Thermodynamics 1 - EML 3100

Spring 2021 Syllabus

MWF Period 5 (11:45 PM –12:30 PM)

Course Location: Because of social distancing guidelines due to COVID-19, class will be online and available both live MWF 11:45 PM –12:30 PM and recorded using Zoom. Links are provided in the Canvas course shell under the "Zoom Conferences" tab.

Course Description: Application of the first and second laws of thermodynamics to closed and open systems and to cyclic heat engines. Includes the development of procedures for calculating the properties of multiphase and single phase pure substances. *Prerequisites*: CHM 2045, MAC 2313 and PHY 2048. *Credits*: 3

Instructor: Prof. Jonathan Scheffe, Department of Mechanical and Aerospace Engineering, *Office*: MAE-A 208, *Email*: jscheffe@ufl.edu. Note that my office this semester will be virtual via Zoom with link provided in your Canvas course shell.

Graduate TA: Dylan McCord, Department of Mechanical and Aerospace Engineering, *Email*: dylanmccord@ufl.edu

Undergraduate TA: Samantha Mangoni, Department of Mechanical and Aerospace Engineering, *Email*: samanthamangoni@ufl.edu

Textbook: "*Thermodynamics, An Engineering Approach*"; Yunus Cengel and Michael Boles; McGraw Hill; Ninth Edition, ISBN: 978-1260048667

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/

Office Hours: Zoom office hours for Prof. Scheffe and TA's are indicated below. Zoom links are provided in the Canvas course shell under the "Zoom Conferences" tab.

	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 - 10:00					
10:00 - 11:30		**Scheffe**	**McCord**		
12:30 - 14:00					**McCord**
14:00 - 15:30				**Scheffe**	
15:00 - 16:30					
16:00 - 17:30	**Mangoni**				

Online Course Information: Canvas

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.

Grading: A: 93-100, A-: 90-92, B+: 87-89, B: 83-86, B-: 80-82, C+: 77-79, C: 73-76, C-: 70-72, D+ 67-69, D: 63-66, D-: 60-62, Fail: <60

Grading Scale: Homework: 25%, Exam 1: 15%, Exam 2: 15%, Exam 3: 15% Final Exam: 30%

Homework: A series of small homework questions will be provided most weeks to complete. Assignments will be given one week prior to their due date (during class and posted on Canvas), and must be turned in prior to class on the due date. 50% of the grade will be based on correctness of a randomly determined question and 50% based on effort. All homework must be turned in on ruled, printer or engineering paper and stapled, with your name clearly labeled on all pages. Answers should be clearly indicated.

Exams: Three mid-term exams and one final exam will be given. Each mid-term examination is worth 15% of the course grade and the final exam is worth 30%. All exams will be graded based on the correctness of final answers, but partial credit will be given. Full credit will be given for answers that are incorrect because of previously incorrect answers (i.e. cascading effects will not be possible). No examinations will be dropped, however one of the two scenarios (whichever results in a greater course average) will be used to amend your final course average:

1) If the final exam score is higher than any of the three midterms, the final exam score will be used in place of the lowest midterm.
2) The standard deviation of all midterm exam scores will be taken and added to your lowest midterm exam.

All exams will be performed via Honorlock in Canvas. No in class exams will be given. You will have 90 minutes for the midterms and 150 minutes for the final exam that all occur within a flexible, larger

window of time. 30 extra minutes (already built into the exam times) are provided as a buffer to allow for downloading, scanning and uploading materials. More details to follow as the semester progresses.

Make-up Policy: Late homework will not be accepted, except under extenuating circumstances. Make-up exams will not be granted except in cases of emergency and will be handled on a case by case basis. If you need extra accommodations for homework or exams please reach out to the Disability Resource Center by visiting https://disability.ufl.edu/students/get-started/ - more information below.

Exam Dates:

Midterm 1: February 5th, 2021

Midterm 2: March 10th, 2021

Midterm 3: April 9th, 2021

Final Exam: April 30, 2021

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.

Evaluations: "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/."

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.

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.

Health and Wellness Resources:

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/.

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.

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