4th Semester

PEI4I102 CONTROL SYSTEM ENGINEERING

University level 80%

Module-I: (12 Hours)

Introduction: definition, control system, open loop, close loop, automatic control, modern control, properties of transfer function

Mathematical Modeling: translational, rotational systems and their electrical analogy, mechanical coupling, liquid level systems, servo motors, sensors, magnetic amplifiers, stepper motor, synchros, block diagram, signal flow graph, gain formula.

Feedback characteristics of Control Systems: Feedback and non-feedback systems, Reduction of parameter variations, Control over system dynamics, Effect of disturbance signal by use of feedback, Linearizing effect of feedback, Regenerative feedback, Sensitivity of control system, parameter variation and disturbance ofsignal.

Module-II: (12 Hours)

Time Domain Analysis: typical test signals, transient analysis of second order systems, overshoot, damping, settling time and rise time, Analysis of multi-order control system with dominant poles, steady state error analysis, error confidents, generalised error series, transient analysis with derivative control, integral control and proportional control, rate feedback control, Routh Hurwitz stability criteria.

Root Locus Technique: Basic conditions for root loci, rules for construction, stability and conditional stability on root locus.

Module-III: (12 Hours)

Frequency Response Analysis: Polar plot, Bode plot, frequency domain behaviour of control, gain margin and phase margin, Wpand Mp for second order system, stability criteria.

Nyquist Criteria: Stability criteria, conformal mapping, Cauchy's theorem, Nyquist stability criteria, conditionally stable system.

State variable Technique: state variable for continuous system, transfer function to state variable, state variable to transfer function, state transition matrix, time domain solution of single input single output system.

Text Book:

1. *I J Nagrath and M Gopal, Control system engineering; New Age International Publisher2010.*

Reference Books:

2. *K Ogata, Modern Control Engineering, PHI, 5th edition*
3. *R C Dorf and R H Bishop, Modern Control Systems; Pearson Education;2009*
4. *B C Kuo, Automatic Control System; PHI; 7th Edition*