

EE 306

**LINEAR CONTROL SYSTEMS
(Common to IE & EEE)**

Instruction	4/1 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Open and Closed loop Systems, Continuous time and discrete time control systems. Control system components, Error sensing devices, Potentiometers. Synchros, AC-DC servo motors-Block diagram representation, Transfer function and impulse response, Signal flow graphs.

UNIT-II

Time Response: Types of Input, Transient response of second order system for step input. Time diagram specifications - Types of system- static error coefficients, Error Series-Routh-Hurwitz criterion of stability. Root Locus Technique- Typical systems analyzed by root locus technique-Effect of location of roots on system response PID Controller.

UNIT-III

Frequency Response Plots: Bode Plots, Frequency domain specifications. : M_p , ω_p for a second order system, Nyquist criterion for a stability, relative stability, gain and phase margin, Compensation: Cascade Compensation using Bode plots.

UNIT-IV

State Space Representation: Concept of State, State Variable, State Models of linear time invariant systems. Derivation for state models from transfer functions and differential equations. State Transition matrix- Solution of State equations by time domain method. Observability and Controllability.

UNIT-V

Discrete Control Analysis: Introduction to signals and systems, The Z-transformation, digital control, advantages and disadvantages. Digital control system architecture. The discrete transfer function. Sample data system. Transfer function of sample data systems- Z-plane specifications of control system design.Z-domain stability.

Suggested Reading:

1. I.J.Nagrath, M.Gopal, Control System Engineering, New Age International (P) Limited Publishers, 5th Edition, 2007.
2. M.Gopal, Control Systems Principles and Design- Tata McGraw Hill, 2nd Edition, 2003.
3. K.Ogata, Modern Control Systems, 3rd Edition.PHI, 2000.
4. J.F.Franklin and J.D.Powell-Digital Control of Dynamic Systems, Addison Wesley, 1980.