



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

|                               |          |          |          |          |
|-------------------------------|----------|----------|----------|----------|
| <b>III Year - II Semester</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                               | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
| <b>INTERNET OF THINGS</b>     |          |          |          |          |

**Course Objectives:**

- To learn and understand elements of IoT system.
- Acquire knowledge about various protocols of IoT.
- To learn and understand design principles and capabilities of IoT.

**UNIT I: Introduction to IoT**

Introduction to IoT, Architectural Overview, Design principles and needed capabilities, 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.

**UNIT II: Elements of IoT**

Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, ARM Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

**UNIT III: IoT Application Development**

Communication, IoT Applications, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.

**Bluetooth Smart Connectivity**

Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

**UNIT IV: Solution framework for IoT applications**

Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

**UNIT V: IoT Case Studies**

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

**Text Books:**

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1<sup>st</sup> Edition, McGraw Hill Education, 2017.
2. The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu, 2011
3. Vijay Madiseti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press, 2015.



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**References:**

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.

**Course Outcomes:**

The student will be able to:

- Understand internet of Things and its hardware and software components.
- Interface I/O devices, sensors & communication modules.
- Remotely monitor data and control devices.
- Design real time IoT based applications