SEMESTER S7

PROCESS AUTOMATION

Course Code	**PECHT744**	**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. Equip students with the skills to map and analyze process flows, define input and output parameters, and implement automation
2. Understand automatic control principles, enabling them to design and optimize control systems effectively.
3. Apply advanced control strategies and integrate them into automated systems to enhance process reliability and performance in industrial applications.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to automation, Architecture of Industrial Automation Systems, Measurement Systems Characteristics, Level of automation, Automated flow lines and transfer mechanisms, Data Acquisition Management, Introduction to PLC, PLC functions.	**8**
2	Process Flows- process mapping, flows, input and output parameters, Automation steps in process industries, PDCA (Plan, Do, Check Act) automation cycle. Introduction to Automatic Control: P-I-D Control, PID Control Tuning, Feed forward Ratio Control, Sequence Control.	**8**
3	Flow Control Valves, Hydraulic Control Systems, Pneumatic Control Systems, Higher Level Automation Systems. Introduction to computer-based industrial automation- Direct Digital Control (DDC), Distributed Control System (DCS) and supervisory control and data acquisition (SCADA) based architectures. SCADA for process	**9**

	industries, Process Safety Automation: Levels of process safety and control.	
4	Robotic Process Automation (RPA): Definition of RPA, RPA Applications, RPA Tools and Platforms. Business ProcessManagement (BPM): Definition of BPM, BPM Tools and Platforms, BPM vs RPA. Artificial Intelligence (AI) andMachine Learning (ML): Definition of AI and ML, AI and ML Applications in Process Automation, AI and ML Toolsand Platforms. Integration and Data Management: Integration Platforms, Data Management Tools, Data Analysis andReporting Tools.	**11**

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

Continuous Internal Evaluation Marks (CIE):

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

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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	Develop a comprehensive understanding and practical skills in industrial automation systems	**K3**
CO2	Apply various automatic control techniques to implement process automation.	**K3**
CO3	Develop knowledge and skills to design, implement, and manage various automation systems and control mechanisms	**K3**
CO4	Apply advanced tools such as Robotic Process Automation (RPA), Business Process Management (BPM), Artificial Intelligence (AI), and Machine Learning (ML) for effective process automation.	**K3**

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

CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Industrial Instrumentation, Control and Automation	S. Mukhopadhyay, S. Sen and A. K. Deb	Jaico Publishing House	2013
2	Chemical Process Control, An Introduction to Theory and Practice.	George Stephanopoulos,	Prentice Hall India	2012

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Process Control Instrumentation Technology.	Curtis D. Johnson	Pearson New International	8th Edition 2013
2	Distributed Control Systems	Lukas M.P	Van Nostrand Reinhold Co., New York	1986
3	SMEC Industrial Automation tools and Techniques			
4	Handbook of Artificial Intelligence and Robotic Process Automation Policy and Government Applications	Naqvi, J. M. Munoz,	Anthem Press	2020

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://nptel.ac.in/courses/108105063
2	https://nptel.ac.in/courses/112101098

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