School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)
Semester V

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Course Code	2IC501
Course Title	Process Control

Course Learning Outcome:
At the end of the course, students will be able to –

- illustrate various components of the feedback control loop

- develop mathematical model of the given process

- select the proper controller and apply the tuning rules to achieve optimum performance

- select advanced control strategy to achieve the objectives

Syllabus	Teaching Hours

UNIT 1: Introduction to Process Control
Objectives of process control, basic process control terminology, overview of process control elements

05

UNIT 2: Mathematical Modeling of Physical System
First order systems, first order systems in series, interacting and noninteracting systems, second order systems, system with transportation lag

09

UNIT 3: Controller Modes

Introduction to various controller modes, response of different controller for various errors, selection criteria for controllers.

08

UNIT 4: Transient Response of Control System

Proportional controller response for set point and load change, proportional-integral and proportional-integral-derivative response for set point and load change.

04

UNIT 5: Frequency Response of Control System

Frequency response of the system with proportional controller, integral, derivative, PI and PID controller, stability analysis in frequency domain

04

UNIT 6: Controller Tuning

05

Need of controller tuning, criteria for good control, tuning methods – Ziegler-Nichols and Choen-Coon, error based performance criteria, process identification for controller tuning

UNIT 7: Advanced Control Strategies

10

Need of advanced control strategies, 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.

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:
Laboratory Work will consist of minimum 10 experiments based on the above syllabus.

References:
1. Donald R Coughanowr and S.E.leBlanc, Process Systems Analysis and Control, McGraw Hill Publication.
2. Curtis Johnson, Process Control Instrumentation Technology, PHI Publication
3. Seborg, Edgar, Millichamp and Doyle, Process Dynamics and Control, Wiley Student Edition
4. Bela G. Liptak, Instrument Engineers Handbook, Process Control, Elsevier