ECE305:CONTROL SYSTEMS

L:3 T:0 P:0 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: Describe the mathematical model for a given physical systems.

CO2 :: Identify physical systems and classification of open and close loop control systems.

CO3 :: Examine the system performance in time and frequency domain.

CO4 :: Analyze system behaviour in state space domain

CO5 :: Assess the performance of LTI systems to different inputs

CO6 :: Design basic controllers to meet out desired performance

Unit I

Introduction to Control Systems : Introduction to linear control system, Open loop and Closed loop systems, Transfer functions, Industrial Control Examples, Transfer Function of Electrical Systems, Mechanical Systems, Electrical Analogous Systems

Unit II

Modelling and Representations of Control Systems : Block diagram representation and reduction techniques, Signal flow graphs, Mason Gain Formula, Concept of Poles and Zeros, Effect of feedback

Unit III

Time Domain analysis and Stability : Standard input signals, Time Response of first order system, Time response of second order system subjected to unit step input, Time -Domain specifications, Steady state error, Static error coefficients, Concept of stability, Absolute and Relative Stability, Routh-Hurwitz criterion

Unit IV

Frequency response analysis : Relationship between time and frequency response, Stability in frequency domain, Nyquist plot and nyquist stability criterion, Root Locus Technique, Polar Plot

Unit V

Design of Compensators : Bode Plot and stability determination, Lag-lead compensation, Lead compensation, Lag compensation, Design of Compensators using Bode plot, PID control

Unit VI

State Space Analysis : State space analysis to transfer functions, Transfer Function Decomposition, Solutions of state equations using Laplace Inverse and Caley-Hamilton Theorem, Controllability and Observability

Text Books:

1. CONTROL SYSTEMS PRINCIPLES AND DESIGN by M GOPAL, MCGRAW HILL EDUCATION

References:

1. LINEAR CONTROL SYSTEMS by B S MANKE, KHANNA PUBLISHERS

2. CONTROL SYSTEMS ENGINEERING by I J NAGRATH AND GOPAL, NEW AGE INTERNATIONAL

3. AUTOMATIC CONTROL SYSTEMS by OGATA K, PRENTICE HALL

4. MODERN CONTROL SYSTEMS by RICHARD C DORF, ROBERT H BOSHOP, PEARSON