

Fall 2018

# CHE 342 - Chemical Engineering Thermodynamics II

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# ChE 342: Chemical Engineering Thermodynamics II

## Fall 2018

**Instructor:** Dr. Gennady Gor, Assistant Professor

Office/Lab: 357/321A Tiernan Hall, Phone: 973-596-2944, E-mail: gor@njit.edu

**Class:** Tuesday, Thursday, 2:30-3:50 PM; Room: Cullimore Lecture Hall 2

**Office Hours:** Tuesday, Thursday, 4:00-5:00 PM; Room: Tiernan Hall 373

### Course Description and Requirements

This course will cover heat engines, refrigeration, thermodynamics of mixtures, phase equilibrium and chemical-reaction equilibrium. Solid knowledge of chemical engineering thermodynamics including these topics is necessary to succeed in more advanced chemical engineering courses. In particular, the current course is a pre-requisite for ChE 349 Kinetics and Reactor Design and ChE 360 Separation Processes I.

**Pre-Requisites:** ChE 230, Math 211 (or Math 213), Chem 236

### Course Objectives

**Taking this course, a motivated student will learn to:**

- Use the laws of thermodynamics to analyze basic power and refrigeration cycles
- Apply both fundamental and practical knowledge of thermodynamics to the design of basic power and cooling cycles
- Apply concepts of thermodynamic to solutions
- Determine equilibrium compositions of chemical reaction products and two-phase liquid/vapor mixtures.

### Learning Materials

**Textbook** Required: Fundamentals of Chemical Engineering Thermodynamics, Kevin D. Dahm, Donald P. Visco (2014). ISBN: 1111580707

Additional: Introduction to Chemical Engineering Thermodynamics, Seventh Edition, J.M. Smith, H.C. Van Ness and M.M. Abbott, McGraw-Hill (2005). ISBN: 0-07-310445-0

**Other Learning Material:** Lecture notes will be posted on Moodle. Reading lecture notes will be necessary but not sufficient for preparation for quizzes and exams. Therefore reading the textbook before each class will be necessary.

**Calculator:** A high-end calculator (TI-83, TI-84 or TI-84SE) is required for solving exam problems.

**Software:** Use of Matlab, Python or other computational software is strongly recommended for working on homework assignments.

## Course Outline

Wk	Date	Topic	Dahm	Van Ness	Exam
1	Sep. 4, 6	Heat Engines	Ch. 3, 4, 5	Ch. 8	Quiz
2	Sep. 11, 13	Heat Engines	Ch. 5	Ch. 8	Quiz
3	Sep. 18, 20	Refrigeration Processes	Ch. 5	Ch. 9	Quiz
4	Sep. 25, 27	Gas Liquefaction	Ch. 5	Ch. 9	Quiz
5	Oct. 2, 4	Mixtures and Solutions	Ch. 9	Ch. 11	Exam #1
6	Oct. 9, 11	Mixtures and Solutions	Ch. 9	Ch. 11	Quiz
7	Oct. 16, 18	Vapor-Liquid Equilibrium	Ch. 8, 10	Ch. 10	Quiz
8	Oct. 23, 25	Vapor-Liquid Equilibrium	Ch. 10	Ch. 10	Quiz
9	Oct. 30, Nov. 1	Vapor-Liquid Equilibrium	Ch. 10	Ch. 10	Quiz
10	Nov. 6, 8	Models for Mixtures VLE	Ch. 11	Ch. 12	Exam #2
11	Nov. 13, 15	Models for Mixtures VLE	Ch. 11	Ch. 12	Quiz
12	Nov. 20	Models for Mixtures VLE	Ch. 12	Ch. 12	Quiz
13	Nov. 27, 29	Chemical Reaction Equilibria	Ch. 14	Ch. 13	Quiz
14	Dec. 4, 6	Chemical Reaction Equilibria	Ch. 14	Ch. 13	Quiz
15	Dec. 11	Chemical Reaction Equilibria	Ch. 14	Ch. 13	Quiz
16	Dec. 15-21				Final

## Assessment and Grading

**Homework:** Homework assignments will be given regularly. The assignments will be posted on Moodle. The homework (including both reading and problems assignments) must be completed by Tuesday's class of the week following the assignment, unless otherwise is explicitly stated. The homework will not be graded. The homework material will be included in quizzes.

**Quizzes:** Regular quizzes will be given based on the homework material, including both concepts and problems. The quizzes will not be announced in advance, so please be prepared to have a quiz during every class. No make-up quizzes will be allowed. All quizzes will be closed book with no material allowed. The quizzes will typically take place at the beginning of the class.

**Exams:** There will be two midterm exams (1.5 hours long) and one final exam (2.5 hours long). All exams will be closed book, however a handwritten sheet (double-sided, letter size) with materials used to prepare for exams will be allowed. Shared or copied preparation sheets, as well as use of any electronic materials will be considered as a violation of academic integrity.

Quizzes	25%
Midterm #1	20%
Midterm #2	25%
Final Exam	30%
	100%

Percent	Grades
above 85%	A
above 80%	B+
above 75%	B
above 70%	C+
above 65%	C
above 55%	D
below 55%	F

## Important Dates

- Midterm exam #1: the week October 2 or 4
- Midterm exam #2: the week November 6 or 8
- Final exam: between December 15 and 21
- Withdraw Deadline: November 12, 2018

## Policies

**NJIT Honor Code:** The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.

**Special Needs:** If you need accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

## Lectures

- Attendance is strongly recommended. Attendance sheet has to be signed at the beginning of each class. The examples discussed in the class are not necessarily from the main textbook and therefore missing a class will have consequences for preparation to quizzes and exams.
- The classes start at 2:30, and the students must be in class by that time. Being late to class may have consequences for the grade, since many of the classes will start from quizzes.
- Electronic devices other than calculators (laptops, tablets, cell-phones etc.) are not permitted during the classes. No audio or video recording is allowed.
- Cellphones should be turned off during both lectures and exams and not allowed under any circumstances.
- Laptops will be permitted only if necessary for class activities.
- No eating any time during the classes.

## Course materials, office hours and correspondence

- The course Moodle page is the main platform for delivering information about the course. All relevant course materials and assignments will be posted on Moodle, so a student should check it regularly.
- The students have to upload a professional-looking head shot for their Moodle profile.

- The students are strongly encouraged to attend Office Hours held bi-weekly. Long questions, which require derivations will be discussed only during the Office Hours and will not be answered by email. Questions regarding grades can be discussed only during the Office Hours.
- E-mail and Moodle correspondence is intended only for quick questions. Questions which require a detailed discussion should be discussed in person during the Office Hours.
- All correspondence should be conducted in a professional style, using formal English.
- To assure quick response to your emails, please add “ChE342” in the subject of your emails.
- The instructor reserves the right not to respond to emails if the email does not have a greeting or a signature.

### Exams, Quizzes and Grades

- A letter grade is based on the final score, calculated using an Excel spreadsheet in accordance with the Tables given in this syllabus. The assigned letter grade is final and cannot be negotiated.
- A student can dispute the exam scores within a week after the announcement of the score. Exam scores can be disputed during the official Office Hours, not during class time or via email.
- The graded exams must be returned within a week to be saved for the department course assessment initiative. If a student does not return the exam, the grade for this exam is zeroed.
- Students will get 0 for not showing to quizzes, exams, or any other course activity. If students miss an exam due to extreme circumstances (such as a medical problem), they need to notify the instructor via email before the beginning of the exam, and bring proof of the circumstance to the Dean of Student’s office. Only in this case of official approval from the Dean of Student’s office, may a make-up be given at the discretion of the instructor.
- A student must show as many details when solving a problem during an exam or a quiz. Not showing the work will cause losing points even if the final answer is correct.
- Partial credits can be given for solving the exams problems.
- No partial credit will be given if there is not enough details to follow.
- The final answer should be always evaluated with respect to its reasonability. No partial credit will be given if the final answer is wrong and unreasonable, and it is not stated.
- There will be no partial credits for the questions/problems quizzes.
- The grade for quizzes will be calculated based on  $N - 2$  best quizzes, where  $N$  is the number of all quizzes within the semester. Typically  $10 \leq N \leq 12$  Therefore, one can miss up to two quizzes and, if the remaining quizzes are still get the whole 25% for the quizzes part of the grade.
- Student handwriting must be legible in order to receive points.
- A student coming to dispute a grade has to bring completed homework sheets. No discussion of grades will be held without completed homework.