# The University of Jordan
# School of Engineering
# Department of Mechatronics Engineering
1st Semester – A.Y. 2019/2020

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| **Course:** | Mechatronics Systems, – 0938561 (3 Cr. – Core Course) |
| **Instructor:** | Dr. Hussam Khasawneh<br>*Office:* IAESTE Office<br>*Office Hours:* Sunday, Tuesday 1 PM - 4 PM<br>            Monday, Wednesday 11 AM - 4 PM<br>*Email*: h.khasawneh@gmail.com;<br>            h.khasawneh@ieee.org |
| **Course Website:** | https://elearning.ju.edu.jo/ |
| **Catalog Data:** | 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. |
| **Prerequisites by Course:** | • Measurement and Signal Processing - 0908352.<br>• Control Systems - 0908451 |
| **Prerequisites By Topic:** | The student should have the basic knowledge of measurement systems, control systems, electronics, programming and mechanics |
| **Textbook:** | • Introduction to Mechatronics and Measurement Systems", Fifth Edition, David G. Alciatore, McGraw Hill International Edition, 2019.<br>• Notes and slides on the JU e-learning website. |
| **References:** | • Mechatronics:  An integrated approach", Clarence W. de Silva, CRC Press, 2005. |
| **Schedule & Duration:** | 15 Weeks, 30 lectures (75 minutes each) plus exams. |
| **Minimum Student Material:** | Textbook, class handouts, scientific calculator, and an access to a personal computer. |
| **Minimum College Facilities:** | Classroom with whiteboard and projection display facilities, library, computational facilities with MATLAB and other engineering programs. |
| **Course Objectives:** | The course provides the student 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 the student to integrate his/her knowledge of measurement systems, control, electronics, programming and mechanics into designing comprehensive mechatronic systems. The practical assignments and the project work prepare the student for the final year graduation project, by enhancing planning and team work skills as well as practical project work and the 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. You know how to select suitable types of physical controllers, control algorithms and actuators for mechatronic systems. [4]
3. Assess the impact of your design on society and the environment in terms of energy consumption, materials recycling and impact on society. [4]

## Course Topics:

| Topic Description | Hrs |
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| 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. | 3 |
| 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: Grey code absolute shaft encoders; rotary and linear. | 3 |
| 11. Transducer selection. | 3 |
| 12. Mechatronics Design Procedure. | 3 |
| 13. Case studies: Selected case studies. | 6 |

| **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. |
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| **Assessments:** | Exams, Projects, and Assignments. |

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| Midterm Exam | **30%** |
| Project | **10%** |
| Homework | **10%** |
| Final Exam | **50 %** |
| Total | **100%** |

| **Last Updated:** | Sep. 2019 |
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