COURSE SYLLABUS: Thermodynamics I, Spring 2021

CHE 232 Spring 2021 Chemical Engineering Thermodynamics I Tues 2-4 pm Thurs 3-4 pm Course website on Moodle and course meets on Zoom (password Thermo)	Instructor Contact Information Dr. Amanda Simson Room 418, (212) 353-4373 Email: amanda.simson@cooper.edu Office Hours: Monday 12:00-1:30 pm Wednesday 12-1 pm

Course Description

This course will apply the first and second laws of thermodynamics to batch and flow processes for single component systems. Topics include energy and entropy balances, fundamental property relationships, applications of steam tables, residuals, and how to choose appropriate thermodynamics models. We will also study how thermodynamics, or the study of heat, work, and energy apply to new and traditional methods of power generation. 3 credits.

Prerequisites

ChE 160 or ChE 221. Important concepts from previous courses that will be used frequently include partial derivatives, chain rule, mass balances, unit conversions, and the basics of physical properties.

Course Objectives

The overall objective of the course is that student will understand the importance of the first and second laws of thermodynamics and be able to apply them to single component batch and flow processes. Students will understand the importance of thermodynamics to unit operations in chemical engineering and will see how they are applied in larger industrial processes. Specifically, by the end of the course, students should be able to:

1) Use appropriate thermodynamic terminology
2) Calculate work and heat for ideal gases along pathways or cycles
3) Use steam tables to calculate work and heat for steam cycles
4) Use entropy balances to calculate outlet conditions for reversible or irreversible systems
5) Use entropy balances to calculate efficiencies for different unit operations
6) Draw and read thermodynamic diagrams
7) Select appropriate equations of state for single component systems (understanding concepts of compressibility and acentric factor).
8) Use fundamental property relationships combined with equations of state to calculate property changes for non-ideal systems.

Course Format

The course will be fully delivered online via Zoom. Typically, the two hour courses will involve a significant amount of problem solving. This problem solving will be done within breakout rooms and students will often be expected to submit the work via Moodle for a grade. There are two primary sections of the course, with several classworks, homeworks, and one exam. Exam format will be discussed, surveyed about, and decided upon within the first week of the course.

Online Etiquette and Suggestions

There are many challenges to online instruction and to online learning. It is helpful for me to see and/or hear from students during class. I also understand that it is not always possible to have cameras on. **Please join with camera and video whenever possible and let me know if issues arise preventing you from doing so.** In breakout rooms, it is helpful to be able to share work. This can be done by sharing screen using a tablet with stylus or a standard PC with mouse, or having a marker or dark pen on paper. Calculators will be useful but not required in class. I suggest preparing and using a consistent space for class.

Expectations of the Instructor

I will post slides before class as pdfs that can be annotated on a tablet or by hand (if printed). I will typically not post annotated slides. I will review or post answers to classwork or homework within 2 weeks of its due dates. I will grade exams within 2 weeks of completion. Videos of previous lectures will be provided to individual students in special circumstances.

Office Hours

Office Hours will be done in Teams on a first come, first serve basis. Chat me starting 15 minutes prior to the appointed hours to join the queue. Appointments may also be made ahead of time.

Learning Environment

I hope to make all students feel respected and recognized in this course. Please email me or chat me in Teams to discuss any issues that arise. I look forward to creating a supportive and inclusive learning environment with you and for you.

Required Text

Fundamentals of Chemical Engineering Thermodynamics
By Kevin D. Dahm, and Donald P. Visco, Jr., CENGAGE Learning, 2015.

Supplementary Text(s)

1. J.R. Elliott and C.T. Lira, *Introductory Chemical Engineering Thermodynamics*, 2nd ed., Prentice Hall, New York (2012).
2. J.M. Smith, H.C. Van Ness and M. M. Abbott, *Introduction to Chemical Engineering Thermodynamics*, 7th ed., McGraw-Hill, New York (2005).

Additional Resources

There are many resources on the web for Thermodynamics I. I highly recommend both the MIT opencourseware lectures (and associated content) and the Learn Chem-E videos on youtube. Resources will often be posted along with the course timeline.

1. Suggested Apps: TLV toolbox
2. Youtube: LearnChemE thermo videos (from Colorado St), MIT Thermodynamics

Course Requirements, Assessment and Administration

Your grade will be calculated as follows:

- Participation and Attendance	5%
- Midterm Exam	30%
- Comprehensive Final Exam	30%
- Homework, Quizzes and Reports	35%

The midterm will be a take-home exam and the final exam will be in-class and not returned. Grades will typically be posted on Moodle.

Attendance and Participation

Attendance is taken daily and will affect your grade. Excused absences must be discussed with the Professor prior to class time except in extreme emergencies.

Pet Policy

Pets are welcome in class. If they do attend (on purpose or not), please introduce them by name 😊

Assignments

Assignments are due on the date assigned. They should be submitted as pdfs via Moodle. When noted, students may discuss classwork or homework with other students, but should complete the work individually. **Plagiarism will not be tolerated**. According to the Cooper Union course catalog, plagiarism is "the presentation of another persons 'work product' (ideas, words, equations, computer code, graphics, lab data, etc.) as one's own."

Additional Places for Help

Please consult the topics list for supplemental resources, particularly those available on Youtube: MIT's opencourseware and LearnChem-E.

Special Accommodations

Students with disabilities or needing special accommodations should email me and meet with me as soon as possible to discuss accommodations.

Course Outline/Schedule

See attached schedule. Schedule may change - updates will be posted on Moodle. Note the add/drop deadline on January 26, wellbeing days, withdrawal deadline on March 31st and final exam date on May 13th.

Updated: Amanda Simson, January 21, 2021