
Thermodynamics

ENGG 3260

Fall 2007

Instructor:	Khosrow Farahbakhsh, Ph.D., P.Eng. Rm. 216, Thornbrough Bldg. khosrowf@uoguelph.ca Ext. 53832
Lecture schedule:	M, W, F 9:30 – 10:20 RZK 102
Tutorials:	Consult the WebAdvisor
GTA:	Steven Murray (smurra03@uoguelph.ca) Jeffrey Ramkellawan (ramkellj@uoguelph.ca)
Prerequisites:	As stated in the U of G Calendar
Textbook:	Yunus A. Çengel and Michael A. Boles, 2006. Thermodynamics – An Engineering Approach 5 th edition, McGraw Hill Higher Education

Course Description

Thermodynamics, once known as the science of heat, has now become a tool that is revolutionizing the way we perceive the world. Whether contemplating evolution or economics, energy conservation or computational science, one cannot but feel the omnipresence of thermodynamics. As engineers, we study thermodynamics not only to understand the limits of our technology, but to challenge the current notions of energy, work, and waste. This course will facilitate the learning of fundamental principles of thermodynamics and an appreciation of their importance in the engineering practice. In addition to exploring the history of thermodynamics, we will learn the practical applications of such topics as energy transfer, first and second law of thermodynamics, entropy, energy analysis and exergy, and thermodynamic cycles. Einstein once said that laws of “[Thermodynamics] ... will never be overthrown” and Frederic Keffer said that “the future belongs to those who can manipulate entropy”. Let’s learn why!

Evaluation (Option 1)[†]

Term Project	35%
Logbooks	5%
3 Quizzes [‡]	20%
Final Exam	40%

Evaluation (Option 2)

Term/Design Project	45%
Logbooks	5%
3 Quizzes	20%
Final Exam	30%

Tutorials and Review Problems

Tutorials will be used for two purposes: to strengthen students’ understanding of thermodynamics through reviewing examples, and to discuss the assigned projects. A large number of review problems with solutions will be made available to the students. These review problems provide an opportunity for the students to better understand the course materials. All students are strongly encouraged to complete these problems either individually or in groups. Additional examples will be provided by the teaching assistants during the tutorials.

Term Project

Groups of five students will be assigned an engineering project to apply the principles of thermodynamics to everyday problems. A portion of the tutorials will be devoted to discussing these projects. Each group is also expected to hold occasional meetings outside the tutorial sessions to discuss the progress of their project. Aside from applying the principles of thermodynamics, the project will enable the students to enhance their group skills and sharpen their research and problem-solving abilities. More details will be provided during the class.

Term/Design Project

Term/design projects are an extension of term projects (see above). The main difference is that these projects involve actual design and build of a working thermodynamic system. The groups will perform preliminary thermodynamics analysis to determine optimum design of the system, design, build and operate the system, collect required data and then perform a detailed thermodynamics analysis of their final system.

Logbooks

Each student will keep a logbook in which he/she will record all important information relevant to the term or term/design project. The information should include a brief record of all meetings attended and decisions made, research conducted for the projects and

[†] Students must select their groups and choose one of the options by September 18. The choice of option cannot be changed beyond Sept. 18.

[‡] Quizzes are 1 hr in duration.

other information such as time spent on the project, rough calculations, and conceptual design drawings, etc. In short, the logbooks are records of individuals' involvement with their term or term/design projects. Please refer to your second-year design course for how to keep an effective logbook. The logbooks must be brought to each quiz for review by TAs and submitted for final evaluation at the end of the term. **Logbooks are a must for getting a passing grade on the term or term/design projects.**

Quizzes and Final Exam

All materials that have been covered before the test will be included. Tests are closed book. A formula sheet and appropriate tables and charts will be provided.

Topic Outline

1. Introduction
2. A brief history of thermodynamics
3. Basic concepts and definitions
4. Properties of pure substances
5. Energy transfer by heat, work, and mass
6. The first law of thermodynamics
7. The second law of thermodynamics
8. Applications of entropy
9. Energy analysis and exergy – Introduction and application

Recommended Readings

Hans Christian von Baeyer, 1998. Warmth Disperses and Time Passes. The Modern Library, New York.

Enrico Fermi, 1936. Thermodynamics. Dover Publications, New York.

P. W. Atkins, 1994. The 2nd Law, Energy, Chaos, and Form. Scientific American Books, New York.

H. C. van Ness, 1969. Understanding Thermodynamics. Dover Publications, New York.

Materials posted on the course WebCT.

Disclaimer

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to University of Guelph Academic Regulations.