

Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	CHC209	Process Dynamics and Control	3	0	0	9

Course Objective

The objective of this course is to provide introductory knowledge to bridge the classical approach to process dynamics and control problems with the current and future trends and needs.

Learning Outcomes

After completion of the course students are expected to know basic control aspects of a chemical process.

Unit No.	Topic to be covered	Lecture Hours	Learning Outcome
1	Introduction: Introduction to process control, terminologies, various control configurations, basic hardware elements for control system, introduction to basic process instrumentation	08	Basic introduction about the course
2	Laplace transform and block diagram: Laplace transform, applications of Laplace transform to process control, concept of transfer function, block diagram, block diagram reduction, forcing functions	05	Development of input output models analysis using Laplace transformations
3	Dynamic behaviour of processes: Introduction to first, second and higher order linear systems, basic modelling and analysis of dynamic behaviour of these systems	09	Introduce the students to the modelling and method to analyse the dynamic behavior of processing systems
4	Feedback control system: Open loop and closed loop systems, feedback control system, stability analysis, root locus diagram, frequency response analysis, Bode plot, Bode and Nyquist stability criterion, design of controller, dynamics of some complex processes	13	Analysis and design of basic feedback control systems
5	Control Valve: Control valves and its characteristics	03	Design and selection of final control element
6	Advanced control systems: Introduction advanced control systems, cascade, feedforward and ratio control system, application of control systems to chemical process equipment such as chemical reactors, heat exchangers, distillation columns, etc.	04	Analysis and design of more complex control systems

Textbooks:

1. Stephanopoulos, G. (2008). Chemical Process Control: An Introduction to Theory and Practice, 3rd Ed., Prentice Hall.
2. Seborg, D. E., Mellichamp, D. A., Edgar, T. F., and Doyle, F. J.(2009). Process Dynamics and Control, 2nd Ed., John Wiley & Sons.
3. Coughanowr, D.R., and LeBlanc E Steven. (2017). Process Systems Analysis and Control, 3rd Ed., McGraw Hill Higher Education.

Reference Books:

1. Ogunnaike, B. A., and Ray, W. H. (1994). Process Dynamics, Modeling and Control, Oxford University Press.
2. Sarakr, P.K. (2013). Process Dynamics and Control. Prentice Hall India.
3. Marlin, T. E. (2012). Process Control: Designing Processes and Control Systems for Dynamic Performance, 2nd Ed., McGraw Hill.