



IOT FOR AUTOMATION 23ICOE411

(COURSE HANDBOOK)

Department of CSE (IoT & Cyber Security with Blockchain Technology)

COURSE FACULTY:

Mr. Sandeep Seetaram Naik

1. GENERAL INFORMATION

Welcome to IoT for Automation

IoT for Automation is a specialized field within cyber-physical systems that focuses on the design, deployment, and management of automated systems using Internet of Things (IoT) technologies, local automation clouds, and service-oriented architectures. With the rapid growth of connected devices, industrial automation, and smart infrastructure, IoT-based automation has become central to modern industrial, energy, and municipal systems. This course introduces students to the fundamental principles, frameworks, and engineering practices used in building and managing IoT automation systems. It covers local cloud automation concepts, the Arrowhead Framework and its core systems and services, engineering methodologies for safe and secure IoT deployment, and real-world applications in energy optimization and complex systems management. The course also emphasizes system scalability, security, safety engineering, swift deployment, and authentication/certification practices essential for reliable automation infrastructure. By the end of the course, learners will gain practical skills to design, engineer, and manage IoT-based automation systems, supporting industrial, energy, and smart infrastructure applications.

1.1. Course Objectives

This course is designed to:

- Provide knowledge on the evolution of industrial automation, from traditional control systems to modern IoT-enabled Systems.
- Impart knowledge on foundational concepts of Local Automation Clouds, including their properties, establishment and applications.
- Impart knowledge on various application automation systems to address complex industrial and societal challenges.

1.2.. Course Outcomes

- CO1.** Describe the concept, architecture, and properties of Local Automation Clouds, including latency, security, scalability, and the Arrowhead Framework for industrial automation.
- CO2.** Apply Arrowhead core systems to enable service discovery, orchestration, authorization, and inter-cloud communication in IoT automation systems.
- CO3.** Describe the component-based engineering methodologies used to design, deploy, and configure safe and secure IoT automation systems for large-scale and dynamic environments.
- CO4.** Describe energy-optimized application systems, including virtual energy markets and context aware automation solutions.
- CO5.** Apply systems management and security automation techniques to real-world use cases such as EV infrastructure and smart maintenance systems.

1.3. Set Text and Suggested Sources

All the below mentioned books are available in the Library.

Key Text Books:

1. Jerker Delsing, “IoT Automation: Arrowhead Framework”, CRC Press, Taylor & Francis Group.

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication).
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian

2. THE COURSE

2.1. Course Description

IoT for Automation			
Semester	VII	CIE Marks	50
Course Code	23ICOE411	SEE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	Exam Hrs	3
Total Hours	42	Credits	3

IoT for Automation is a specialized field within cyber-physical systems that focuses on the design, deployment, and management of automated systems using Internet of Things (IoT) technologies. The course will run for 14 weeks during Semester 7 and consists of 5 modules that cover essential topics in IoT for Automation. Each week includes 3 lectures, delivered by Mr. Sandeep Seetaram Naik. These lectures focus on theoretical concepts, practical applications, and course-related activities. Spanning a total of 42 hours, this 3-credit course is assessed through Continuous Internal Evaluation (CIE) for 50 marks and a Semester-End Examination (SEE) for 50 marks in the form of 3-hour exam duration. This structure ensures a balanced and engaging learning experience for students.

2.2. Initiating Contact with Staff and Other Students

We encourage open communication and welcome your questions regarding the course. However, given the large number of students enrolled, we request that you use email, office-hour appointments, and other forms of correspondence thoughtfully. Before contacting the course team with administrative queries, please check whether your question has already been addressed in previous communications, the course handbook, or the course website. Additionally, we encourage you to engage with your peers for discussion and collaborative learning, as this will enhance your understanding of the course content and help foster a supportive academic community.

2.3. Resources

Resources go beyond just books they include dynamic tools like digital libraries, e-learning platforms, and research databases. These modern learning environments offer anytime, anywhere access to academic materials, interactive courses, and cutting-edge research, empowering students to explore knowledge and excel in their fields.

Students can access a variety of resources through the college website. These include the VTU Consortium, e-learning platforms, and additional sources like open-access repositories, government portals (e.g., NPTEL, NDLI), and these digital tools provide access to e-books, research papers, video lectures, and interactive tutorials, offering flexible and comprehensive learning environments.

E-learning and digital library can be accessed via the college website <https://mite.ac.in/> (Campus Life section > Library > VTU Consortium/e-learning platforms/additional sources).

2.4. Staff

Course Convenor: Mr. Sandeep Seetaram Naik

Cabin: Ground floor, PG Block

Email: Sandeepnaik@mite.ac.in

2.5. Topics and Reading materials for each module

Module 1	No. of Hours: 09
Topic: Local Automation Clouds	
The Local Cloud Concept, Local Cloud Properties, Local Cloud Establishment, Automation Support, Automation Application Engineering in Local Clouds, Latency in Local Clouds, Security in Local Clouds, SoS Scalability.	
The Arrow Head Framework architecture: Important definitions, Documentation structure, The mandatory core systems, Automation support core systems.	
Module 2	No. of Hours: 09
Topic: Arrowhead Framework core systems and services	
Service Registry system, Authorization system, Orchestration system, Plant Description system, Configuration system, System Discovery and Device Discovery services.	
Module 3	No. of Hours: 08
Topic: Engineering of IoT Automation Systems	
Introduction, Component-based Engineering Methodology, Safety and Security Engineering of IoT Automation Systems, Swift Deployment and Configuration, PLC device monitoring, Replacement of device.	
Module 4	No. of Hours: 08
Topic: Application System Design Energy Optimization	
Introduction, Market as an Energy Optimizing Method, Optimizations Based on a Virtual Market of Energy, Energy Optimization on Lifts, Context Aware Streets, Optimization of Municipal Service Systems.	
Module 5	No. of Hours: 08
Topic: Complex Systems Management, Automation and Security	
Electric Vehicles and Recharge Infrastructure, Arrowhead SOA EM Solution, Systems and Services, Arrowhead EM Services and Related Automation Aspects, Co-simulation Platform. Smart Maintenance Use Case, Authentication and Certification Service, Safety and Security Analysis for Identifying System Vulnerabilities.	

3. ASSESSMENT

The assessment for the IoT for Automation is divided into two components: Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), each accounting for 50% of the total marks.

Continuous Internal Evaluation (CIE) comprises two internal tests, scheduled for 8th and 14th week, which together contribute 30% of the total marks. Additionally, students can earn 20% through the completion of two assignments (10 marks for each assignment).

Semester End Examination (SEE) constitutes the remaining 50% of the total marks. Key information regarding examination dates and related details can be accessed via the college website (Academics and Courses section > Calendar of Events > B.E-Even Sem.)