



ENGR 2300

Division: Natural Science and Mathematics

Department: Engineering and Computer Science

Course: ENGR 2300

Title: Engineering Thermodynamics

Catalog Description:

This course is an introduction to principles of thermodynamics, including reversible and irreversible processes, equations of state, First and Second Laws, internal energy, enthalpy, entropy, exergy, the Carnot cycle, and gas power cycles.

General Education Requirements: N/A

Semesters Offered: Spring

Credit/Time Requirement: Credit: 3; Lecture: 3; Lab: 0

Clock/Hour Requirements: 0

Offered for Non-Credit: No

Prerequisites: MATH 1220 or equivalent

Justification:

This course is designed as a component of the standard pre-professional curriculum in engineering, which enables the student to transfer with junior-level status into a four-year engineering program. Similar courses are offered in university engineering schools. For instance, it will transfer to Utah State University as MAE 2300, and at the University of Utah it corresponds to CH EN 2300. This course is to be taken during the sophomore year of the pre-engineering curriculum and will prepare the student for subsequent course work.

Student Learning Outcomes:

After completing this course, a student should:

- A. Be able to apply previously-studied math skills and physical principles to practical thermodynamics problems.
- B. Have a thorough understanding of thermodynamics nomenclature.
- C. Understand and know how to use states, properties (including internal energy, enthalpy, entropy, exergy), and property balances (including mass, energy, entropy and exergy).
- D. Understand how to use the First and Second Laws of Thermodynamics to evaluate processes.
- E. Be able to design a simple electrical generating plant with economic and technical constraints.
- F. Be prepared to take Thermodynamics II after transferring.

Content:

Students will learn the basic concepts, vocabulary and skills involved in thermodynamics including:

Vocabulary including open and closed systems, properties, states, processes, cycles, pressure, phase changes, quality, saturation, etc

Zeroth, first, and second laws of thermodynamics

Equations of state

Internal energy, enthalpy, and specific heats

Energy transfer by heat, work, and mass

Energy, entropy, and exergy balances of open and closed systems

Carnot principles, heat engines, refrigerators, and heat pumps

Various efficiencies including thermal and second law

Gas power cycles including the Otto cycle, the Diesel cycle, the Stirling cycle, the Ericsson Cycle, and the Brayton cycle

Use of intercooling, reheating, and regeneration

Jet propulsion cycles

Design of a gas power cycle with economic and technical constraints

General Education Outcomes:

- 4) Retrieve, evaluate, interpret, and deliver information through a variety of traditional and electronic media.
Students will learn the skills to be able to present, using traditional and electronic media, the results of problems that they have used many different types of sources and media to evaluate.
- 6) Apply computational skills to a variety of contexts.
Students solve 5 - 10 homework problems per day; many of which require computation. They receive scores and feedback on their assignments. They also learn to use spreadsheets and EES (Engineering Equation Solver) to aid their solution of thermodynamic problems.
- 7) Apply scientific reasoning to a variety of contexts.
Much of this course is conceptually based as well as computationally based. Students learn to apply the concepts of thermodynamics to many current issues and everyday occurrences. They practice the application of these concepts in almost daily homework assignments which are then discussed in class.

Key Performance Indicators:

Homework assignments: 25%-35% of the final grade
Presentation of homework problems: 15%-25% of the final grade
Exams: 20%-30% of the final grade (usually 2)
Comprehensive final exam: 20%-30% of the final grade

Representative Text and/or Supplies:

Cengel, et.al., Thermodynamics an Engineering Approach, Current Edition, McGraw-Hill, New York, NY, or equivalent

Optimum Class Size: 5

Maximum Class Size: 15

Signatures:

I hereby submit this course syllabus:

Garth O. Sorenson, MS, Associate Professor

I hereby find this course consistent with the goals and resources of the Engineering and Computer Science Department:

Garth O. Sorenson, MS, Associate Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)