Course Number and Name

BEI601 - CONTROL SYSTEMS

Credits and Contact Hours

4 and 60

Course Coordinator's Name

Ms B.Kalaiselvi

Text Books and References

TextBook:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition,2007.

References:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7thEdition, 1995.
2. M.Gopal, "Control System– Principles and Design", TataMcGrawHill, 2ndEdition,2002.
3. Schaum"sOutlineSeries, "FeedbackandControlSystems" Tata McGraw-Hill,2007.
4. John J.D"Azzo &ConstantineH.Houpis, "LinearControl System Analysisand Design"",Tata McGraw-Hill,Inc., 1995.
5. www.electrical4u.com

Course Description

- To study control problem, control system dynamics and feedback principles.
- To study time response of first and second order systems and basic state variable analysis and to do simple problems.
- To study the concept of stability and criteria for stability and to do simple problems.
- To study the frequency response through polar plots and Bode plots and Nyquist stability criteria and to do simple problems.

Prerequisites	Co-requisites
Signals & Systems , Electronics and Instrumentation	Nil

required, elective, or selected elective (as per Table 5-1)

required

Course Outcomes (COs)

CO1: Outline the development of mathematical models to represent systems and their representation by transfer functions

CO2: Discuss the transient and steady state response of control systems

CO3: Practice frequency domain plots (Bode and Polar)

CO4: Analyze performance of control systems

CO5: Design compensation networks

CO6: Design the different types of compensators

Student Outcomes (SOs) from Criterion 3 covered by this Course

COs/SOs	a	b	c	d	e	f	g	h	i	j	k
CO1	H					M	L		M	M	
CO2	M	L	H	M	M				L		
CO3	M			H							
CO4	M		M		H		M			H	
CO5		L							M		
CO6						H					

List of Topics Covered

UNIT I CONTROL SYSTEM MODELLING 12

System concept. Differential equations. Transfer functions. Introduction to model based design- Modelling of electric systems, Translational and rotational mechanical systems, simple Electro - mechanical systems. Block diagram representation of systems. Block Diagram reduction methods. Closed loop transfer function, determination of Signal flow graphs. Mason's gain formula. Examples.

UNIT II TIME RESPONSE ANALYSIS: 12

First Order Systems. Impulse and Step Response analysis. Second Order system Analysis. Steady state error. Error Coefficients and Generalized error series. Principle of PI, PD and PID Compensation. Servo Motor, Synchros & Stepper Motor-analysis using Matlab.

UNIT III STABILITY IN TIME DOMAIN: 12

Stability Analysis. Routh - Hurwitz Criterion. Root locus Method. Construction of root, locus diagrams. Stability Study. Application of root locus diagram-analysis using Matlab.

UNIT IV STABILITY IN FREQUENCY DOMAIN 12

Frequency response analysis. Frequency domain specifications . Polar plot, Bode's Plot, Magnitude - Phase plot, Constant M and N Circles. Nichol's Chart Nyquist Stability Criterion. Relative Stability - gain Margin and Phase margin, determination from Polar plot, Bode's Plot and Magnitude – Phase Plot. Use of Nichol's Chart in system analysis to determine relative stability, Bandwidth, Resonance peak and resonance frequency- Analysis using Matlab.

UNIT V COMPENSATION TECHNIQUES: 12

Cascade and feedback compensation. Lag, Lead and Lag- lead Compensation. Design of Cascade Compensators - Using Bode's Plot.