

1. ES202 Principles of Mechatronics

2. 3 credits, 4 contact hours

3. Course Coordinator: Jenelle Piepmeier

Additional Instructors: Levi DeVries, John Donnal, Dennis Evangelista,

4. No text book.

a. Supplemental materials

Bolton, W., Mechatronics, 5th Edition. Pearson, 2011. ISBN: 978-0-273-74286-9

Nise, N. S., Control Systems Engineering, 7th Edition. Wiley & Sons, 2014. ISBN: 978-1-118-175051-9

5. Specific course information

a. This second course in systems engineering introduces concepts from control theory, instrumentation, and mechatronics, offering students a practical, hands-on introduction to these topics through the use of projects and laboratory exercises.

b. Prerequisite: ES200

c. Required course

6. Specific goals for the course

a. At the conclusion of the course, students will be able to:

- Understand the tools and techniques of systems engineering
- Understand the differences between open and closed loop control systems
- Define terminology related to data, including accuracy, precision, sensitivity, resolution, linearity, error, deviation and uncertainty
- Design and build an operating circuit system using a breadboard and components
- Discuss the criteria for selecting a sensor for a particular measurement
- Understand and work with hardware and software related to:
 - Standard laboratory and test equipment
 - MATLAB and Simulink
 - C programming language
 - Microcontrollers

b. This course introduces/reinforces the following Student Outcomes

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (d) an ability to function on multidisciplinary teams
- (g) an ability to communicate effectively
- (k) an ability to use techniques, skills, and modern engineering tools

Outcome (g) is assessed in this course

7. Topics covered:

- MATLAB review
- Communication protocols
- Mechanisms, Gears
- Simple Feedback control and feedback block diagrams
- Operational amplifiers
- Resistive, capacitive, and inductive sensors
- Sensor calibration