

The University of Jordan
School of Engineering
Department of Mechatronics Engineering
1st Semester – A.Y. 2021/2022



Course: Mechatronics Systems Design, – 0938561 (3 Cr. – Core Course)

Instructor: Dr. Romil Al-Adwan
Office: Office
Office Hours: Sunday, Tuesday 11:30 AM – 12:30 PM

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Course Website: The course aims to introduce the candidate to the design process of mechatronics systems, actuator types, sizing and selection, measurement systems and transducers selection, control system algorithms and selection of physical controllers, case studies of various mechatronics systems.

Catalogue Data:

Prerequisites by Course:

- Measurement and Signal Processing - 0908352.
- Control Systems - 0908451

The student should have the basic knowledge of measurement systems, control systems, electronics, programming, and mechanics

Prerequisites By Topic:

- Introduction to Mechatronics and Measurement Systems”, Fifth Edition, David G. Alciatore, McGraw Hill International Edition, 2019.
- Notes and slides on the JU e-learning website.
- Mechatronics: An integrated approach”, Clarence W. de Silva, CRC Press, 2005.

Textbook:

References:

Schedule & Duration: 15 Weeks, 30 lectures (75 minutes each) plus exams.

Minimum Student Textbook, class handouts, scientific calculator, and an access to a personal computer.

Material:

Minimum College Classroom with whiteboard and projection display facilities, library, computational facilities with MATLAB and other engineering programs.

Facilities:

Course Objectives: The course provides students with general overview of mechatronic systems, their main components, and the approach to the design process. An important aim of the course is to allow students to integrate their knowledge of measurement systems, control, electronics, programming, and mechanics into designing comprehensive mechatronic systems. The practical assignments and the project work prepare students for their final year graduation projects, by enhancing planning and team-work skills, as well as providing practical project experiences including building of prototypes.

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1. Know how to identify whether system dynamics is important in a Mechatronics system. [4]
2. know how to select suitable types of physical controllers, control algorithms and actuators [4] for mechatronic systems.
3. Assess the impact of your design on society and the environment in terms of energy consumption, [4] materials recycling and impact on society.

Course Topics:

Topic Description	Hrs
1. Introduction to Mechatronic Systems.	3
2. User requirements specification (URS).	3
3. The four questions that a Mechatronics system design must consider.	3
4. Accuracy, precision, and resolution.	1.5
5. The importance of system dynamics.	3
6. Types of motors (servomotor; stepper motor; squirrel cage induction motor; permanent magnet synchronous motor; DC motor).	9
7. Actuator sizing and selection: Geared hoisting systems; Conveyor Systems; Power Screw Systems; stepper motor sizing selection example from a production line.	6
8. Physical controller selection.	3
9. Control algorithm selection.	3
10. Speed and position feedback: Gray code absolute shaft encoders; rotary and linear.	3
11. Transducer selection.	3
12. Mechatronics Design Procedure.	1.5
13. Case studies: Selected case studies.	3

Ground Rules: **Attendance is required** and highly encouraged. To that end, attendance will be taken every lecture; Absence of more than 7 hours will result in the expulsion of the student from the course.

Assessments: Exams, Projects, and Assignments.

Midterm Exam	30%
Project	10%
Participation	10%
Final Exam	50 %
Total	100%

Last Updated: Feb. 2022