Chemical Engineering Thermodynamics 141 - Spring 2019

Instructor:
Prof. Roya Maboudian 101-B Gilman E-mail: maboudia@berkeley.edu

Graduate Student Instructors:
Christopher Barnes E-mail: cbarne20@berkeley.edu
Rebecca Pinals E-mail: rebecca_pinals@berkeley.edu
Ever Velasquez E-mail: evervelasquez@berkeley.edu

Textbook:
Smith, J.M.; Van Ness, H.C.; Abbott, M.M., Swihart, M., "Introduction to Chemical Engineering Thermodynamics"; 8th Edition; Mc Graw-Hill: New York, 2018.

Lecture Hours: Tuesdays and Thursdays, 8:00-9:30 am, Valley Life Sciences 2060

Discussion Sections:

101	M 10:00-10:59 am Etcheverry 3113 (Chris)
102	M 3:00-3:59 pm Valley Life Sciences 2032 (Ever)
103	W 8:00-8:59 am Barrows 185 (Chris)
104	W 1:00-1:59 pm LeConte 385 (Ever)
105	Th 11:00-11:59 am Cory 285 (Rebecca)
106	F 11:00-11:59 am Wurster 101 (Rebecca)

Course Web Site:
The course website is maintained on bCourses which you should be enrolled in automatically. Assignments, solution sets, handouts and other course materials will be posted on bCourses throughout the semester.

Prerequisites:
Chemical Engineering 140, Introduction to Chemical Engineering

Office Hours:
Prof. Maboudian: Tuesdays 11-12 am; Thursdays 10-11 am (101-B Gilman Hall)
Chris: Mondays 8-9 am (433 Latimer); Fridays 10-11 am (425 Latimer)
Rebecca: Tuesdays 4:30-5:30 pm (Hildebrand 100D); Wednesdays 10-11 am (425 Latimer)
Ever: Wednesdays 3-4 pm (Hildebrand 100E); Thursdays 5-6 pm (Hildebrand 100D)

Scope:
Thermodynamics is a closed, self-consistent body of knowledge, resting on a few fundamental postulates or laws. Starting from these laws, which we accept as true on the basis of everyday experience, we can derive the whole of Thermodynamics in an elegant, rigorously mathematical way. By virtue of their generality, the principles of Thermodynamics constitute a powerful framework for solving a tremendous variety of real-life problems.

Our purpose in this course is twofold: (a) to obtain a firm grasp of the basic concepts of Thermodynamics; (b) to develop skills in applying Thermodynamics to the solution of engineering problems. Extensive exposure to applications is a prerequisite for fully realizing the meaning of basic principles; this is why solving homework problems and attending discussion

sessions is an essential part of your work in the course.

We will try to be as thorough as possible in the lectures and discussions. There is, however, an extensive amount of material to be covered, and your personal study and effort will be key factors in your learning. We expect everyone to be prepared for class. Please read the assignments promptly. These include the reading assignments posted on bCourses and the lecture notes. These assignments will enable you to follow the lecture much more comfortably. Do review carefully the lecture materials. Please do not hesitate to ask questions during, and after class, and do not hesitate to see the instructor and GSIs in their offices. If you need help, let us help you.

Course Outline:

- Fundamentals
  - First and second laws
  - Fundamental equations of thermodynamics for closed and open systems
  - Thermodynamics calculus
  - Examples

- Properties of Pure Substances
  - Principle of corresponding states
  - Residual properties
  - Thermodynamic diagrams
  - Examples

- Power Cycles and Refrigeration
  - Carnot power cycle
  - Rankine power cycle
  - Refrigeration cycles
  - Examples

- Mixtures
  - Chemical potential
  - Fugacity and activity
  - Calculations of mixtures properties
  - Examples

- Phase Equilibria
  - Vapor-liquid equilibria
  - Examples

- Chemical Thermodynamics
  - Standard Gibbs energy of reaction
  - Equilibrium constant and its temperature dependence
  - Third law of thermodynamics
  - Examples

Homework, Examinations and Grading:

Homework sets will be assigned on Thursdays and will be due the following Thursday at the beginning of lecture. Working on the homework problems and understanding their solution is *critical* to your learning in this course. Your solutions must be handwritten. Please upload them in pdf format to Gradescope (https://www.gradescope.com/courses/33440, Course Entry Code: **95J4G6**). The solutions will be posted shortly after lecture. Late homework will NOT be accepted. The lowest homework grade will be dropped if the course evaluation is submitted at the end of the semester.

There will be two midterm exams and a three-hour final examination in the course. **Midterm exams will be given on Tuesday, February 26 and Tuesday, April 2. The final exam is set for Thursday May 16, 7-10 pm.** These examinations will be closed book. The exam problems are expected to test not only your familiarity with the homework problems and course material, but your ability to synthesize and think critically about the material.

Grading:
Your final grade will be determined as follows:

	% of total grade
All homework sets	10
Two Midterm Exams	50 (25 each)
Final Exam	40
Total	100

Academic Honesty:

Academic misconduct in all forms, especially copying homework assignments and gaining unfair advantages through cheating on exams, is not only unfair to yourself, but also your classmates. Instances of academic misconduct will be reported and handled according to the guidelines outlined in the Campus Code of Student Conduct.

The Chemical and Biomolecular Engineering Department at Berkeley has generous feedback from its alumni, extending back more than forty years. This feedback clearly shows that our alumni consider Chemical Engineering Thermodynamics 141 to be one of the most important and useful courses in the Berkeley curriculum. Because of its very wide range of application, knowledge of thermodynamics will not only make you a better chemical engineer, but also a better educated, mature person.

Roya Maboudian

Berkeley, January 2019