Course Code	Course Title	L	T	P	C
1151EC106	ANALOG AND DIGITAL CONTROL SYSTEMS	2	2	0	3

a Course Category

Program Core

b) Preamble

This course aims to provide a basic knowledge about what is a control system, its significance, transfer function, open and closed loop systems, time domain and frequency domain analysis and its specifications, stability, error constants and designing of compensators viz., lag, lead and lag lead compensators, significance of P, PI and PID controllers and stability & state variable analysis.

c) Prerequisite

Nil

d) Related Courses

Linear Integrated Circuits, Analog Communication Systems

e) Course Outcomes

On successful completion of this course, students will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Derive the transfer function of electrical, mechanical and Electro mechanical systems Apply the concept of state space for system analysis	K3
CO2	Derive Time response of I order and II order systems Apply the Root locus and Routh - Hurwitz criteria to analyze the stability of the given system	K3
CO3	Determine the system stability by various methods such as Bode plot, Polar plot etc in frequency domain	K3
CO4	Design various controllers and compensators for control systems	K3

CO5	Apply the concept of state space and sampling theorem to digital control system.	K3

f) Correlation of Co's with Po's

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

g) Course Content

UNIT I CONTROL SYSTEM MODELING & STATE VARIABLE ANALYSIS 12

Basic elements of control system – open loop and closed loop systems: differential equation - transfer function, modeling of electric systems, translational and rotational mechanical systems - block diagram reduction techniques - signal flow graph. State space representation of continuous time systems – physical systems and phase variable model.

UNIT II TIME DOMAIN AND STABILITY ANALYSIS 12

Time response analysis: first order systems - impulse and step response analysis of second order systems. Root locus technique: construction of root locus- stability - dominant poles. Routh - Hurwitz criterion: relative stability.

UNIT III FREQUENCY DOMAIN AND STABILITY ANALYSIS 12

Frequencyresponse - correlation between time and frequency responses - bodeplot, polarplot- frequencydomain specificationsfromthe plots - nyquistplot, nyquist stability criterion.

UNIT IV DESIGN OF COMPENSATORS IN FREQUENCY DOMAIN 12

P, PI,PDand PIDcontrollers: Introduction – transfer function model – characteristics; series, paralleland series- parallelcompensation - Lead and Lag networks– series compensator designfor desired response usingBodediagrams.

UNIT V DIGITAL CONTROL SYSTEMS 12

State space representation for discrete time systems – phase variable model Sampled data control systems – Sampling theorem – Sampler and Hold – open loop and closed loop sampled data systems.

Total 60 Hrs

g) Learning Resources

Text Books

1. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002
2. J.NAGRATH and M.Gopal," Control System Engineering", New Age International Publishers, 5th Edition, 2007.

Reference Books

1. Ogata, K., "Modern Control Engineering", Prentice Hall of India Ltd., 4th Edition, New Delhi, 2006.