# GUJARAT TECHNOLOGICAL UNIVERSITY

**Minor Degree : Internet of Things**
**Subject Code: 117AI01**
**Semester : VII**
**Subject Name : IoT Programming Technologies**

**Prerequisite :** The students should be having knowledge of Basics of IOT and IOT Embedded hardware.

**Rationale :** The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IoT based projects.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Theory Marks | | Practical Marks | | |
| | | | | 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:** Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT. | **10** |
| 2. | **Elements of IoT:** Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP. | **10** |
| 3. | **IoT Application Development:** Frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices. | **15** |
| 4. | **IoT Case Studies:** IoT Case studies based on industrial Automation, Transportation, Smart cities, smart supply chain, Remote site monitoring . | **7** |

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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)**

**List of Books :**


1. Raj Kamal , " Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022
2. Pethuru Raj, Anupama C. Raman ," The Internet of Things Enabling Technologies, Platforms, and Use Cases", Taylor and Francis group. February 2017
3. Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018.
4. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
5. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
6. Adrian McEwen, "Designing the Internet of Things", Wiley
7. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media


**Course Outcomes :**

Upon completion of this course students should be able to:

| No. | Course Outcomes | % weightage |
|---|---|---|
| 01 | Understand internet of Things and its hardware and software components. | 35 |
| 02 | Apply design methodology and cloud platforms involved in IoT. | 15 |
| 03 | Interface I/O devices, sensors & communication modules. | 35 |
| 04 | Compare IoT Applications in Industrial &real world. | 15 |

**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/