NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech.in Electronics and Instrumentation Engineering
Semester:	V
Course Code:	3EI101CC24
Course Title:	Industrial Controls
Course Type:	Core
Year of Introduction:	2024-25

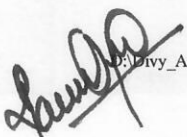| L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. interpret time domain requirements and design suitable compensator **(BL2)**
2. design the industrial controller as per the system requirements **(BL3)**
3. apply the tuning rules to achieve optimum performance **(BL3)**
4. select advanced control strategy to achieve the objectives of control system **(BL4)**

Unit	Contents	Teaching Hours (Total 45)
Unit- I	**Conventional controllers** Time domain specifications for controller design, Concept of compensator design in time domain, Phase lead, lag and lead-lag compensator design with relevant examples	15
Unit- II	**Industrial controllers** Introduction to various controller modes, response of different controller for various errors, selection criteria for controllers. Proportional controller response for set point and load change, proportional-integral and proportional-integral-derivative response for set point and load change	10
Unit- III	**Tuning of controllers** Need of controller tuning, criteria for good control, tuning methods – Ziegler-Nichols and Choen-Coon, error based performance criteria, process identification for controller tuning	08
Unit- IV	**Advanced controllers** Need of advanced control strategies, State feedback controllers, cascade control, feedforward-feedback control, ratio control, dead time compensator, compensator for inverse response system, split range control, selective control, inferential control, reset windup, adaptive control, applications of advanced control strategies in various unit operations	12

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 practical based on the above syllabus.

Suggested Reading:
1. Donald R Coughanowr and S.E.leBlanc, Process Systems Analysis and Control, McGraw Hill Publication
2. I.J. Nagrath and M. Gopal, Control System Engineering, New Age Publishers
3. Curtis Johnson, Process Control Instrumentation Technology, Prentice Hall of India Publication
4. Seborg, Edgar, Millichamp and Doyle, Process Dynamics and Control, Wiley Student Edition
5. Bela G. Liptak, Instrument Engineers Handbook, Process Control, Elsevier

Suggested List of Experiments (not restricted to the following):
(Only for Information)

1.	To Evaluate the dynamic behavior of first order and second order system	**(02 Hrs)**
2.	To analyse dynamic behavior of U-tube manometer	**(02 Hrs)**
3.	To check the performance of Interacting and Non interacting system	**(04 Hrs)**
4.	To Check continuous cycling method for controller tuning	**(02 Hrs)**
5.	To Perform the Temperature Control for Stirrer Tank System	**(02 Hrs)**
6.	To Perform the of pressure control system	**(02 Hrs)**
7.	To Evaluate smith predictor for control of process with dead time	**(02 Hrs)**
8.	To Perform the cascade control scheme	**(02 Hrs)**
9.	To study Ratio Control scheme	**(02 Hrs)**
10.	To check the performance of Split Range Control scheme using PROSIM software	**(04 Hrs)**

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2024 - 25 and onwards