

**NIRMA UNIVERSITY**  
**School of Engineering, Institute of Technology**  
**B.Tech. in Chemical Engineering**  
**Disciplinary Minor in Chemical Engineering**  
**Third Year/Semester V**

<b>Institute:</b>	Institute of Technology
<b>Name of Programme:</b>	B. Tech. (Chemical Engineering)
<b>Course Code:</b>	3CH603DC24
<b>Course Title:</b>	Plantwide Process Control
<b>Course Type:</b>	Core
<b>Year of introduction:</b>	2024-25

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

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

- |                                                       |       |
|-------------------------------------------------------|-------|
| 1. analyse a feedback control system                  | (BL4) |
| 2. assess advanced control systems                    | (BL5) |
| 3. design control systems for multivariable processes | (BL6) |
| 4. apply digital control system in chemical plant     | (BL3) |

	<b>Contents</b>	<b>Teaching hours (Total 45)</b>
<b>Unit I</b>	<b>Feedback Control System</b> Introduction, dynamic behaviour, stability analysis, frequency response analysis, design of feedback control system using frequency response techniques, z-transform.	<b>06</b>
<b>Unit II</b>	<b>Advanced Control Systems</b> Feedback control of systems with large dead time or inverse response, cascade control, selective control system, split-range control, feedforward control, feedforward–feedback control, ratio control, adaptive and inferential control system.	<b>10</b>
<b>Unit III</b>	<b>Introduction to Plant Control</b> Multiple input multiple output (MIMO) control system, degrees of freedom, controlled, manipulated and measured variables, generation of alternative loop configurations, interaction of control loops, relative-gain array, selection of loops, design of non-interacting control systems. Design of control system for complete plants: Case studies	<b>18</b>
<b>Unit IV</b>	<b>Process Control using Computers</b> Digital computer control loops, design of digital feedback controllers, process identification and adaptive control.	<b>05</b>
<b>Unit V</b>	<b>Digital Control System</b> Programmable logic controller (PLC), distributed control system (DCS), supervisory control and data acquisition systems (SCADA).	<b>06</b>

**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.

**Tutorial Work:**

tutorial work will be based on the above content of course.

**Suggested Readings/References:**

1. Stephanopoulos G., Chemical Process Control: An Introduction to Theory and Practice, PHI Learning.
2. [Luyben](#) W.L., Process Modeling, Simulation and Control for Chemical Engineers, McGraw-Hill.
3. Seborg D.E., Mellichamp, D.A., Edgar, T.F., Doyle, F.J., Process Dynamics and Control, [John Wiley & Sons](#).
4. Ray W.H., Advanced Process Control, McGraw-Hill.

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