Elements of Thermodynamics and Heat Transfer

EML 3007 Section 12126
Class Periods: Online 100%
Location: Online 100%
Academic Term: Fall 2025

Instructor:
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Office: (352) 392 – 4521
Office Hours: See Canvas for up-to-date office hours schedule

Course Description
Credits: 3
Applications of the first and second laws of thermodynamics to closed and open systems. Steady one-dimensional conduction, lumped parameter analysis, convection, radiation. Intended for non-mechanical engineering students.

Course Pre-Requisites / Co-Requisites
CHM 2045, *MAC 2313*, and *PHY 2048*
While undergraduate calculus, chemistry and physics are required pre-requisite, this course will briefly re-introduce all relevant topics from these subjects as they become necessary.

Course Objectives
This course provides undergraduate coverage of basic thermodynamic processes. The course emphasizes the fundamental principles of control volume analysis to both open and closed systems, the application of conservation of energy and conservation of mass, the concept of entropy and thermodynamic losses, and the general calculation of various state properties. Students will learn to apply these concepts through exposure to numerous practical engineering problems. Upon completion of the course, students are expected to have developed a thorough understanding of the fundamentals of thermodynamics and problem-solving techniques applicable to heat and fluid transfer systems.

Materials and Supply Fees
None

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Low
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5. An ability to function effectively on a team whose members together provide leadership, create a	

collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

Lecture videos and course notes (developed by the instructor), all available on Canvas, comprise the required course materials.

The free CATT3 thermodynamics software, available on Canvas, is required during the second half of the course.

Recommended Materials

- Fundamentals of Thermal-Fluid Sciences
- Yunus Cengel, John Cimbala, and Afshin Ghajar
- 2022, 6th Edition
- **ISBN10:** 1266360190 **| ISBN13:** 9781266360190

While the textbook above is the official text for the course, its newest version is prohibitively expensive. Students are advised to purchase/acquire an earlier edition (4th, 5th, or 6th editions are all equally acceptable) or a used copy of the text. Contact the instructor for the most economical options for acquiring the text.

You can find a copy of the textbook's appendices and thermodynamic data on the course Canvas site: Files/Tech Resources/Appendix.pdf. (Duplicated by permission from McGraw-Hill)

Course Schedule

Week 1: Introduction, Laws, Basic Definitions, Units, Thermodynamic Properties
Week 2: Properties of pure simple substances, Thermodynamic Processes
Week 3: Work and Heat
Week 4: First Law, Enthalpy, Internal Energy, Specific Heat, Conservation of Mass
Week 5: First Law Analysis for a Closed System
Week 6: First Law Analysis for an Open System
Week 7: Common Open Systems
Week 8: Forward and Reverse Heat Engines, Reversibility
Week 9: Entropy and Entropy Generation
Week 10: Second Law of Thermodynamics for Closed Systems
Week 11: Second Law Analysis of Open Systems
Week 12: Power and Refrigeration Cycles
Week 13: Steady-State Heat Conduction
Week 14: Convection Heat Transfer
Week 15: Thermal Radiation

See Canvas for a more detailed weekly and daily breakdown of course modules.

Attendance Policy, Class Expectations, and Make-Up Policy

As this course is a fully online offering, there is no class to attend. Lecture videos, filmed recently during the 23/24 academic year, are your primary and most important academic content. Watch the posted lecture videos on a regular, weekly basis just as if you were attending class live. A lecture video calendar can be found on Canvas to help you stay on track.

All homework and quizzes will be administered and submitted electronically through Canvas. The midterm exam and the final exam will all be proctored online through Zoom during the evening assembly exam periods (8:20 PM to 10:20 PM). Make-up exams for excused absences are scheduled on a case-by-case basis. See Canvas for the up-to-date exam schedule and contact the instructor if you have a conflict.

Students are required to watch all posted videos and read all posted content but your consumption of course materials will not be monitored by the instructor. We will use Zoom as our primary means of communication for office hours and homework help. Face-to-face meetings are also available on request. Students are encouraged to contact the instructor through email or text at any time (I can always make myself available for a chat if you need help or have any concerns!).

Generally, late assignments are not accepted, however a 15-minute grace period after an assignment is due is allowed before it is counted as late. If you have extenuating circumstances, it does not hurt to ask for an extension.

Important Dates

10/16/2025 Exam 1 (8:20 pm – 10:20 pm, Online via Zoom, see Canvas for link)
12/03/2025 Final Exam (8:20 pm – 10:20 pm, Online via Zoom, see Canvas for link)

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (9)	100 each	30%
Quizzes (5)	100 each	20%
Midterm Exam	100	25%
Final Exam	100	25%
		100%

Extra credit assignments are also offered periodically throughout the semester. All extra credit points are applied only at the end of the semester during the calculation of final course grades. See Canvas for more details about individual assignment scoring, overall grade calculations, and extra credit.

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:
- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu