EC-305	CONTROL ENGINEERING	L	T	P	C
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COURSE OBJECTIVES:

1. To the mathematical modeling of control systems using transfer function and impulse response functions
2. To know the transient and steady state responses of first and second order systems
3. To know the fundamentals of root locus technique
4. To plot Bode diagrams and polar plots
5. To represent control systems in state space

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. model the dynamic control systems with and without feedback in time domain, frequency domain and in state space.
2. analyze the transient, steady state responses of first and higher order unity feedback control systems with steady state error.
3. assess the stability of control systems through Routh Hurwitz criterion.
4. improve the stability of control systems using Root Locus Technique and by compensation.
5. analyze the stability of control system in frequency domain through Bode plot, polar plot and Nyquist plot.

UNIT I **(12)**

Introduction to Control Systems : Introduction, Examples of Control systems, Closed Loop Control vs Open Loop Control, Mathematical modeling of Dynamic systems, Mathematical models transfer function and Impulse Response function, Automatic Control Systems, Block Diagram Reduction Techniques Signal Flow graphs.

UNIT II **(12)**

Transient and Steady-State Response Analyses : Introduction, First-Order Systems, Second-Order Systems, Higher Order systems (upto third order) Steady-State Errors in Unity Feed back Control Systems.

UNIT III **(12)**

Routh Hurwitz Stability Criterion, Root-Locus Analysis : Introduction, Root-Locus Plots, Summary of General Rules for Constructing Root Loci.

Lead Compensation, Lag Compensation, Lag-Lead Compensation

UNIT IV **(12)**

Frequency-Response Analysis : Introduction, Bode Diagrams, Polar Plots, Log-Magnitude vs Phase Plots, Nyquist Stability Criterion, Stability Analysis.

UNIT V **(12)**

Analysis of Control Systems in State Space : Modeling in State Space, State Representation of Dynamic Systems, State Space representations of Transfer Function systems, Solving the Time Invariant State Equation(upto second order systems), Controlability, Observability.

LEARNING RESOURCES:

TEXT BOOK(s):

Katsuhiko Ogata, Modern Control Engineering, 4th Edition, PHI, 2002.

REFERENCE BOOK(s):

1. J.Nagrath and M.Gopal, Control Systems Engineering, NewAge Publishers, 2009
2. A.K.Jairath,Problems and Solutions of Control Systems with Essential Theory,2012
3. B C KUO, Automatic Control Systems,7th Edition, PHI, 2004.
4. Norman Nise, Control Systems Engineering, 6th Edition, John Wiley, 2011.

WEB RESOURCES:

1. http://nptel.ac.in/courses/108101037/
2. http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedback-control-systems-fall-2010/