BMEE405L	Industrial Automation	L	T	P	C
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Pre-requisite	**BMEE210L , BMEE210P**	**Syllabus version**			
		1.0			

Course Objectives:

1. To gain knowledge on the industrial automation process and understand the construction, operation and installation of PLCs.
2. To provide the knowledge on interfacing the PLCs and field devices with communication protocols.
3. To understand the concepts of DCS and SCADA systems.
4. To acquire skills on wireless sensor networks and the industrial networking.

Expected Course Outcome:

At the end of the course, the student will be able to

1. Comprehend the need for industrial process automation.
2. Differentiate various types of automation systems and components of automation.
3. Illustrate the programmable logic controller and distributed control systems.
4. Formulate various types of industrial networking.
5. Perform supervisory control and data acquisition.
6. Develop simple automation programs for application specific automation.

Module:1	**Industrial Process Automation**	**5 hours**

Introduction to Industrial Process Automation-Definition of Process-Meaning of Automation and Control-Necessity and Evolution of Automation-Role of Automation in Process Industry-Architecture of Industrial Automation Network-Types of Automation Systems-Role of Information Technology in Process Automation-Process Automation with Smart and Intelligent Instruments-Challenges of Process Automation-Industry 1.0 to Industry 4.0.

Module:2	**Programmable Logic Controller (PLC)**	**7 hours**

Basics of PLC- I/O Devices of PLC-PLC Programming Devices-PLC Selection Criteria-Design and Operation of PLC-Architecture of PLC-Central Control Unit of PLC-Functional Modes of PLC.

Module:3	**PLC Programming**	**6 hours**

PLC Program Structure and Execution-Programming Devices for PLC-PLC Programming Tools-Timer-Counters-Registers-Advanced PLC Functions-PLC Communication-PLC Protocols-Selection and Commissioning of PLC.

Module:4	**Distributed Control System (DCS)**	**6 hours**

Computers in Process Automation-Architecture of Computer-Based Industrial Automation System-Hardware and Software Configuration-Process Automation Network-PC-Based Control Loop-Sampling of Process Data- Distributed Control System-Hardware Units of DCS-Communications in DCS Architecture-Software Packages of DCS-Operation, Monitoring, Control, and Data Acquisition in DCS-Integration of DCS with PLC and SCADA-DCS based Process Control Simulations.

Module:5	**Supervisory Control and Data Acquisition (SCADA)**	**6 hours**

Introduction-SCADA Basics-Different SCADA System Topologies-Evolution of SCADA-SCADA Architecture-Functions of SCADA-Elements of SCADA-SCADA, DCS, and PLC: A Comparison-SCADA Security: Threats, Vulnerabilities, and Consequences-SCADA Standards Organizations-Application Areas of SCADA-SCADA and IIoT SCADA Implementations for Automation Industries.

Module:6	**Industrial Networking**	**7 hours**

Introduction to industrial Networking-Network Devices- Fieldbus-Types- Topology-Benefits-Foundation Fieldbus-Comparison with OSI Model-Medium Access Control (MAC)-PROFIBUS-Communication via PROFIBUS,PROFINET,DP Bus Access-HART: Highway Addressable Remote Transducer-Wireless field bus-WHART-Wireless Sensor Network(WSN) -Introduction-Types-ISM Band-Wireless Standards-Structure of a Node-A Sensor Network Arrangement-Characteristic Features of a WSN-Challenges and

Constraints-Integrating WSN in Internet-Topology in Wireless Sensor Networks-Advantages/Disadvantages.		
Module:7	**Applied Automation**	**6 hours**
Building Automation, Home Automation, Systems Design & Operation, Automated HVAC systems,Production Automation,Business Automation,Waste Management Automation,Highway System Automation.		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Books	
1.	Dey, Chanchal, and Sunit Kumar Sen, Industrial automation technologies. CRC Press,
2.	2020. Gilchrist, Alasdair. Industrial Internet use-cases. Industry 4.0., Apress, Berkeley, CA, 2016.
Reference Books	
1.	Johnson, David. Programmable Controllers for Factory Automation. N.p.: 2020, CRC
2.	Press.
3.	Sharma, K. L. S. Overview of industrial process automation, 2016, Elsevier.
4.	Mikell P Groover., Automation,Production Systems and Computer- Integrated Manufacturing, 2016, Pearson. Frank D. Petruzella.,Programmable Logic Controllers, 2019, McGrawHill.

Mode of Evaluation: CAT, Written assignment, Quiz , FAT			
Recommended by Board of Studies	09-03-2022		
Approved by Academic Council	No. 65	Date	17-03-2022