

Elements of Thermodynamics and Heat Transfer

EML 3007 Class #: 13411, 13412

Class Periods: MWF, 3rd period, 9:35 am – 10:25 am

Location: CSE E107

Academic Term: Spring 2021

Instructor:

Philip B. Jackson, Ph.D.

philipbjackson@ufl.edu

(352) 392 - 4521

Office Hours: See Canvas for times and Zoom link

Peer Mentors:

Please contact through the Canvas website

- Amanda Goldberg, amandagoldber@ufl.edu, see Canvas for office hours

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

Course Objectives

This course provides an 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):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

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	
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	
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	Low
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*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

- Fundamentals of Thermal-Fluid Sciences
Cengel, Y., Cimbala, J., and Turner, R.
2016, 5th Edition
9781259934025

(course notes are developed by the instructor)

Recommended Materials

- None

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:	Second Law of Thermodynamics, Entropy
Week 8:	Second Law Analysis of Open Systems
Week 9:	Power and Refrigeration Cycles
Week 10:	Thermodynamics of environmental systems
Week 11:	Internal combustion thermodynamics
Week 12:	The Mechanisms of Heat Transfer
Week 13:	Steady-State Heat Conduction
Week 14:	Convection Heat Transfer
Week 15:	Thermal Radiation

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

F2F Course Policy in Response to COVID-19

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here](#) for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here](#) for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

Attendance Policy, Class Expectations, and Make-Up Policy

Because of COVID-19 policies, only students that are enrolled in Section #13411 will be permitted to attend the live taping of lectures each week. Students that are enrolled in Section #13412 will not be allowed in the classroom.

There will be **nine** total homework assignments. **The final homework average will be calculated as the sum of all homework grades divided by one less than the total number.** This will allow students leverage to abstain from a single weekly assignment if they choose or provide a grade boost to those that do not.

Homework assignments will be submitted online through Canvas. Homework that is to be submitted online is due by the posted due date and time (usually midnight on the date due) with no exceptions.

Treat your homework as a professional deliverable to an employer. Homework assignments are not only exercises through which to learn material, but also opportunities to demonstrate your ever-increasing mastery of the topic at hand. As such, even if your answers are wrong, your work should be **neat** and completed with pride.

Each exam will chiefly cover only the most recent material since the previous exam before it. In other words, each exam will not be comprehensive. That being said, the discipline of thermodynamics builds upon itself and therefore students will frequently be relying on early concepts late into the semester. **The final exam, however, WILL be comprehensive.**

Your lowest exam score will be increased by an amount equal to the standard deviation of your four exam scores. Standard deviation is calculated from the following formula:

$$\sigma = \sqrt{\frac{1}{N} \sum (x_i - \mu)^2}$$

where μ is the mean and N is the total number of exams.

To encourage everyone to stay current with class topics **six** quizzes will be given throughout the semester. You can expect to see about two quizzes given in between each exam. Quizzes are administered online through Canvas. **The lowest quiz grade is dropped from final grade calculations.**

Collaboration on homework is a vital part of the college learning experience, but each student is responsible for submitting original work by their own efforts. The copying of assignments from peers or solutions manuals is **cheating** and will be subject to university sanctions.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (9)	100 each	20%
Quizzes (6)	100 each	20%
Exam 1	100	20%
Exam 2	100	20%
Final Exam	100	20%
		100%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100	A	4.00
89.0 - 89.9	A-	3.67
87.0 - 88.9	B+	3.33
80.0 - 86.9	B	3.00
79.0 - 79.9	B-	2.67
77.0 - 78.9	C+	2.33
70.0 - 76.9	C	2.00
69.0 - 69.9	C-	1.67
67.0 - 68.9	D+	1.33
60.0 - 66.9	D	1.00
59.0 - 59.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **[Office of Title IX Compliance](#)**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.