

COURSE SYLLABUS: Thermodynamics II (Fall 2021)

CHE 331 Fall 2021 Chemical Engineering Thermodynamics II Tues 9-10 am Thurs 9-11 am Course Website on Moodle	<u>Instructor Contact Information</u> Dr. Amanda Simson Email: amanda.simson@cooper.edu Office Hours: M 12-1 pm, W 12-1 pm and by appointment
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Course Description

This course will apply the concepts learned in Thermodynamics I (CHE 232) for single phase, pure systems to mixtures. Topics include fugacity, partial molar properties, activity coefficients in non-ideal mixtures, vapor-liquid equilibria, and choosing appropriate thermodynamics models.

Prerequisites:

Thermodynamics I (CHE 232). You are expected to already be able to:

1. Apply the first and second laws and calculate internal energy, work, entropy, enthalpy, and free energy for single phase, single component solutions
2. Write mass and energy balances for non-reactive systems
3. Calculate partial derivatives, integrate functions and solve quadratic and cubic equations using software (of your choice)

Course Objectives

To introduce students to the study of multiphase and multi-component thermodynamics. By the end of the course, students should be able to:

- 1) Understand phase equilibrium and calculate phase compositions using chemical potential, fugacity, activity, and different equations of state
- 2) Use partial properties to calculate property changes of mixtures
- 3) Select appropriate models for calculating phase equilibria of specific gas, liquid, and solid mixtures
- 4) Calculate equilibrium compositions of reactive mixtures
- 5) Understand the development of thermodynamic models from a molecular standpoint

Course Format

The class is split into three primary sections with several classworks, homeworks, and one exam per section. Exam format will be discussed and decided upon within the first week of the course. Typically, two-hour classes will involve a significant amount of problem solving, activities, and group work. Calculators are useful but not required. Please keep other electronic devices away unless they are useful for a particular activity. However, if you like using a device for notetaking or other accommodation please let me know.

Classroom Expectations

Please be on time for class and communicate any absences in advance via email. Appropriate email format will be discussed in the first week. You can expect email responses within 1-2 business days but follow-up if you do not get a response.

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 post additional practice problems before each exam on Moodle. I will grade exams within 2 weeks of completion. I am available to set-up additional office hours as necessary.

Learning Environment

I hope to make all students feel respected and recognized in this course. Please email me, stop by, 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 Readings and Resources

1. Chapter 7 (Maple Sugar Moon) of Braiding Sweetgrass by Robin Wall Kimmerer available for free on [proquest from the library](#).
2. Suggested Apps: TLV toolbox or something else for steam table information
3. 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 Exams	50%
- Comprehensive Final Exam	25%
- Homework, Quizzes and Reports	20%

Exams will typically be closed book, closed notes and in-person though format will be decided together in the beginning of the year. Usually, an equation sheet will be given and posted prior to the exam 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.

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." You can read more about the Engineering School's Academic Integrity Policies and other Academic Regulations [here](#).

Additional Places for Help

Please consult the topics list for supplemental resources, particularly those available on youtube like MIT's opencourseware and LearnChem-E. Also, I love having students at office hours – please attend!

Course Outline/Schedule

See attached document. Schedule may change and updates will be posted on the course Moodle.