CONTROL SYSTEMS (THEORY) EE-360

Pre-requisite: Signals & Systems, Digital Signal Processing
Credit Hours 03
Contact Hours 48

RECOMMENDED BOOKS

Control systems engineering by Norman S. Nise 6th Edition, 2010, John Wiley & Sons, ISBN-13: 978-0470547564.

REFERENCE BOOKS

- Modern Control Engineering by Katsuhiko Ogata 4th Edition, 2002, Prentice Hall, ISBN: 0130609072.
- Automatic Control Systems by FaridGolnaragi, Benjamin C. Kuo 9th Edition, 2003, John Wiley & Sons, ISBN: 0471381489.
- Modern Control Systems by R. C. Dorf and R. H. Bishop 12th Edition, 2011, Prentice Hall, ISBN-13:978-0-13-602458-3

S.NO	CLO/PLOs MAPPING	DOMAIN	PLO
01	**Define** behavior of a physical system. The gained knowledge can be used in modeling electrical, mechanical and electromechanical physical systems to determine the stability.	**C1**	**01**
02	**Analyze** control engineering problems using the mathematical models and study their time response and steady state dynamics.	**C4**	**02**
03	**Apply** the knowledge developed in the analysis process for devising control system with desired specifications.	**C3**	**03**

OBJECTIVE OF COURSE

This course presents an introduction to feedback control systems. Control systems have importance in all fields of engineering. The objective is to provide the student with the basic concepts of control theory as developed over the years in both frequency domain and time domain.

COURSE CONTENTS

Introduction to Control System

- Introduction
- Open loop and closed loop systems
- Steps of control system design

Modeling in the Frequency Domain
- Review of Laplace Transform and Transfer function
- Modeling of Electrical Networks
- Modeling of Mechanical Networks
- Modeling of Electromechanical Networks

Reduction of Multiple Subsystems
- Introduction to block diagrams
- Block diagram reduction
- Signal Flow Graphs (SFGs)
- Mason's Rule

Time Response
- Time response analysis of control system
- Time response of first order system
- Time response of second order system
- Time response analysis of control system

Stability
- Introduction to stability of control system
- Routh-Hurwitz Criterion
- Special cases of Routh-Hurwitz Criterion

Steady State Errors
- Introduction to steady state error
- Steady state error for unity feedback system
- Static error constants and system type
- Steady state error for disturbances
- Steady state error for non-unity feedback system

Root Locus
- Properties of the locus technique
- Sketching root locus
- Introduction to root locus technique

Frequency Response Techniques
- Bode plots
- Nyquist criterion

Time Domain Modeling
- Introduction to state space
- State space modeling of electrical networks
- State space modeling of mechanical systems

Controller Design
- Introduction to controllers

- Introduction to compensators