COURSE DESCRIPTIONS

Faculty	**College of Engineering**				
Department	**Department of Renewable Engineering**			**NQF level**	7
Course Title	Automatic control methods	**Code**	703431	**Prerequisite**	
Credit Hours	3	**Theory**		**Practical**	
Course Leader	Dr. Amer Al-Canaan	**email**	a.alcanaan@jadara.edu.jo		
Lecturers	Dr. Amer Al-Canaan	**emails**	a.**alcanaan**@jadara.edu.jo		
Lecture time	11:30- 13:00	**Classroom**		**Attendance**	Fulltime
Semester	Summer 2023/2024	**Production**	2019	**Updated**	2023
Type of Teaching	☐ Face to Face	■ Blended	☐ Online		

Short Description

This course is designed to provide the concepts, procedures, and data and decision analysis techniques necessary to automatic control methods. The topics in this course include analysis of open-loop and closed-loop linear feedback control systems in the s and time domains, transfer functions, Laplace transform, initial and final value theorems, block diagram reduction rules, impulse response, step response, frequency response, state space methods and applications to electro-mechanical and mechatronics systems.

Course Objectives

This course is designed to guide students through the continuation of their transition from being students of engineering to being practitioners of engineering.

1. Understand basics if Laplace Transform.
2. Distinguish between open-loop and closed-loop systems.
3. Apply block diagram reduction rules to feedback control systems.
4. Apply the initial and final-value theorems in control systems.
5. Master the application of basic control theories.
6. Gain experience in using and implementing relevant software codes and packages
7. Gain an appreciation for and become proficient in applying the final steps of the engineering design process to the significant.
8. Become proficient in proper professional written documentation, become proficient in the oral communication of technical concepts.

Course Intended Learning Outcomes (CILOs)

A. Knowledge - Theoretical Understanding

a1. Understand the basic elements of open-loop and closed-loop control systems, describe the functions and design requirements of keys & couplings. (K1) a2. Apply the fundamentals of transfer functions and block diagram reduction rules to control systems. (K2)
B. Knowledge - Practical Application
a3.
C. Skills - Generic Problem Solving and Analytical Skills
b1. Analyse the different parameters of control methods including damping ratio, gain by utilising the Laplace transform, final/initial value theorems and partial fractions. (S1)
D. Skills - Communication, ICT, and Numeracy
b2. b3. Work effectively in a team to design/analyse different control methods with specific parameters/requirements. (C1)
E. Competence: Autonomy, Responsibility, and Context
c1.
Teaching and Learning Methods
■ Face to Face Lectures ☐ Brain Storming ■ Synchronous remote ■ Asynchronous remote ■ Using Video ☐ Discussions ☐ Research Project ☐ Case Study ☐ Field visit ■ Problem solving
Assessment Methods
☐ Formative Assessment ■ Quiz ☐ Lab Exam ■ Homework ☐ Project Assessment ☐ Oral Presentation ■ Midterm ■ Final Exam

Course Contents					
Week	**Hours**	**CILOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1.	3	a.1 a.2	Introduction to Control Systems A History of Control Systems	lectures, Discussions	
2.	3	a.1 c.1	Contemporary Applications Open-Loop Systems Closed-Loop (Feedback Control) Systems	lectures, Discussions	
3.	3	c.1	Computer-Controlled Systems The Design Process	Lectures, Discussions.	
4.	3	b.1	Modeling in the frequency domain. Mathematical representation	lectures, Discussions	Quiz #1
5.	3	a.1 b.1	Laplace transform, Direct Laplace transform	lectures, Discussions	
6.	3	a.1 b.1	inverse Laplace transform Laplace transform table	lectures, Discussions	Quiz #2
7.	3	a.1 b.1	Transfer Function Partial-Fraction Expansion	lectures, Discussions	

8.	3	b.1 a.1	Block diagram of a transfer function Simple Circuits via Mesh Analysis	lectures, Discussions	Midterm Exam
9.	3	a.1 c.1	Simple Circuits via Voltage Division Electric Circuit Analogs	lectures, Discussions	
10.	3	a.1 b.1	Components of A control system Block Diagrams Branch Point Summing point	lectures, Discussions	
11.	3	a1 b1	Block Diagram of a Closed-Loop System	lectures, Discussions	Quiz #3
12.	3	a.1 b.1	Open-Loop Transfer Function and Feedforward Transfer Function Open-Loop Transfer Function Feedforward transfer function	lectures, Discussions	
13.	3	a.1 b.1	Closed-Loop System Subjected to a Disturbance block diagram of the RC circuit	lectures, Discussions	Quiz #4
14.	3	b.1 c1	Block Diagram Reduction Moving Blocks to Create Familiar Forms	lectures, Discussions	
15.	3	b1, c1	Reduction of Multiple-loop feedback control system. SIGNAL-FLOW GRAPH MODELS Non-touching loops	lectures, Discussions	
16.	3	a1, a2, b1,	Final Exam		Final Exam

Infrastructure	
Textbook	CONTROL SYSTEMS ENGINEERING, Norman S. Nise, sixth Edition, John Wiley & Sons, Inc. 2020
References	MODERN CONTROL ENGINEERING, Katsuhiko Ogata. 5th edition 2019`
Required reading	
Electronic materials	
Other	

Course Assessment Plan						
Assessment Method		**Grade**	**CILOs**			
			a1	**a2**	**b1**	**b3**
First (Midterm)		**30%**	15	9	6	
Second (if applicable)			16	10	14	
Final Exam		**40%**				
Coursework		**30%**				
Coursework assessment methods	Assignments					
	Case study					
	Discussion and interaction					
	Group work activities	15				15
	Lab tests and assignments					
	Presentations					
	Quizzes	15	7	2	6	
Total		**100%**	38	21	26	15

Plagiarism
Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code). Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.