SARDAR RAJA COLLEGE OF ENGINEERING, ALANGULAM

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MICRO LESSON PLAN

SUBJECT : CONTROL SYSTEMS

CODE : EE2253

CLASS : II Year / IV SEM

STAFF: Miss.S.PRIYADHARSINI,

A.P/EEE

EE2253 CONTROL SYSTEMS

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(Common to EEE, EIE & ICE)

UNIT I SYSTEMS AND THEIR REPRESENTATION 9

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

UNIT III FREQUENCY RESPONSE 9

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 9

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

UNIT V COMPENSATOR DESIGN 9

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

SUBJECT DESCRIPTION AND OBJECTIVES

DESCRIPTION

To teach the basic concepts in the elements of a control system performance and basics of control process. It is a subject which dealt with the formation of transfer function for the electrical and mechanical system and their block diagram. It is a platform for all engineers to design a control system with an efficient control and evaluate their response with respect to frequency and time. In this subject we are going to provide a sound knowledge about the basic concepts of linear control theory and design of control system.

System and their representation:

It covers the fundamental elements in the control system with open loop and closed loops. It explains the concept of electrical analogy of mechanical and thermal systems also derives the transfer function of mechanical and thermal systems. This chapter also deals with the ac and dc servo motor and their characteristics. This chapter concluded with the wide explanation about the block diagram reduction techniques and the analysis about the signal flow graph.

Time response, frequency response and stability:

It dealt with the concepts of steady state error analysis by accounting the time response. The same analysis is also extending to the first and second order system there by finding the error coefficients. The feedback is applied to the P, PI, PID modes to find the steady state error. It covers the frequency response of closed loop system from open loop response by drawing the bode plot and polar plot. Stability of a control system can be obtained by locating the roots of the system in S plane thereby getting the stability criterion

Compensator design:

In this unit we can study about the three types of ways for designing the compensation for control systems. The design techniques includes the evaluation of performance criteria using bode plot.

OBJECTIVE

i. To understand the methods of representation of systems and to desire their transfer function models.

ii. To provide adequate knowledge in the time response of systems and steady state error analysis.

iii. To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.

iv. To understand the concept of stability of control system and methods of stability analysis.

v. To study the three ways of designing compensation for a control system.

MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
	UNIT I - SYSTEMS AND THEIR REPREENTATION	
1	Basic elements in control systems	T1
2	Open and closed loop systems (AV)	T1
3,4	Electrical analogy of mechanical and thermal systems	T2
5	Transfer function	T2
6	Synchros – AC and DC servomotors (AV)	T2
7,8,9	Block diagram reduction techniques – Signal flow graphs	T2
10,11, 12	Problems (Tutorial)	T2
	UNIT II –TIME RESPONSE	
13,14	Time response	T1
15,16, 17	Time domain specifications	T1
18,19	Types of test input –. I and II order system response – Error coefficients – Generalized error series.	T1
20,21	Steady state error – P, PI, PID modes of feedback control(AV)	T1
22,23, 24	Problems (Tutorial)	T1
	UNIT III FREQUENCY RESPOSE	
25	Frequency response	T1
26,27	Bode plot – Polar plot (AV)	T1
28,29, 30	Determination of closed loop response from open loop response	T1

31,32, 33	Correlation between frequency domain and time domain specifications	T1
34,35, 36	Problems(Tutorial)	T1
UNIT IV STABILITY OF CONTROL SYSTEM		
37	Characteristics equation	T2
38,39	Location of roots in S plane for stability (AV)	T2
40,41,	Routh Hurwitz criterion –.Root locus construction	T1
42,43	Effect of pole, zero addition – Gain margin and phase margin	T1
44,45	Nyquist stability criterion	T1
46,47, 48	Problems(Tutorial)	T1
UNIT V COMPENSATOR DESIGN		
49	Performance criteria	T2
50,51	Lag, lead networks (AV)	T2
52,53	lag-lead networks	T2
54,55, 56,57	Compensator design using bode plots	T2
58,59, 60	Problems (Tutorial)	T2

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