

Course Code	Course Title	L	T	P	C
1154EC111	PROCESS CONTROL	3	0	0	3

a) **Course Category**
Institutional elective

b) **Preamble**
The purpose of this course is to provide students with the knowledge of various process control elements and controllers to solve real world problems in an efficient manner.

c) **Prerequisite**
Basic Electronics Engineering

d) **Related courses**
Control systems

e) **Course educational objectives**

1. Understand the concepts of various process and its characteristics
2. Study on concepts of various controllers such as P, PI.
3. Gain knowledge in controller tuning and performance evaluation.
4. Expose on final control elements and its characteristics.
5. Learn on various control schemes and its application.

f) **Course Outcomes**

On successful completion of this course the student will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the concepts of various process dynamics and its mathematical model.	K2
CO2	Describe the concepts of various controllers in PID and its operation.	K2
CO3	Illustrate the evaluation criteria and various controller tuning methods such as process reaction curve method.	K2
CO4	Elaborate the various final control elements such as electric actuators, control valves.	K2
CO5	Explain the multivariable control and its application.	K2

g) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

h) Course Content

UNIT I PROCESS DYNAMICS 9

Need for process control – Mathematical model of flow, Level, Pressure and Thermal processes – Interacting and non-interacting systems – Degrees of freedom – Continuous and batch processes – Self regulation – Servo and regulatory operations - Inverse response

UNIT II CONTROLLER 9

Characteristics of on-off, proportional, single speed floating, integral and derivative– P+I, P+D and P+I+D control modes – Electronic PID controller - Auto/Manual Transfer – Reset Windup

UNIT III CONTROLLER TUNING 9

Need for controller tuning – Evaluation criteria – Quarter Decay Ratio, IAE, ISE and ITAE - Types of controller tuning: Process reaction curve method, Continuous cycling method and Damped oscillation method

UNIT IV FINAL CONTROL ELEMENTS 9

/P converter-Pneumatic and electric actuators–Valve Positioner–Control Valves– Characteristic of Control Valves: -Inherent and Installed characteristics–Modeling of pneumatic control valve– Valve body:-Commercial valve bodies –Control valve sizing –Cavitation and flashing – Selection criteria.

UNIT V MULTILoop CONTROL 9

Cascade control – feed forward control- ratio control – Interference control – split range control – application in distillation columns, chemical reactors, Heat exchangers and boilers – introduction to adaptive control.

Total 45 Hrs

h) Learning Resources

(i) Text books

1. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004
2. Stephanopoulos, G., "Chemical Process Control -An Introduction to Theory and practice", Prentice Hall of India, 2005

(ii) Reference Books

1. Seborg, D.E., Edgar, T.F. and Mellichamp, D.A., "Process Dynamics and Control", Wiley John and Sons, 2nd Edition, 2003
2. Coughanowr, D.R., "Process Systems Analysis and Control", McGraw-Hill International Edition, 2004.