UEI605: PROCESS DYNAMICS AND CONTROL

L	T	P	Cr
3	0	2	4.0

Course objective: To make the students understand basic ideas, challenges, techniques, and applications of process control for controlling various processes.

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

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

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

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

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

Course Learning Outcomes (CLO):
After the successful completion of the course the students will be able to:
1. demonstrate fundamental understanding of process control.
2. develop the mathematical model of various chemical processes.
3. explain different control modes and their application in controlling various processes.
4. explain the working of electric, hydraulic and pneumatic controllers.
5. demonstrate the working and application of different type of actuators and control valves

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:

S.NO.	Evaluation Elements	Weightage
1	MST	25
2	EST	40
3	Sessional (May include Assignments//Quizzes/Lab Evaluations)	35