FLORIDA POLYTECHNIC UNIVERSITY

# Syllabus: Mechatronic Systems

**Spring semester 2026**

## Course Information

- **Course Number and Title:** EML 3811 Mechatronic Systems, Section 3
- **Credit Hours:** 3
- **Academic Term:** Spring 2026

### Instructor Information

- **Instructor:** Dr. Edwar Romero-Ramirez
- **Office Location:** BARC 1184
- **Office Hours**: TWR 1:00-2:00 PM, BARC 1184
- **E-mail:** eromeroramirez@floridapoly.edu
- **Other Ways to Contact You**: Canvas message

## Course Details

- **Delivery Mode**: In person
- **Official Catalog Course Description**: An interdisciplinary course overviewing the design and analysis of mechatronic and robotic systems. Specific topics include sensors, basic signal processing, actuator modeling and implementation, and an introduction to system control. This class will include hands-on activities and laboratories to reinforce both practical and theoretical topics.
    - **Course Pre-Requisites**: EEL 3111C – Circuits 1 or EEL 3110 – Principles of Electrical Engineering, COP 2271C – Introduction to Computation and Programming, MAP 2302 – Differential Equations, EGN 3321 – Dynamics
    - **Course Co-Requisites**: none
    - **Communication/Computation Skills Requirement (6A-10.030)**: No
- **Required Texts:** Mechatronics, by Bolton, ISBN: 9781292076683, Publisher: Pearson, 6th ed. or 7th ed.
    - **Equipment and Materials**: Canvas, laptop, Microsoft Office or Latex, MATLAB, Arduino IDE, FL Poly email, calculator*
    - **Note**: Only use of the following calculator models as used on the Fundamentals of Engineering (FE) Exam will be allowed:
        - **Casio:** All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)
        - **Hewlett Packard:** The HP 33s and HP 35s models, but no others
        - **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have “TI-30X” or “TI-36X” in its model name.)
- **Course Objectives**:
    - Provide a fundamental understanding of mechatronic systems and associated components
    - Introduce control of mechatronic systems and its implementation in software
    - Describe modeling approaches for mechatronic systems and their application for control
    - Demonstrate the design and implementation of a mechatronic system
- **Course Learning Outcomes**:
        - Identify and explain the basic operation and use of various sensors, actuators, and software components of mechatronic systems
        - Implement signal conditioning and control logic via both software and hardware through in-class activities and example problems
        - Model and design electro-mechanical systems and components through theoretical example problems
        - Construct a mechatronic system that completes a targeted task through a group project

- **Alignment with Program Outcomes**:

| **Course Learning Outcome** | **Learning Level (e.g. Bloom's, Anderson/ Krathwohl; Rogers/Hatfield (ABET Assessment Example)** | **Program Learning Outcome (ABET, GenEd, Other)** |
|---|---|---|
| Identify and explain the basic operation and use of various sensors, actuators, and software components of mechatronic systems | **Knowledge**- Ability to recall previously learned material<br>**Comprehension**- Ability to grasp meaning, explain, and restate ideas<br><br>**ABET Assessment** – Exam 1 | ABET 7 – an ability to acquire and apply new knowledge as needed, using appropriate learning strategies |
| Implement signal conditioning and control logic via both software and hardware through in-class activities and example problems | **Application**- Ability to use learned material in new situations<br>**Comprehension**- Ability to grasp meaning, explain, and restate ideas<br><br>**ABET Assessment** – Projects | ABET 7 – an ability to acquire and apply new knowledge as needed, using appropriate learning strategies |
| Model and design electro-mechanical systems and components through theoretical example problems | **Application**- Ability to use learned material in new situations<br>**Comprehension**- Ability to grasp meaning, explain, and restate ideas<br>**Evaluation** - Ability to judge the worth of material against stated criteria<br><br>**ABET Assessment** – Exam 3 | ABET 1 – an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and math. |
| Construct a mechatronic system that completes a targeted task through a group project | **Application**- Ability to use learned material in new situations<br>**Comprehension**- Ability to grasp meaning, explain, and restate ideas<br>**Evaluation** - Ability to judge the worth of material against stated criteria<br><br>**ABET Assessment** – Project 2 | ABET 2 - an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors |

# Course Policies

## Attendance

- Students in **face-to-face (this includes labs and C-courses)** courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- Exceptions to any attendance requirements may be made on a case-by-case basis.
- In-class assignments may be given and turned in during a single class: attendance is required to earn credit.

## Late Work/Make-up work

- Homework and Reports are due in Canvas by 11:59 on their due date.
- ALL DELIVERABLES MUST BE TURNED IN TO THE ASSOCIATED CANVAS ASSIGNMENT TO EARN CREDIT AND RECEIVE A GRADE. IF THE ASSIGNMENT IS NOT SUBMITTED TO CANVAS, A ZERO WILL BE RECORDED FOR THAT ASSIGNMENT.
- Under extreme circumstances, your instructor may, at their discretion, accept a 'past due' assignment, however, YOU must email your instructor and ask them to open the Canvas assignment for you. The instructor retains the right to ask for documentation of your 'extreme circumstance' before they reopen the assignment. The Canvas Assignment will remain open for 24 hours, after the request has been accepted with a confirmation email from the instructor to the student.
- All deliverables will be 'individual' where everyone must submit their own work, unless otherwise noted by the instructor.

## Grading Scale

| Grade | Percentage |
|---|---|
| **A** | 100 - 93 |
| **A-** | 92 - 90 |
| **B+** | 89 - 86 |
| **B** | 85 - 83 |
| **B-** | 82 - 80 |
| **C+** | 79 - 76 |
| **C** | 75 - 70 |
| **D** | 69 - 60 |
| **F** | 59 - 0 |

Percentages that fall between grades will be rounded up.

**Grades for will be posted to Canvas for reference only, and students should make sure they are recorded correctly. However, there is no guarantee that the percentages or projected grades provided there are correct. The instructor will calculate final percentages and will determine final grades regardless of Canvas calculations.**

## Assignment/Evaluation Methods

| Activity | Percentage |
|---|---|
| Final Exam | 20 |
| Assignments | 20 |
| Projects | 60 |

- Assignment/Evaluation Methods:
  - Assignments (20% of the total grade)
    - Assignments include in-class assignments and homework assignments.
    - ATTENDANCE at all class meetings is mandatory and assignments may be given and collected within a single class.
    - Late Homework –Noting habitual lateness will not be tolerated. Under **extreme** circumstances, your instructor may, at their discretion, accept a 'past due' assignment, however, **YOU must email your instructor and ask them to open the Canvas assignment for you.** The instructor retains the right to ask for documentation of your 'extreme circumstance' before they reopen the assignment. The Canvas Assignment will remain open for 24 hours, after the request has been accepted with a confirmation email from the instructor to the student.
  - Projects (60% of the total grade)
    - 3 projects broken down into subparts to be completed throughout the semester
      - Project 1: Sensor signal conditioning and design
      - Project 2: Coding logic, Arduino, physical implementation of a robotic task
      - Project 3: Controller design, MATLAB simulation
  - Final Exam (20% of the total grade)
    - The final exam will be held during the final exam period, as scheduled by the university.
    - **Exam Policy**: A student missing an exam will be given the opportunity to make up the exam only if he/she presents satisfactory evidence that his/her absence was unavoidable. It is the obligation of the student to notify the instructor prior to the exam or within twenty-four hours of the time of absence, at which time, arrangements will be made for a make-up exam.
- **Changes in syllabus and assignment sheets may be modified as deemed appropriate. All changes will be announced in class.

Course Schedule

- Tentative schedule (subject to change).

| Week | Date | Topics(s) | Deliverable(s)/Note(s)/Action(s) |
|---|---|---|---|
| **1** | Jan 13/15 | Course Introduction<br>Ch. 1, Introducing Mechatronics<br>Ch. 2, Sensors and Transducers | HW1 |
| **2** | Jan 20/22 | Ch. 3, Signal Conditioning<br>Ch. 4, Digital Signals<br>Arduino/coding | HW2 |
| **3** | Jan 27/29 | Project 1 | Project 1a |
| **4** | Feb 3/5 | Project 1 | Project 1b |
| **5** | Feb 12 | Project 1 | No class Feb 10 (Career Day)<br>Project 1c |
| **6** | Feb 17/19 | Ch. 7, Pneumatic and Hydraulic Actuation<br>Ch. 8, Mechanical Actuation Systems<br>Ch. 9, Electrical Actuation Systems | HW3 |
| **7** | Feb 24/26 | Project 2 | Project 2a |
| **8** | Mar 3/5 | Project 2 | Project 2b |
| **9** | Mar 10/12 | Project 2 | Project 2c |
| **10** | Mar 17/19 | Spring Break | No classes |
| **11** | Mar 24/26 | Ch. 17, Basic System Models<br>Ch. 19, Dynamic Responses of Systems | HW4 |
| **12** | Mar 31, Apr 2 | PID Control<br>MATLAB simulations: ode45 | HW5 |
| **13** | Apr 7/9 | Project 3 | Project 3a |
| **14** | Apr 14/16 | Project 3 | Project 3b |
| **15** | Apr 21/23 | Project 3 | Project 3c |
| **16** | Apr 28 | Exam Review | Exam during final exam week |
| | No Classes: Feb 10 (Career Day), Mar 17/19 (Spring Break) | | |

## University Policies

**Reasonable Accommodations**

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

**Accommodations for Religious Observances, Practices and Beliefs**

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

**Title IX**

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

**Academic Integrity**

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students.

Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

**Recording Lectures**
Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is* ***prohibited****.*

## Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
    - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit floridapoly.edu/writing center.