



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

| EDGE ANALYTICS | | | | | | | | |
|---|-----------------------|------------------------|---|---|-------------------|---------------|-----|-------|
| II Semester: CSE | | | | | | | | |
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| 2425821 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |
| Prerequisites: A basic knowledge of Python Programming | | | | | | | | |

Course Overview:

Edge Analytics involves processing data at or near the source (edge devices) to enable real-time decision-making, reduce latency, and optimize bandwidth usage. The course covers edge architectures, communication protocols, and integration with cloud platforms like Microsoft Azure using Azure IoT Hub. Students gain hands-on experience with devices such as ESP-12F and Raspberry Pi, and programming using MicroPython. The course also includes real-world applications, basic machine learning at the edge, and security techniques for protecting edge systems.

Course Objectives:

1. To understand the fundamental concepts, architecture, and applications of Edge Analytics in modern computing environments.
2. To study the components, communication protocols, and devices used in edge analytics and IoT systems.
3. To learn the integration of edge devices with cloud platforms such as Microsoft Azure IoT Hub for data processing and analytics.
4. To develop practical knowledge of MicroPython, Raspberry Pi, and edge intelligence for real-time edge computing applications.
5. To analyze security challenges and design efficient edge analytics solutions for real-world IoT and smart applications.

Course Outcomes: After Completion of the Course, Students should be able to

1. Implement edge analytics concepts to process data closer to the source.
2. Connect sensors to microcontrollers (e.g., ESP-12F) and configure communication technologies like Wi-Fi, Bluetooth, and LoRa.
3. Analyze the workflow of data exchange between edge devices and cloud services.
4. Analyze how edge intelligence integrates with machine learning tools such as Azure ML Designer and IoT Edge Custom Vision.
5. Evaluate protection strategies to ensure the reliability and security of edge analytics systems.

UNIT - I

Introduction to Edge Analytics

What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

UNIT - II

Basic edge analytics components, connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics, Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long-distance communication using LoRa and Signfox for edge analytics.

UNIT - III

Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure IoT Hub, Using the Raspberry Pi with Azure IoT edge, connecting our Raspberry Pi edge device, adding a simulated temperature sensor to our edge device.

UNIT - IV

Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

UNIT - V

Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code, creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protecting our edge analytics applications

TEXT BOOK:

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edge analytical solutions including Azure IoT Edge by Colin Dow

REFERENCES:

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source using Microsoft Azure by Ashish Mahajan

ELECTRONIC RESOURCES:

1. <https://www.coursera.org/courses?query=edge%20computing>
2. <https://www.espressif.com/en/products/socs/esp8266>
3. <https://learn.microsoft.com/en-us/azure/iot-hub/>
4. <https://azure.microsoft.com/en-in/products/machine-learning/>
5. <https://owasp.org/www-project-internet-of-things/>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)

