



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Syllabus

Subject Code : 3174501

Subject Name : Industrial IoT

WEF Academic Year :	2021 - 22
Semester :	7
Category of the Course :	Professional Core

Prerequisite :	Fundamental of IoT, Python/Java/C++ Programming
Rationale :	It is required of digital transformation of the traditional industrial setups to improve product quality, machine's efficiency & lifetime, automated fault detection and maintenance through Industry 4.0 revolution. Industrial IoT concerns of IoT applications, emerging technologies such as AI & ML, AR and VR, M2M communication, wireless technologies, smart sensors & actuators. This course covers basics of Industry 4.0, Industrial IoT, various technologies, sensors & actuators, industrial data transmission, industrial data acquisition and concepts of communications, connectivity and control related to IIoT. The course contains real-life examples and case studies related to industries. The learners are able to solve many long-standing, real-life issues related with industries.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Overview of Industry 4.0 and Industrial IoT : Introduction, Industry 4.0, IIoT, basics of CPS, CPS and IIoT, Applications of IIoT.	3	5
2	Industry 4.0 : Introduction, design requirements of Industry 4.0, Drivers of Industry 4.0, sustainability assessment of industries, smart business perspective, cyber security, impact of Industry 4.0	5	10



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3	Industrial Internet of Things : Introduction, industrial internet systems, industrial sensing, industrial processes, business models of IIoT, reference architecture of IIoT, IIRA, key performance indicators for occupational safety and health.	7	15
4	Key technologies – Off-site technologies : Introduction, cloud computing, fog computing.	5	10
5	Key technologies – On site technologies : Introduction, AR, VR, Big Data and advanced analytics, smart factories, lean manufacturing system.	5	15
6	Sensors & Actuators : Characteristics of Sensors, Sensor categories, Thermal actuators, Hydraulic actuators, Pneumatic actuators, Electromechanical actuators.	6	10
7	Industrial Data Transmission : Introduction, foundation Fieldbus, Profibus, HART, Interbus, Bitbus, CC-link, Modbus, Batibus, DigitalSTROM, Controller Area Network, DeviceNet, LonWorks, ISA 100.11a, Wireless HART, LoRA and LoRaWAN, recent and upcoming technologies.	7	15
8	Industrial Data Acquisition : Introduction, distributed control system, PLC, SCADA.	5	10
9	Plant Safety & Security and Case Studies : Plan safety, plant security, Introduction, manufacturing industry, automotive industry, mining industry.	5	10
	Total	48	100

Reference Book :

- Sudip Misra, Chandana Roy, Anandarup Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0, CRC Press, Taylor & Francis, 2021
- Sabina Jeschke, Christian Brecher Houbing Song , Danda B. Rawat, Industrial Internet of Things Cyber Manufacturing Systems, Springer, 2017
- Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things”, Apress, 2017

Course Outcome :

After Completion of the Course, Student will able to :

No	Course Outcomes	RBT Level*
01	Understand concepts of Industrial IoT, Industry 4.0 and their process.	UN
02	Describe various technologies used in Industrial IoT.	UN



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03	Demonstrate various sensors, actuators, and industrial data transmission used in the Industrial IoT.	AP
04	Apply various industrial data acquisition techniques, safety and security measures in the Industrial IoT	AP
05	Analysis of challenges, issues and their solutions related to industries	AN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List :

1. Setup of Raspberry Pi/Arduino Uno Module.
2. Interfacing LEDs and blink the LEDs.
3. Interfacing relays and operate relays based on timer.
4. Interfacing push buttons and make turn ON and OFF the LEDs/Relays based on the status of the push buttons.
5. Interfacing Temperature sensor and store the value of the temperature.
6. Interfacing level sensor and turn on/off the relays based on the level of liquid.
7. Interfacing Camera and monitor the industrial based equipments.
8. Interfacing Wi-Fi Module/ Zigbee Module and setup the client-server model.
9. Interfacing LoRA Module and setup the client-server model
10. Interfacing Motion Sensor and monitor the movement of the humans in the industry.
11. Working with MQTT protocol and publish data of sensors in the cloud platforms.
12. Create cluster of Raspberry Pi/Arduino Uno and control/monitor the data.
13. Interfacing DC/Servo Motors and control the movement of any equipment used in industry.
14. Remote Monitoring System for any industrial setup.
15. Liquid level indicator for the chemical industry.
16. Quality control system for processing industry.
17. Plan safety system (monitoring the equipments, plant air quality, avoid hazardous situations, etc.).
18. Automated inventory monitoring system.
19. Predictive maintenance system.
20. Smart Energy Consumption in the industry.

List of Laboratory/Learning Resources Required :

- Raspberry Pi Module
- Arduino Uno Module



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- Sensors & actuators – Temperature Sensor, Humidity Sensor, Level Sensor, Camera, Motion Sensors, LDR, Liquid sensor, dust sensor, air quality sensor, camera, smoke detector, buzzer, PH sensor, relays, switches, LEDs, LCDs etc.
- <https://github.com/connectIoT/iottoolkit>
- <https://www.arduino.cc/>
- <https://www.raspberrypi.org/>
- NPTEL Course: Introduction to Industry 4.0 and Industrial Internet of Things - https://onlinecourses.nptel.ac.in/noc20_cs69/preview

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