

ESG 440 Engineering Science Design III (Required)

Course website: <http://www.matscieng.sunysb.edu/esg440-1/>

Course Catalog description:

Lectures by faculty members and visitors on typical design problems encountered in engineering practice. During this semester each student chooses a senior design project. A preliminary design report is required.
3 credits

Pre- or Corequisite(s): ESG 316 Engineering Science Design II: Methods; ESG major; U4 standing; Permission of the department

Text(s) or other required material: None

Course learning outcomes:

- Conception and design of a new product or product improvement
- Development of research skills to determine prior art via intellectual property and literature searches
- Appreciation for the use of design of experiments in research and manufacturing
- Learning time management and budgeting skills for the design project
- Using computer-aided drawings to illustrate designs and provide details for machining of components
- Using materials selection in design
- Discussion of ethical issues in engineering to make students aware of possible scenarios they could encounter in the work force
- Development of team-work skills
- Development of written and oral communication skills

Topics Covered:

- Engineering design concepts
- Idea generation – brain storming
- Intellectual property
- Design of experiments
- Materials selection
- Computer-aided design
- Time management
- Cost-benefit analyses
- Ethics in engineering

Class/ Laboratory Schedule:

ESG	440	Engineering Science Design III	LEC	1	M	5:20 PM	8:10 PM
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Contribution of Course to **meet requirement of Criterion 5:**

ESG 440 is the first in a two-semester sequence of classes which are dedicated to the students' senior capstone design project. The course aims to take the skills developed by students in previous design courses, as well as general engineering and major-specific engineering education and apply those skills to an original design project. Students form groups and work together to design a new product or apparatus or find innovative ways to improve existing products. In ESG 440, the design project topic is solidified and the groups determine a faculty mentor for the project. The design is developed through CAD drawings, and

is communicated to the class and professor through oral and written presentations. Supplemental topics related to working in the field of engineering are also covered during this semester.

Many of the program outcomes are addressed during ESG 440. Prior knowledge of mathematics, science and engineering is culminated while designing their product. For many of the groups, calculations of stresses in order to determine material requirements is necessary. The entire design must be made within the constraints of a budget, and needs to address feasibility in terms of manufacturability and environmental impact. Design groups are generally made up of students with different specializations in engineering science resulting in multi-disciplinary teams who work together to solve the problem. For most of the projects, students come up with their own design topic which they must identify and formulate for the professor and the class which includes addressing the issue of feasibility in terms of the budget and time frame for a senior design project. During the semester, engineering ethics is specifically addressed as part of a class exercise, but it is also addressed through discussions with each group during the design process. This project gets students to really investigate their world to find engineering problems. It also has them do research in intellectual property to determine what has already been done in their project area. These activities serve to inspire self-motivated learning when they are faced with engineering issues in the future. Throughout the semester both oral and written communication skills are developed through in-class presentations and written assignments. This capstone design experience extends the classroom knowledge that has been acquired by getting students to think about practical solutions to engineering problems. During the selection of projects, choosing topics that effect society at a local, national, or global level is highly encouraged. Regardless, the students are coming up with original solutions to a variety of contemporary engineering problems and are using and expanding their knowledge base to solve the problem. During this semester, computer aided design is the primary means of illustrating the design. Through discussions with machinists and faculty mentors, feedback leads to a solid design from which a prototype will be built during ESG 441.

The work in both ESG 440 and ESG 441 supports the program objectives of Engineering Science. By bringing together all the knowledge acquired through classroom and laboratory education in the culmination of the design of an actual product, students are given a taste of what a career in science and engineering entails. All of the products or product improvements that are designed are novel and increase the innovative and competitive nature of this country. By working on multi-disciplinary teams to solve a problem, the students are better prepared for leading teams in the future particularly in engineering design. Students are encouraged to participate in University-wide programs to showcase their work and share the knowledge they have gained. In addition, in both the ESG 440 fall semester and ESG 441 spring semester, the students attend a local ASM International chapter meeting to give poster presentations. This allows them to interact with the greater scientific community to foster lifelong partnerships. Throughout the year discussions between the professor and students on issues of personal safety and the welfare of the community as a result of their product occur. Students are continually engaged in the issue of engineering ethics in both the classroom and through interactions with faculty mentors and members of ASM International who are outside the University.

Relationship of course to program outcomes:

a:10% b: 9% c: 9% d:9% e:9% f:9% g: 9% h: 9% i:9% j:9% k: 9%

Person(s) who prepared this description and date of preparation:

Christopher M. Weyant 2/20/2009