# Philadelphia University

## Faculty of Engineering and Technology
## Mechatronics Engineering Department

## Course Details:

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| **Title:** | Mechatronics System Design (640447) |
| **Prerequisite:** | Automatic Control Theory (640344) + Power electronics and drives (640312) |
| **Credit Hours:** | 3 credit hours  (16 weeks per semester, approximately 45 contact hours) |
| **Textbook:** | "Mechatronics: An Integrated Approach" By Clarence W. Silva, CRC Press 2005 |
| **References:** | - Modern Control Technology: Components and Systems 2nd edition by Kilian. Delmer Publication 2005<br>- "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering" by W. Bolton, 7th Edition, Pearson 2019.<br>- Mechatronics and Measurement System 4th edition by Alciatore and Histand 2012. |
| **Description:** | The course provides the student with general overview of mechatronics systems, their main components and the approach to the design process. |
| **Website:** | **http://www.philadelphia.edu.jo/academics/malkhawaldeh** |
| **Instructor:** | Dr. Mustafa  Awwad Al-Khawaldeh<br>**Email**: malkhawaldeh@philadelphia.edu.jo<br>**Office**: Engineering building, room 6407. Ext. 2304<br>**Office hours**: Sunday, Tuesday: 11:15-12:45 |

## Course Outlines:

| Week | Topic |
|---|---|
| (1) | Introduction to mechatronics systems |
| (2) | Mechatronic Design Approach |
| (3) | Modeling and Simulation |
| (4) | Simulation and Analysis: MATLAB work |
| (5) | Sensors and Transducers: Overview |
| (6) | Sensors and transducers: Selection Criteria |
| (7) | Signal conditioning circuit design |
| (8) | Mechanics and drive systems |
| (9) | DC motors: Selection criteria |
| (10) | AC motors: Selection criteria |
| (11) | Stepper motors: : Selection criteria |
| (12) | Controller selection and programming algorithms |
| (13) | Control Simulation: MATLAB. |
| (14,15) | Mechatronic System Design: Case Studies |
| (16) | Project Presentation |

## Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

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| 1. | Understand the principles, stages, and procedures of mechatronics system design | [1] |
| 2. | Perform the required mechanical calculations and dynamic modeling for mechatronics systems | [1] |
| 3. | Select the proper actuator, sensor, controller, and signal conditioning for mechatronics system | [1, 2] |
| 4. | Understand, analyze, troubleshoot, and maintain mechatronics systems | [1, 2] |
| 5. | Design mechatronics systems | [2] |

## Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

**Midterm Exam:**    Midterm exam will cover about 8-weeks of lectures.

**Quizzes :**    Two quizzes will be given during the semester.

**Homework and Project** :    Students will be given two homework assignments during this course. Students will be asked to present their projects.

**Final Exam:**    The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

## Grading policy:

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| Midterm Exam | 30% |
| Homework | 30% |
| Final Exam | 40% |
| Total: | 100% |

## Attendance Regulation:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course. If the excuse is approved by the deanship the student will be considered withdrawn from the course.