Thermodynamics 1
EML 3100, Fall 2023

Instructor: Dr. Andrés Rubiano, MAE-B 222 – Preferred Communication: over Canvas Messages, not email.

Office hours (virtual): as many as you want. Send me a Canvas message with an "Office Hours" subject and a when2meet link availability, and I'll reply to you with available times.

Course Structure:

Before EVERY class meeting, students are to:

- **study** the one 8-12-minute lecture main video (1-hour worth of lecture content).
- watch the two or three 1-4-minute "additional examples videos" for each lecture topic.
    - attempt to solve these problems **before** watching the solution.
- solve the textbook-style-exercises homework assignment.

Students are to attend all classes, with **camera ON**. Attendance will be taken, and participation will be noted.

Class meeting times will be used to:

- answer specific questions about lecture videos, example videos, and homework (in that order).
- work on one engineering-specific problems.
- take in-class quizzes (Fridays).

Course Assignments

- Homework: There is one homework assignment for every day of class (textbook-style problems, very similar to the video example solutions). Homework assignments will not be graded, but they are essential to properly prepare for class, quizzes, and exams. Assignments are found under the "Homework" folder in the course files.

- Quizzes: Approximately 10 quizzes total; mostly 30-minute quizzes. Quiz time will appear limited and quiz problems, challenging, if homework assignments are not completed.
  These will take place, during class time, on Friday of every week (except when an Exam is scheduled).

- Exams: There will be 3 cumulative, 50-minute exams. These will be given during the lecture time.

Grading: Quizzes (35%), Exams (65%).

Grade Changes: Corrections of grades should be submitted to instructor within 5 business days of the grade posting in writing with a concise statement of why you believe there has been an error. Otherwise, the grade will remain will not be changed.
Make-ups: Make-up exams will not be granted except in cases of emergency and will be handled on a case by case basis.

Other Course Information

Textbook:
Thermodynamics, An Engineering Approach"; Yunus Cengel and Michael Boles; McGraw Hill; Ninth Edition, ISBN: 978-1260048667. You can opt-in through UF all-access to obtain at a lower price.

Other Useful Course Related Resources:
Thermochemical Tables - https://janaf.nist.gov/
Thermophysical Properties - https://webbook.nist.gov/chemistry/fluid/
NIST Chemistry WebBook - https://webbook.nist.gov/chemistry/
Python and Jupyter - https://www.anaconda.com/
Cantera - https://cantera.org/

Grading Scale: The final grade will be calculated by the following table.

Table 1. Grading Table. *%GE = Percent Grade Earned.*

Percentage Range	Grade Point
$93.33 \leq$ %GE $< 100.00 \Longrightarrow$ A	4.00
$90.00 \leq$ %GE $< 93.33 \Longrightarrow$ A-	3.67
$86.67 \leq$ %GE $< 90.00 \Longrightarrow$ B+	3.33
$83.33 \leq$ %GE $< 86.67 \Longrightarrow$ B	3.00
$80.00 \leq$ %GE $< 83.33 \Longrightarrow$ B-	2.67
$76.67 \leq$ %GE $< 80.00 \Longrightarrow$ C+	2.33
$73.33 \leq$ %GE $< 76.67 \Longrightarrow$ C	2.00
$70.00 \leq$ %GE $< 73.33 \Longrightarrow$ C-	1.67
$66.67 \leq$ %GE $< 70.00 \Longrightarrow$ D+	1.33
$63.33 \leq$ %GE $< 66.67 \Longrightarrow$ D	1.00
$60.00 \leq$ %GE $< 63.33 \Longrightarrow$ D-	0.67
$00.00 \leq$ %GE $< 60.00 \Longrightarrow$ E	0.00

Course Objectives:
The objective of this course is for students to learn about energy conversion to describe physical systems relevant to today's world. Such systems include, but are not limited to, fossil fuel powered fired power plants, renewable power plants, combustion engines, Stirling engines, refrigeration, heat pumps and chemical reactors. Systems will be described applying the laws of energy and mass conservation and their application to of the Second Law of Thermodynamics. This class will provide a framework to understand the fundamentals of energy conversion from a somewhat broad and macroscopic perspective, going into fine mechanistic details of specific systems only sporadically. With the skillset obtained in this class, students will have the necessary tools to understanding and analyze a broad range energy conversion processes, a necessary prerequisite for the ultimate design and engineering of more cost effective and efficient systems in the future.

Relevance:
All (or almost all) energy ultimately is derived from the sun. The suns photons are converted in nature to heat, wind, biomass and rain, all of which can be further transformed into heat, work or electricity via a number of processes and thermodynamic cycles. As such, energy and energy conversion surround and sustain our daily lives, from the sunlight used to grow food, to its transportation via rail, ship or truck, to its storage in our refrigerators, to electricity provided from fossil or renewable sources. Our metabolic cycles convert the energy stored in our food to do work, analogously to the way a combustion engine converts the energy stored in gasoline to drive a car. Understanding the concept of energy and mass conservation will allow one to approach, analyze and appreciate these systems from a simplified energetic point of view to the more complex underlying mechanisms driving them.

General Course Schedule:
Week 1 – Introductory Concepts
Week 2 – Energy Transfer and the First Law of Thermodynamics

Week 3 – Properties of Pure Substances
Weeks 4 and 5– Closed System Analysis
Weeks 6 and 7 – Open System Analysis
Week 8 – Second Law of Thermodynamics
Week 9 – Spring Break
Week 10 – Entropy
Week 11 – Gas Power Cycles
Week 12 – Vapor and Combined Power Cycles
Week 12 – Refrigeration Cycles

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	Low
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	High
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	Low
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

Academic honesty
All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others.

Accommodation for Students with Disabilities
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Health and Wellness
- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
- 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 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/.

Software Use
All faculty, staff and student 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 regarding grades earned in courses and on individual assignments. For more information, please see: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

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