The University of Jordan
School of Engineering
Department of Mechatronics Engineering
1st Semester – A.Y. 2025/2026

Course: Control Systems Laboratory– 0908484 (1 Cr. – Core Course)

Instructor: Eng. Nisreen Amayreh
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Course Website: `http://elearning.ju.edu.jo`

Catalog Data: The lab consists of experiments that are related to: First and second order system analysis control experiments, Servo Systems, Stability of dynamical systems. System identification. Design and tuning of PID controller in closed-loop Systems. Simulation of systems using Simulink or Matlab.

Prerequisites by Course: Automatic Control Systems (0908353)

Prerequisites By Topic: Students are assumed to have sufficient knowledge pertaining to the following:
1. Modeling and Simulation of Physical systems.
2. Control System Analysis and Design
3. Programming with MATLAB.

Textbook: Experiments Handouts and Lectures Notes

References:
- *Control Systems Engineering, by Norman S. Nise,* 6th Edition, Johm Wiley
- *Modern Control Systems . Richard Drof and Robert Bishop*, 12th Edition, Prentice Hall.
- *Modern Control Engineering , Katsuhiko Ogata,* 5th Edition n, Prentice Hall
- Automatic Control Systems by Benjamin C. Kuo, Farid Golinaraghi. 9th Edition. Wiley

Minimum Student Material: Lab manual, class handouts, and an access to Personal Computer with MATLAB

Instructional Methods
1. Pre-lab
2. Conducting experiements
3. Writing lab reports

Minimum College Facilities: Lab room with whiteboard and laboratory instrumentation

Course Objectives:
1.To teach students the concept of Control System Design, and the Introduction to Model-Based Design usign MATLAB and SIMULINK.
2. To teach students the techniques to Simulation and Modeling the Control System using the SimScape (Physical Modelg in MATLAB)
3. To let students analysis and design a controller for Control system

Course Learning Outcomes and Relation to ABET Student Outcomes:
Upon successful completion of this course, a student should:
1. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. [5]

2. Design and Implement controller for differnt systems (Temperature,TWIN Rotor, Coupled Tanks, DC Servo Motor) and analyse the results. [6]

Course Topics:

	Topic Description	Week
0.	**Orientation and going over the lab rules and safety**	**1**
1.	**Introduction to Control System Design, Model Based Design**	**1**
2.	**Mathematical Modeling Using Simulink**	**1**
3.	**Physical Modeling using SimScape and Simulink (Mechanical and Electrical Systems)**	**1**
4.	**System Identification Concept and Using Toolbox (First Order, Second Order)**	**1**
5.	**Method of Design a Controller (PID)**	**1**
	Mid-Term Exam	
6.	**Introduction to LabVIEW and data acquisition System**	**1**
7.	**DC Motor Identification, Modeling and Analysis**	**1**
8.	**DC Motor Feedback and Controller Design**	**1**
9.	**Rotary Inverted Pendulum**	
10.	**Control of Temperature System**	**1**
	Final Exam	

Ground Rules:

- **Attendance:**

Students are expected to attend EVERY CLASS SESSION and they are responsible for all material, announcements, schedule changes, etc., discussed in class. The university policy regarding the attendance will be strictly adhered to.

Assessments: Exams, Quizzes, Reports, and lab work.

Grading policy:

Assessments	Weight
Quiz, Reports, Project & Lab work	30%
Midterm Exam	30 %
Final Exam	40 %
Total	**100 %**

Last Updated: Oct., 2025