هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Introduction to Control Systems
Course Code:	EE1461
Program:	Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	V5
Last Revision Date:	01-01-2025

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (7th level, 4th year)					
4. Course general Description:					
Basic components of a control system, Mathematical foundation : Complex-variable concept, Laplace transform, Transfer function, Block Diagrams, Signal-flow graphs, State-variable analysis of linear dynamic systems, stability of linear control systems, Introduction to Modelling of Mechanical systems , Modeling of Electrical Systems, DC Motors in control systems, PID Controllers, Steady State Errors, Root Locus, Time-domain analysis of control systems, frequency-domain analysis of control systems.					
5. Pre-requirements for this course (if any)**:**					
EE 1332, EE 1341					
6. Co-requisites for this course (if any)**:**					
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7. Course Main Objective(s):					
• Providing students with Block Diagrams and Signal-Flow Graphs of Control • systems • Understand the stability concept of Control Systems • Providing students with the necessary information about DC motor • Basic knowledge of PID Controllers • Providing students with the necessary information about Time domain Analysis of control systems					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning	-	-

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	15
5.	**Others (specify)**	-
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
K1	Calculate various analog control system's steady-state errors	1.3	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam
K1	Identify the poles and zero's locations and transient response	1.8	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam
K1	Apply Bode and Polar plots techniques to draw the frequency response of analog control systems	1.5	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam
2.0	**Skills**			
S1	Apply the Routh Hurwitz method to determine the stability of analog control systems	2.1	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
S2	Use the Root Locus method and design a compensator	6.7	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam
S2	Use simulation tools for modeling Continuous Control System	6.6	Prepare report / presentation using computer	Report / presentation
3.0	**Values, autonomy, and responsibility**			
V1	Apply graphical techniques for modeling analog control systems	3.3	Lectures, tutorials, online resources	Quizzes in class Midterm exams Final exam

C. Course Content

No	List of Topics	Contact Hours
1	Basic components of a control system, What is feedback, and what are its effects, Types of Feedback control systems	2
2	Mathematical Foundation: complex variable concept, frequency Domain plots, Introduction to differential equations…	7
3	Laplace Transform, inverse Laplace transform, solutions of Differential equations with Laplace, Impulse response and transfer function	7
4	Stability of linear control system, BIBO, relationship between Roots and stability, Methods of determining Stability, Routh-Hurwitz Criterion, Routh`s Tabulation	7
5	Block Diagrams and Signal-Flow Graphs of Control systems	7
6	Modeling of Dynamic systems : Introduction to Modeling of Mechanical systems, Introduction to Modeling of Electrical systems, Introduction to Modeling of thermal systems, Introduction to Modeling of Fluid systems, DC Motors in control systems	7
7	Time domain Analysis of control systems : Time response of control systems, Unit step response and time domain specifications, steady state error, time response of first-order system, transient response of second order system,	7
8	Speed and position control of a DC motor, Basic control systems and effects of adding poles and zeros to transfer functions, Root Locus Analysis, Basic Properties of the Root, Properties of the Root Loci	7
9	PID Controllers, Frequency Domain Analysis	7
10	Review	2
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	7th week	20
2.	Midterm 2	12th week	20
3.	Quizzes	All Along	10
4.	Project	13th to 14th week	10
5.	Final Exam	Final Exam week	40

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Title: Automatic control systems Author(s): Farid Golnaraghi, Benjamin C. Kuo Publisher: WILEY Year and Edition: 2013, Ninth Edition
Supportive References	1- Modern Control Systems (12th Edition) by Richard C. Dorf (Author), Robert H. Bishop 2- - Control System Engineering by Norman S. Nise (6th Edition)
Electronic Materials	Computer animations and online resources supplied by the instructor.
Other Learning Materials	LabView and MatLab

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One classroom: fits up to 25 students with white board.
Technology equipment (projector, smart board, software)	A laptop computer connected to a projector to display PowerPoint presentations
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students assessment	Students	Indirect
Quality of learning resources	Relevant Focus Group	Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Dept. Quality Committee	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	