CHE 611. Thermodynamics. 3 credits, 3 contact hours.

Course Syllabus

This course begins with reviewing the laws of thermodynamics. Specific focus is on phase equilibria, including liquid-gas, liquid-liquid, and solid-liquid systems. Students learn to develop and use phase diagrams, analyze complex thermodynamic systems, including those experiencing chemical reactions. Foundations of the statistical thermodynamics are introduced. Students learn using common thermodynamic references, including NIST Chemistry Webbook. Finally, energy and exergy-based analytical approaches are compared as related to engineering applications.

This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

Instructor: Prof. E.L. Dreizin, dreizin@njit.edu

Office hours by appointment

Text: D. A. McQuarrie, J. D. Simon. Molecular Thermodynamics
University Science books, Sausalito, CA, 1999.
ISBN 1-891389-05-X

Reference: Introduction to Chemical Engineering Thermodynamics
by J.M. Smith, H.C. Van Ness, M.M. Abbott; M.T. Swihart, 9th edition, 2022
ISBN10: 1260721477
ISBN13: 9781260721478

Format of midterms and final exams:

The assignments will be given for take-home exams. At least five days will be available to complete the assignment and submit it through Canvas. The assignments will be given the week before the scheduled exam. After assignments are submitted, each student will be required to pass an oral part of the exam. A time slot for the oral exam will be scheduled individually with each student, preferably during the time period when the exam is scheduled. The oral part of the exam may be set up in person or via Zoom.

Grading:

Quiz 1: 25%
Quiz 2: 25%
Project: 10%
Final Exam: 35%
In-class assignments: 0.5% per week

Students must notify the instructor in writing of any conflicts between course requirements and religious observances. Students expecting to miss classes or exams due to religious observances must submit a written list of dates to the instructor, ideally by the end of the second week of class, but no later than two weeks before the anticipated absence.

Topics by weeks, approximate breakdown

Topic #	TOPICS
1	Intro; Zeroth Law; First Law
2	Properties of fluids, Equations of state
3	Entropy, Second Law
4	Third Law; T/D potentials, Maxwell Relations; Project groups formed
Q1	Quiz
5	Intro to phase equilibria, chemical potential, fugacity
6	Vapor-Liquid Equilibrium; Intro to Liquid-Liquid Solutions
7	Activity; Solutions; Project topics selected
8	Solid-Liquid Solutions, Colligative Properties
Q2	Quiz
9	Chemical Equilibrium
10	Exergy or availability
P	Project presentations
C	Review/Consultation