SEMESTER S8
INDUSTRIAL AUTOMATION

Course Code	**OEICT831**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. Provide an overview of automation concepts, including historical evolution, principles, and the importance of automation in modern industries.
2. Introduce students to Programmable Logic Controllers (PLCs)
3. Explain Supervisory Control and Data Acquisition (SCADA) systems.
4. Discuss networking fundamentals relevant to industrial automation.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Automation introduction** Control Systems and Automation Strategy, Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to Descriptive automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Control system audit, and performance criteria.	8
2	**Instrumentation Standard Protocols** Definition of protocol, Introduction to Open System Interconnection (OSI) model, Communication standard (RS232, RS485), Modbus (ASCII/RTU), Introduction to third party interface, concept of OPC (Object linking and embedding for Process Control), **HART Protocol**: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. **Foundation Fieldbus H1**: Introduction, frame structure, programming, implementation examples,benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Device net,Profibus, Controlnet, Industrial Ethernet	11
3	**Programmable logic controllers (PLC)**	9

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	Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, high speed counter, PTO, PWM and PID blocks in PLC, PLC design, study of at least one industrial PLC.	
4	**Networking fundamentals** Advance Applications of PLC and SCADA, PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU) **Distributed Control Systems** DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, Latest trends and developments.	**10**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

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Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Provide an overview of automation concepts, including historical evolution, principles, and the importance of automation in modern industries.	**K2**
CO2	Information about Instrumentation standard protocols	**K2**
CO3	Develop Skills in Programmable Logic Controllers (PLCs), Supervisory Control and Data Acquisition (SCADA) systems.	**K2**
CO4	Knowledge of networking fundamentals relevant to industrial automation.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				2							2
CO2	3				2							2
CO3	3				2							2
CO4	3				2							2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Industrial Automation and Control System Security Principles	Tyler, Joel Thomas	CRC Press	Edition: 1st Edition Year: 2020
2	Industrial Communication Technology Handbook	Richard Zurawski (Editor)	CRC Press	Edition: 3rd Edition Year: 2016
3	Programmable Logic Controllers: A Practical Approach to IEC 61131-3 using CoDeSys	Dag H. Hanssen	Wiley-IEEE Press	Edition: 1st Edition Year: 2015
4	Industrial Automation and Control System Security Principles	Joel Thomas Tyler	CRC Press	Edition: 1st Edition Year: 2020

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	"Industrial Automation and Process Control"	Jon Stenerson, Mark A. Howard, and Damian A. Flynn	Prentice Hall	Edition: 2nd Edition Year: 2010
2	"Programmable Logic Controllers: Principles and Applications"	John W. Webb, Ronald A. Reis	Pearson	Edition: 1st Edition Year: 2003

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc24_ee56/preview#:~:text=Nptel https://control.com/technical-articles/understanding-the-automation-lingo-plc-pac-rtu-dcs-and-scada/
2	https://www.scribd.com/presentation/571046284/Unit-2
3	https://archive.nptel.ac.in/content/storage2/courses/112102011/downloads/faq%20of%20module%204.pdf
4	https://controllogicbd.com/advance-plc-with-hmi-scada/ https://onlinecourses.nptel.ac.in/noc21_cs87/preview

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