

**13EE3106-LINEAR CONTROL SYSTEMS**  
**(Common for EEE, ECE)**

Instruction/week: 4 hrs.  
Univ. Exam: 3 hrs.

Max. Sessional marks: 40  
Univ. Exam marks: 60

**UNIT –I**

**Introduction to classical control systems:** Open loop and closed loop control systems- Types of feedback, Feedback and its effects- Transfer functions - block diagrams and their reduction- signal flow graphs - Mason's gain formula.

**UNIT-II**

**Mathematical modeling of physical systems:** Mathematical modeling and transfer functions of electrical, mechanical and electro-mechanical elements. DC servo motors- two phase A.C. servo motors – synchros.

**UNIT-III**

**Time domain analysis:** Introduction, Standard test signals, Time response of first order and second order systems – steady state error and error constants-effect of adding a zero to a system, design specification of second order system.

**Stability of control systems:** Routh Hurwitz criterion- Root Locus – rules for the construction of root loci- Introduction to proportional, derivative and integral controllers.

**UNIT-IV**

**Frequency domain Analysis:** introduction- Frequency domain specifications-Polar plots – Gain and Phase margin- Bode Plots- Phase and Gain margin- Nyquist stability criterion-Gain and Phase margin. Constant M-circles and N-circles. Nichols Chart.

**UNIT-V**

**Design of compensators:** Introduction - Need for compensators, Lag and Lead compensators design in frequency domain.

**TEXT BOOKS:**

1. "Control system Engineering" by I.J.Nagrath and M.Gopal, Wiley Eastern Ltd.
2. "Control Systems" by A. Anand kumar PHI publishers

**REFERENCES:**

1. "Automatic Control systems" by B.C.Kuo, PHI publishers.
2. "Modern Control Engineering" by K.Ogata, Pearson education. .
3. "Control system Engineering" by NISE, Wiley, 2000.