

## UEI604 PROCESS DYNAMICS AND CONTROL

L	T	P	Cr
3	1	2	4.5

**Introduction:** Historical perspective, Incentives of process control, Synthesis of control system. Classification and definition of process variables.

**Mathematical Modeling:** Need and application of mathematical modeling, Lumped and distributed parameters, Analogies, Thermal, Electrical and chemical systems, Modeling of CSTR, Modeling of heat exchanger, Interacting and non-interacting type of systems, Dead time elements, Developing continuous time and discrete time models from process data.

**Control Modes:** Definition, Characteristics and comparison of on-off, Proportional (P), Integral (I), Differential (D), PI, PD, PID, Dynamic behavior of feedback controlled processes for different control modes, Control system quality, IAE, ISE, IATE criterion, Tuning of controllers Ziegler-Nichols, Cohen-Coon methods, Controller trouble shooting.

**Realization of Control Modes:** Realization of different control modes like P, I, D, In Electric, Pneumatic, Hydraulic controllers.

**Actuators:** Hydraulic, Pneumatic actuators, Solenoid, E-P converters, Control valves, Types, Functions, Quick opening, Linear and equal percentage valve, Ball valves, Butterfly valves, Globe valves, Pinch valves, Valve application and selection, Cavitations and flashing, Dampers and variable speed Drives.

**Advanced Controls:** Introduction to advanced control schemes like Cascade, Feed forward, Ratio, Selective, Override, Split range and Auctioneering control, Plant wide control.

### Laboratory Work:

I to P, P to I, Valve characteristics, Simulation of different control modes, Experiments around Basic Process RIG.

**COURSE LEARNING OUTCOME (CLO):**The student will be able to

1. Develop the mathematical modeling of various chemical processes.
2. Implement PID and IMC PID controllers for different processes.
3. Explain the working of various types of valves.
4. Implement advance control schemes such as ratio control, selective control on suitable processes.

### Text Books:

1. Johnson, C.D., *Process Control Instrumentation Technology*, Prentice–Hall of India Private Limited (1992).
2. Stephanopoulos, G., *Chemical Process Control*, Prentice–Hall of India Private Limited (1983).

### Reference Books:

1. Harriot, P., *Process Control*, Tata McGraw–Hill (1982).
2. Liptak, B.G., *Instrument Engineers Handbook*, Butterworth, Heinemann (2002).
3. Seborg, D.E. and Edgar, T., *Process Dynamics and Control*, John Wiley and Sons (1989).

**Evaluation Scheme:**

<b>Sr. No.</b>	<b>Evaluation Elements</b>	<b>Weightage (%)</b>
1	MST	25
2	EST	35
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	40