CHE 502: Advanced Thermodynamics

Spring 2017
TTh 6:00 – 7:50 (FH 267)

Required course

Catalog Description: CHE 502 Advanced Thermodynamics (4-0-4).
Prerequisites: Graduate standing in chemical engineering or permission of instructor.
Principles of chemical engineering thermodynamics applied to advanced problems, first and second law, property relations, equilibrium and stability, mixtures, phase and chemical equilibria, systems under stress, and surface phases. Offered every year.

Reference: Smith, J.M., Van Ness, H.C., and Abbott, M.M. "Introduction to Chemical Engineering Thermodynamics", 7th Ed., McGraw-Hill, New York, NY (2005).

Coordinator: Dr.-Ing. habil. Rolf Lustig
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Office Hours: TTh 3 – 4 (or by appointment)

Course Objectives: This course is designed to:
1. Provide graduate-level students with advanced applications of Chemical Engineering Thermodynamics.
2. Demonstrate the application of the fundamental concepts to a wide variety of processes occurring in Chemical Engineering.
3. Develop skills necessary to make appropriate assumptions in specific Chemical Engineering problems.
4. Emphasize the principal exactness of the discipline and the consequences of necessary assumptions in practical work.

Expected Outcomes: Upon completion of this course, students should be able to:
1. Formulate and manipulate the thermodynamic treatment of arbitrary processes.
2. Formulate and analyze specific Chemical Engineering problems using fundamental concepts.
3. Select appropriate approximations for practical problem solving.
4. Understand the implications of approximations on the efficiency and accuracy of the solution.

Fulfills Program Outcomes:
a. Application of Mathematics, Science, and Engineering Principles.
e. Identification, Formulation, and Solution of Engineering Problems.
k. Techniques, Skills, and Tools common in modern Engineering Practice.
l. Principles and Working Knowledge as imperative for Chemical Engineering Graduates.

Prerequisites by Topic:
General engineering thermodynamics, multivariable differential and integral calculus, computer programming.

Topics and Schedule (tentative):

Review of the laws, equilibrium, and stability	3 weeks
Theory of mixtures	3 weeks
Theory of chemical reaction equilibria	3 weeks
Topics in phase, chemical, and adsorption equilibria	3 weeks
Introduction to molecular thermodynamics	3 weeks

Homework/Project(s):
The course consists of lectures and recitations in the classroom. Additional work in the form of homework and/or projects/presentations may be assigned on an irregular basis. The schedules for these assignments will be determined as the course proceeds.

Organization:
For a successful completion of this course attendance is required and note-taking is recommended. The reference book will be used as supplemental instructional material only.

If a class is missed, the student is responsible for the missed material.

There will be one traditional mid-term examination after about half of the course and a final comprehensive examination, which must be taken when scheduled. The form of both examinations will be determined as the course proceeds.

By default, the overall grade will be determined by:

Homework/Projects:	20%
Midterm:	40%
Final:	40%

Prepared by: Rolf Lustig, January 2017