

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Industrial Automation (Professional Elective-I)
Course Code:	2ET1090507T
Pre-requisite Course:	-

Course Objectives:

1. The main objective of this course is to understand the working principle of various types of sensors and actuators.
2. To Develop logical programmers of PLC for various industrial applications.
3. To understand the various case studies of industrial automation.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Sensors: Mechanical sensors: Strain, Motion, Pressure, Flow, Thermal sensors: RTD, Thermistor, Thermocouple, Optical sensors: Photo detectors, Optical sources, Infrared Sensors, Ultrasonic Sensors, Reflection light barrier sensors, Lasers in micro machining, Electric sensors: Inductive sensors, Capacitive sensors, Magnetic field sensors, Hall effect sensors.	10	23
2	Actuators: Classification of actuators, Control elements, Signal conversions: Analog electrical signals, Digital signals, Pneumatic signals, Actuators: Electrical, Pneumatic, Hydro pneumatic, Fluid valves: Control valve principle, Types, Sizing.	07	15
3	Programmable Logic Controllers: Introduction, Hardware and internal architecture of PLC, Basic PLC programming, PLC functions: Basic, Timer function, Arithmetic function, Working with bits and advanced PLC functions, Close loop speed control & close loop temperature control using PLC, Data handling.	12	25
4	HMI & Supervisory Control & Data Acquisition (SCADA): Introduction to HMI and SCADA, Communication of SCADA and HMI with PLC and PC, communication of SCADA with drives, Remote control, Remote terminal units, Master terminal units, Applications.	10	22
5	Case Study of Industrial Automation: Conveyor belt system, Textile industry, Power distribution sector, Automobile industry, Food and beverages industry.	06	15

Text Books:

1. JOHN WEBB, “Programmable Logic Controllers Principles & applications”, PHI, 3rd edition-2017.
2. Stuart A. Boyer, “SCADA: Supervisory Control and Data Acquisition”, The Instrumentation, Systems, and Automation Society of America publication, 2nd edition-2019.
3. Ramon Pallas-Areny, John G. Webster, “Sensors & Signal Conditioning”, John Willey & Sons.

Reference Books:

1. William Bolton, “Programmable Logic Controllers”, Newnes publication.
2. John R. Hackworth & Frederick D. Hackworth Jr., “Programmable Logic Controllers: Programming Methods and Applications”, Pearson, 3rd edition-2014.
3. Madhuchhanda Mitra & Samarjit Sengupta, “Programmable Logic Controllers and Industrial Automation”, Penram International Publishing (India) Pvt. Ltd.
4. David Bailey, “Practical SCADA for Industry”, Newnes publication, 5th edition-2013.

ICT/MOOCs Reference:

1. <https://nptel.ac.in/courses/108/105/108105088/>
2. <https://nptel.ac.in/courses/112/102/112102011/>
3. <https://nptel.ac.in/courses/108/105/108105062/>
4. <https://nptel.ac.in/courses/108/106/108106022/>
5. <https://nptel.ac.in/courses/108/108/108108147/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain working principle of various types of sensors and actuators.	2 Understanding
CLO2	Develop logical programmes of PLC for various industrial applications.	6 Creating
CLO3	Describe the SCADA and HMI based industrial applications.	2 Understanding
CLO4	Demonstrate various case studies of industrial automation.	1 Remembering

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	L	L	L	L		L	M	M	L		M	L		L	L
CLO2	H	M	M	L	L				L	L	L	L		H		L
CLO3	H	L	M	L	L	M			L		L	L	H		M	
CLO4	M	H	H	M	M					L	M	M		M		H

H: High, M: Medium, L: Low