

ESG 100 Introduction to Engineering Science (Required)

Course Catalog description:

An overview of the development and application of engineering principles in response to social, industrial, and environmental problems from ancient times to the present. Engineering methods and theory through case studies and real-world applications. Creativity and problem solving techniques of modern engineering through participation in a design project as well as learning through analyses of engineering disasters.
3 credits

Pre- or Corequisite(s):

None

Text(s) or other required material:

- "Inviting Disaster: Lessons from the Edge of Technology" by James R. Chiles
- "Stiquito for Beginners: An Introduction to Robotics" by James M. Conrad and Jonathan W. Mills
- "Understanding Nanotechnology" by Scientific American

Course learning outcomes:

Topics Covered:

Week 1 & 2. A Brief history of engineering and technology

Week 3 & 4. A review of areas of modern engineering and research Materials engineering. What is "engineering" today?

Week 5 & 6. The engineering science program at Stony Brook. Resources for engineering for students at Stony Brook. Being a successful engineering student.

Week 7 & 8. Problem solving in Engineering

Week 9. An introduction to and case studies in engineering design. Learning engineering design/ethics

Week 10 - 14. Visualization and graphics. Use of computers in engineering.

Week 15 Technical communication/concurrent engineering

Class/ Laboratory Schedule, i.e. number of sessions each week and duration of each session:

ESG	100	Intro to Engineering Science	LEC	1	MWF	10:40 AM	11:35 AM
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Contribution of Course to **meet requirement of Criterion 5:**

70% Engineering Science, Laboratory Experience 10%, Mathematics 0%, Basic Science 5%, General Education 5%, Design Experience 10%

Relationship of course to program outcomes: Rated on scale of 1 (least) to 10

(a) an ability to apply knowledge of mathematics, science, and engineering (5)

Task: Constructing a shape-memory alloy walking robot

Science: Understanding nature of shape-memory alloys sufficient for their use.

Engineering: Measuring, cutting and assembling parts based on detailed instructions.

(b) an ability to design and conduct experiments, as well as to analyze and interpret data (7)

Task: Building and analyzing data from a gas fuel cell
Students were required to build a working gas fuel cell and write a report on its operation.

(c) an ability to design a system (5)

Task: Building and optimizing a shape-memory alloy walking robot
Students designed and optimized a shape memory walking robot. They also had to write a report on the engineering design aspects of the project.

(d) an ability to function on multi-disciplinary teams (6)

Task: Writing a report on the role of multidisciplinary problem solving using a real-world example

(e) an ability to identify, formulate, and solve engineering problems (3)

Task: Charting results for gas fuel cells

(f) an understanding of professional and ethical responsibility (8)

Task: Creating a failure analysis report and identifying responsibilities and causes for failure, films and lectures on engineering disasters and the role of human error or negligence in operation or design

(g) an ability to communicate effectively (8)

Task: Creating a portfolio of essays on multidisciplinary engineering, engineering design and learning from engineering disaster

(h) understand the impact of engineering solutions in a global, economic, environmental, and societal context (7)

Task: Studying the growth and impact of new areas of engineering, including nanotechnology and fuel cell research; student wrote an essay on their findings

(i) a recognition of the need for, and an ability to engage in life-long learning (6)

Task: Writing an essay on the role of professional engineering organizations in education and outreach

(j) a knowledge of contemporary issues (6)

Task: Creating a portfolio of essays on multidisciplinary engineering, engineering design and learning from engineering disaster

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (5)

Task: Using tools to build shape memory alloy devices; electronics principles and tools used in building the gas fuel cell

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