

UG

Course Code: **CH308**

Credit: **4**

Version: **1**

Prerequisite Course: **Nil**

Department: **Chemical Engineering**

Course Name: **Process Dynamics and Control**

L-T-P: **3-1-0**

Approved on:

Introduction to process control and review of Laplace transforms.

Linear Open-Loop Systems

First-Order Systems: Transfer function, transient response (step response, impulse response, sinusoidal response), examples of first-order systems, response of first-order systems in series: non-interacting systems and interacting systems.

Second-Order Systems: Transfer function, step response, impulse response, sinusoidal response, transportation lag.

Linear Closed-Loop Systems

Control system: Components of a control system, block diagram, negative feedback and positive feedback, servo problem and regulator problem.

Controller and final control element: Mechanism of control valve and controller, transfer functions of control valve and controllers (P, PI, PD, PID) Example of a chemical-reactor control system.

Closed-Loop Transfer Functions: Overall transfer function for single-loop systems, overall transfer function for set-point change and load change, multi-loop control systems.

Transient Response of Simple Control Systems: P and PI control for set-point change and for load change.

Stability: Concept of Stability; Stability criteria; Routh test for stability; Root Locus.

Frequency Response

Introduction to Frequency Response, Bode Diagrams for first- and second-order systems, Bode Stability Criteria, Ziegler-Nichols and Cohen-Coon Tuning Rules.

Books

1. Coughanowr, D. R., "*Process Systems Analysis and Control*", 2nd ed., McGraw Hill, 1991.
2. Stephanopoulos, G., "*Chemical Process Control*", PHI, New Delhi, 1984.
3. Luyben, W. L., "*Process Modeling, Simulation and Control for Chemical Engineers*," McGraw Hill, 1973.