EGR 202: Engineering Thermodynamics

Required Course

Course Description (2009 Bulletin)
This course provides an introduction to engineering thermodynamics, emphasizing the vital importance of energy generation and efficiency from a multi-disciplinary perspective. State descriptions of pure substances and mixtures. Control volume analysis and conservation principles applied to systems with respect to mass, energy, and entropy with applications to power, refrigeration, chemically reacting and other energy conversion systems. Introduces a common problem-solving approach and processes to address real, open ended problems and creative application of theory. Both analytical and computer solutions of engineering thermodynamics problems are emphasized. This course is part of the Integrated Engineering Core for all engineering students. 3 semester hours. *3 sem. hrs.*

Prerequisites: MTH 168.

Class Schedule: TuTh 75-minute classes (Spring 2009)

Textbook
None required

Goals

- To introduce the student to fundamental principles of thermodynamics as applied to engineering systems.
- To emphasize the importance of improved energy generation and energy efficiency to future engineering.
- To provide a suitable background for the study of advanced topics in thermodynamics encountered in Mechanical and Chemical Engineering.
- To give non-specialists an understanding of energy flows and systems analysis, with relevance established to their own discipline.
- To emphasize parallels between control-volume, electronic systems, and free-body diagram analysis.
- To develop a problem-solving process that transcends all disciplines.
- To reinforce and improve problem-solving and design capability using both analytical and computer-based problem solving methods.
- To enhance physical understanding of concepts through experimental assignments.

Topics

1. Introduction (week 1)
2. Mass and Energy Balance (week 1)
3. 1st Law Foundations (week 1-2)
4. State Descriptions (week 2-6)
5. 1st Law: Open and Closed Systems (week 7-8)
6. 1st Law: Flow and Chemical Applications (week 7-8)
7. Probabilistic Definition of Entropy (week 9)
8. 2nd Law of Thermodynamics – Implications (week 10)
9. 2nd Law of Thermodynamics – Macroscopic Approaches (week 11-14)
10. Energy Conversion Systems (week 13-14)

Assessment

Three exams (60%), assignments and projects (40%)

Relevant ABET Program Outcomes

a	ability to apply knowledge of mathematics, science and engineering.
c	ability to design a system, component, or process to meet desired needs.
e	ability to identify, formulate, and solve engineering problems.
f	an understanding of professional and ethical responsibility
g	ability to communicate effectively.
h	understand the impact of engineering solutions in a global and societal context
j	a knowledge of contemporary issues
k	able to use the techniques, skills, and modern engineering tools

Course Learning Outcomes

1. Students will apply basic skills of mathematics and physics to solve problems of dynamics equilibrium mechanics of particles and rigid bodies. (a)
2. Students will engage in a semester long design project oriented toward the development of an optimal thermodynamic energy conversion project. (c)
3. Students will address problems concerned with roller coasters, aircraft performance, power transmission, auto crashes and many other “real World” applications. (e)
4. Through societal relevant problems, students learn to appreciate the professional obligation of engineers to use energy and resources as effectively as possible. (f)
5. Problems are posed which require students to understand the societal context of energy and the role of engineers in using it as effectively as possible. (h)
6. Students will gain an understanding of the importance of energy in the world. (j)
7. Students are expected to use Excel or some other tool to develop an optimal design. (k)

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