Faculty of Engineering & Technology

Control Systems

Information :

| Course Code : | CMP 470 | Level | : | Undergraduate | Course Hours : | 3.00- Hours |

| Department : | Department of Mechanical Engineering |

Instructor Information :

Title	Name	Office hours
Lecturer	Ziad Ahmed Ibrahim Abdo	2
Assistant Lecturer	Rana Mohamed Abdel Rahman Saleh	5

Area Of Study :

At the end of this course, students should:
1- Comprehend the basic concepts of classical control systems.
2- Comprehend control systems theory considering only the Continuous Linear Time Invariant systems.
3- Derive transient response and steady state error.
4- Be able to do stability analysis
5- Perform root locus analysis
6- Perform frequency response analysis and state space methods.

Description :

Introduction to feedback control systems; Block diagram reduction and signal flow graphs; System time response and stability; Feedback systems performance specifications; Time; RootLocus; Frequency response analysis techniques; State space analysis of multivariable systems; Controllability, observability, and sensitivity; Basic controller design in frequency domain and state space; PID, lead-lag and lag-lead compensation; Analysis and design of feedback control systems using Matlab.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Define the objective of continuous control system.
2 -	Outline the Mathematical Modeling of different analog system.
3 -	Recall the mathematical tools in dealing with control systems.
4 -	Explain the different transient time responses and steady state error in control systems.
5 -	Illustrate how the stability of control systems could be evaluated.
6 -	Explain how to draw the root locus and bode diagram for control systems.
7 -	Understanding modeling and analysis using state space representation.
8 -	Knowledge about controller and observer.

b.Intellectual Skills: :

1 -	Select appropriate mathematical and different methods for modeling and analyzing problems.

2 -	Design continuous control systems applying appropriate knowledge and principles.
3 -	Select appropriate solutions for engineering problems based on analytical thinking.
4 -	Analyze system, processes and components critically.

c.Professional and Practical Skills: :

1 -	Write MatLab code for developed design methods.
2 -	Apply gained hardware and software skills to controller design in diverse mechatronics applications

d.General and Transferable Skills: :

1 -	Collaborate effectively within multidisciplinary team. d2.
2 -	Use digital libraries and/or learning systems and demonstrate efficient IT capabilities

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Transient Response Analysis	4	2	2
Steady-State Response Analysis	4	2	2
The Root Locus Methods	4	2	2
Lead Compensation Design Based on The Root Locus Methods	4	2	2
Lag Compensation Design Based on The Root Locus Methods	4	2	2
Bode Diagrams	4	2	2
Lead & Lag Compensation Design Based on Bode Diagrams	4	2	2
State Space Representation and Analysis	4	2	2
Pole Placement Design	4	2	2
State Obsevers	4	2	2
Servo Systems	4	2	2

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Experiential learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments, Participation, & Quizzes	30.00		
Final Exam	40.00	16	
First Midterm Exam	15.00	5	
Second Midterm Exam	15.00	10	

Course Notes :
in MS Power Point or PDF format

Recommended books :
1- Automatic Control Systems, B. C. Kuo and F. Golnaraghi, 9th edition or higher, 2010, John Wiley & Sons, Inc. 2- Modern Control Systems, R. C. Dorf, R. H. Bishop, 12th edition or higher, 2010, Prentice Hall 3- Linear Control System Analysis and Design with Matlab, J. J. Do Azzo, C. H. Houpis and S. N. Sheldon, 5th edition or higher, 2003, Marcel Dekker, Inc. 4- Control Systems Engineering, N. S. Nise, 6th edition or higher, 2010, John Wily

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