Course Code	18EIO133T	Course Name	INDUSTRIAL AUTOMATION SYSTEMS	Course Category	O	Open Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Electronics and Instrumentation Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
CLR-1:	Study the basic components of PLC	
CLR-2:	Identify the use of timers and counters in process automation	
CLR-3:	Understand the DCS architecture	
CLR-4:	Gain knowledge on operator and engineering interface in DCS	
CLR-5:	Impart the knowledge on various elements in SCADA	

Course Outcomes (CO):	At the end of this course, learners will be able to:	Blooms level (1-6)
CO-1:	Summarize the I/O modules in PLC for process control	2
CO-2:	Apply timers and counters in process automation	3
CO-3:	Use the knowledge of DCS in LCU selection	3
CO-4:	Analyze data in operator displays for industrial automation	4
CO-5:	Illustrate the remote terminal unit and master terminal unit in SCADA.	3

Program Outcomes (PO)														
1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	Automatic control for continuous& discrete systems	Utilize PLC & DCS for control of systems	Effective management skills
3	-	-	-	-	-	-	-	-	-	-	-	-	3	-
3	2	-	-	-	-	-	-	-	-	-	-	-	3	-
2	-	-	-	-	-	-	-	-	-	-	-	3	2	-
2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
2	-	-	-	-	-	-	-	-	-	-	-	2	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Programmable logic controllers	PLC Programming Languages	Evolution of DCS	Operator Interfaces Requirements	SCADA basics introduction
	SLO-2	PLC vs Computer	Ladder Diagram	Hybrid System Architecture	Process Monitoring	Elements of SCADA
S-2	SLO-1	Parts of a PLC	Functional block	Central Computer system Architecture	Process Control	Functionality of SCADA
	SLO-2	Architecture	Sequential Function Chart	DCS Architecture	Process Diagnostics	Process example
S-3	SLO-1	PLC size and Application.	Instruction List	Comparison of Architecture	Process Record Keeping	Key features
	SLO-2	Fixed and Modular I/O	Structured Text	Local Control Unit Architecture	Low Level Operator Interface	Real time systems
S-4	SLO-1	Discrete Input Modules	Wiring Diagram	Architectural Parameters	High Level Operator Interface	Analog signals measurement
	SLO-2	Discrete Output Modules	Ladder logic Program	Comparison Of LCU Architecture	Hardware Elements In The Operator Interface	Control techniques
S-5	SLO-1	Analog Input Modules	On-Delay Timer Instruction	LCU Language Requirements	Operator Input And Output Devices	Remote terminal unit
	SLO-2	Analog Output Modules	Off-Delay Timer Instruction	Function Blocks	Operator Display Hierarchy	Analog and Discrete control
S-6	SLO-1	Special I/O Modules	Retentive Timer	Function Block Libraries	Plant-Level Display	Monitoring signals
	SLO-2	High Speed Counter Module	Cascading Timer	Problem-Oriented Language	Area- Level Display	Master terminal unit
S-7	SLO-1	Power Supplies	Up-Counter	LCU Process Interfacing Issues	Group- Level Display	RTU/MTU communication
	SLO-2	Isolators	Down-Counter	Security Requirements	Loop- Level Display	System components
S-8	SLO-1	Input/output Devices: Switches	Cascading Counters	Security Design Approach	Engineering Interface Requirements	

	SLO-2	*sensors*	*Combining Counter and Timer Functions*	*On-Line Diagnostics*	*Requirement For Operator Interface Configuration*	Communication Protocols
S-9	**SLO-1**	*Relays*	*Math Operation*	*Redundant Controller Design*	*Low Level Engineering Interface,*	Operator interface
	SLO-2	*Solenoid valve*	*Program*	*One-On-One, One-On-Many Redundancy*	*High Level Engineering Interfaces*	

Learning Resources	1. Frank D. Petruzella, Programmable Logic Controller, Tata McGraw Hill Fifth Edition, 2017 2. Bolton. W, Programmable Logic Controllers,6th Edition, Elsevier Newnes, Sixth Edition 2016. 3. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India, New Delhi,2015	4. Bowten, R HART Application Guide, HART Communication foundation, 2015. 5. Berge, J, Field Busses for process control: Engineering, operation, maintenance, ISA press,2015

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40 %*	-	*20 %*	-	*20 %*	-	*20 %*	-	*20 %*	-
Level 2	Understand	*60 %*	-	20 %	-	20 %	-	20 %	-	20 %	-
Level 3	Apply	-	-	*60 %*	-	*40 %*	-	*30 %*	-	*40 %*	-
Level 4	Analyze	-	-		-	*20%*	-	*30 %*	-	*20 %*	-
Level 5	Evaluate	-	-	-	-	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-	-	-	-	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

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