

Faculty of Engineering & Technology

Digital Control Systems

Information :

Course Code : CMP 475

Level : Undergraduate

Course Hours : 3.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Professor	Abdel Monem Abdel Hamid Ahmed Seif	9
Professor	Abdel Monem Abdel Hamid Ahmed Seif	9
Professor	Abdel Monem Abdel Hamid Ahmed Seif	9
Assistant Lecturer	Rana Mohamed Abdel Rahman Saleh	5
Assistant Lecturer	Rana Mohamed Abdel Rahman Saleh	5
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Area Of Study :

Develop students knowledge about the basic concepts of discrete-time control systems (Digital Control Systems) Discrete Linear Time Invariant systems only will be considered.
 Introduce students to control systems theory considering only the Continuous Linear Time Invariant systems.
 Prepare Students to derive transient response analysis
 Train Students to apply steady state error analysis, do stability analysis, perform root locus analysis, and perform frequency response methods and state space methods.

Description :

Discrete-time signals and systems; z-Transform analysis; Pulse transfer function and discrete-time feedback system; Static error, Jury stability test, and system sensitivity; Frequency-domain and state space analysis and design of discrete-time systems using Matlab; Digital controller implementation issues.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Outline the Mathematical Modeling of different digital control systems.
2 -	Illustrate how the stability of control systems, transient response and steady-state error could be evaluated.
3 -	Explain how to draw the root locus and bode diagram for control systems and how to design the digital controllers using conventional methods.
4 -	Define the state space representation and analysis and illustrate the steps of the design of controllers and observers.

b.Intellectual Skills: :

1 -	Select appropriate mathematical and computer-based methods for modeling and analyzing systems.
2 -	Design digital control systems applying appropriate knowledge and principles.

3 -	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 -	Efficiently manage tasks, time and resources.
2 -	Use digital libraries and/or learning systems and demonstrate efficient IT capabilities.

Course Topic And Contents :			
Topic	No. of hours	Lecture	Tutorial / Practical
The z Transform	4	2	2
The Pulse Transfer Function	4	2	2
Mapping between the s Plane and the z Plane	4	2	2
Transient and Steady-State Response Analysis	4	2	2
The Root Locus Methods	6	3	3
Design Based on The Root Locus Methods	8	4	4
Bode Diagrams	6	3	3
Design Based on Bode Diagrams	8	4	4
State Space Representation and Analysis	4	2	2
Pole Placement Design	4	2	2
State Observers	4	2	2
Servo Systems	4	2	2

Teaching And Learning Methodologies :
Interactive Lecturing
Problem based Learning
Discussion
Experiential learning

Course Assessment :			
Methods of assessment	Relative weight %	Week No	Assess What
Assignment	7.00		
Computer Assignment	8.00		
Final Exam	40.00		
Mid- Exam 1I	15.00		
Mid- Exam I	15.00		
Participation	5.00		
Quizzes	10.00		

Course Notes :

Course Notes (in MS Power Point or PDF format)

Recommended books :

- “Digital Control System Analysis and Design, Charles L. Phillips, H. Troy Nagle, 3rd Edition, 1994, Prentice-Hall
- “Digital Control of Dynamic Systems, G. Franklin and J. Powell and M. Workman, 3rd Edition, 1998, Prentice-Hall
- “Discrete Time Control Problems Using Matlab by Joe H. Chow, Dean K. Frederick, Nicolas W. Chbat, October 2002, CL Engineering