Gateways, Processing, Software, Power, IOT Reference Architectures, Business Models, Challenges in IOT.	**16**
2.	Modern trends in IOT – Wearable, industrial standards, Open Data Management & API. Case studies, connected use cases in Real-life/Thematic areas – Smart Homes/Buildings, Smart Cities, Smart Village, Smart Agriculture, Smart Industry, Smart Medical care, Smart Automation. Ethical issues.	**06**
3.	Sensor Fundamentals: How Sensors Work, Analog and Digital Sensors, Pull-Up/Down resistors and Examples of sensors and working principles, A/D Conversion: A brief Introduction to sampling theory, A/D conversion, Acceleration, Temperature, pressure, force, Humidity, Distance, Light, Orientation, Sound, Electric Current, displacement, speed, flow.	**12**
4.	Actuators, Relay Switch, process control valves, power electronics devices: SCR, DIAC, TRIAC, Power MOSFET, IGBT, DC motor: Introduction and Speed control, Servo motors and Position Controlling.	**8**

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Suggested Specification table (Theory):

Distribution of Theory Marks (%)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	35	35	10	5	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

[1] Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication.

[2] Raj Kamal, "Internet of Things: Architecture and Design Principles, Mc Graw Hill Education.

[3] Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.

[4] Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.

[5] Industrial Instrumentation and Control By. S.K. Singh The McGraw Hill Companies

[6] Rangan & Mani "Instrumentation: Devices and Systems", McGraw Hill

[7] Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009

[8] D.V.S. Murty, "Transducers and Instrumentation", Prentice Hall India

Course Outcomes:

Upon completion of this course students should be able to:

No	Course Outcomes	% weightage
01	Restate basic concepts of IoT, Distinguish different components of IoT	40
02	Discuss different applications of IoT by case studies of real world	15
03	Determine various sensing techniques for real world physical quantities and apply them in various IoT applications	30
04	Illustrate different actuators used in IoT applications and their interfacing	15

List of Practical:

1. Getting started with Node MCU, Arduino with ESP8266 and ESP32 in the Arduino IDE.
2. GPIO Interfacing and programming.
3. Introduction to various sensors & its Application implementation using Arduino:
   a. Temperature Sensor
   b. PIR Motion Sensor
   c. Moistur e Sensor
   d. Infrared Sensor
   e. Ultrasonic Sensor
   f. Accelerometer
   g. Load Cell

4. Introduction to various Actuators & its Application implementation using Arduino:
    a. Relay
    b. DC Motor
    c. Servo Motor

List of Open Source Software/learning website:

- Arduino IDE
- https://onlinecourses.nptel.ac.in/noc21_cs17/preview
- https://www.electronicshub.org/arduino-project-ideas
- https://playground.arduino.cc/Projects/Ideas/