1. ES309 Guided Design Experience

2. 2 credit hours, 4 laboratory hours

3. Course coordinator: Assoc. Prof. Matthew Feemster

   Additional instructors: CDR Tracie Severson and Asst. Prof. Michael Kutzer

4. Textbook: Control Systems Engineering (Eleventh Edition), Nice, 2015

5. Specific course information

   a. Students pursue a semester-long structured and guided engineering design project, starting from a problem statement and carrying through to a final prototype design. Working in small groups, students participate in a project-based-learning exercise through which they develop the breadth of technical experience required for open-ended design on the large scale.

   b. Prerequisites or co-requisites

      ES305 or ES305H, ES301, SM316.

   c. Required course.

6. Specific goals for the course

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

      - Develop and execute a formal test plan to acquire experimental data.
      - Apply appropriate analysis techniques for interpretation of measured data.
      - Perform appropriate research on components to span a design space.
      - Make informed decisions for part selection.
      - Analyze and design a power system to meet the needs of a project.
      - Apply basic computer vision methods through MATLAB.

      Additionally, the course is intended to:

      - Foster a preliminary understanding of and appreciation for the engineering design process.
      - Provide a framework for exercise and Integration of the components of the systems engineering curriculum into a complete project.
      - Enhance hands-on skills.

b. This course addresses the following student outcomes:

- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

7. Topics covered:

- Circular Error Probable.
- Linear system modeling.
- Frequency domain compensator design.
- Proportional Integral Derivative (PID) control design and implementation.
- Tustin's transformation.
- Computer vision.