ChE 230 Chemical Engineering Thermodynamics I
Fall 2025

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Class: Tuesday, Thursday, 1:00 PM – 3:05 PM; Room: Mechanical Engineering Center 224
Office Hours: Tuesday, 3:05 PM – 4:00 PM; Room: Tiernan Hall 373

Course Web Page: https://njit.instructure.com/courses/55863

Course Description and Requirements

This course introduces the basic concepts of the laws of thermodynamics and their applications to chemical engineering processes. Thermodynamics relates work, heat, temperature, and states of matter to each other. From the laws of thermodynamics, an enormous amount of information about the relationships among equilibrium parameters/properties for a system can be deduced. This information can then be applied to physical, chemical, and biological systems including chemical process design, energy production, materials processing, and cellular processes.
Pre-Requisites: CHEM 126, MATH 112, PHYS 111. **Co-requisites:** MATH 211 (or MATH 213)

Course Objectives

Taking this course, a student should be able to:

1. Apply conservation principles (mass and energy) to evaluate the performance of simple engineering systems and cycles.
2. Evaluate thermodynamic properties of simple homogeneous substances.
3. Analyze processes and cycles using the second law of thermodynamics to determine maximum efficiency and performance.
4. Discuss the physical relevance of the numerical values for the solutions to specific engineering problems and the physical relevance of the problems in general.
5. Evaluate the validity of the numerical solutions for specific engineering problems.

Learning Materials

Required Textbook: Milo D. Koretsky, "Engineering and Chemical Thermodynamics", 2nd Edition, J. Wiley & Sons Inc., (2013). ISBN 978-0470259610.
Other Learning Material: The students take notes during the class. Well-documented class notes will serve as the main learning material. Additional materials will be posted on Canvas: https://njit.instructure.com/courses/55863

Technology

Calculator: A high-end calculator (TI-83, TI-84 or TI-84SE) is required for solving homework, quiz, and exam problems. The calculator should be brought to every class.
Computer: Some homework assignments and classes will require use of laptops. These classes will be announced, and the students have to bring their laptops to these classes. The laptops' batteries have to be charged, as power outlets may not necessarily be available. In-class use of computers at times other than for in-class activities is not permitted.
Software: Excel of similar software is necessary to work on some of the computational assignments. Use of Matlab, Python or other computational software is strongly recommended for working on homework assignments.
OS: Any OS will work: Linux, Windows or MacOS, as long as it supports the necessary software.

Course Outline

Class	**Day**	**Date**	**Topic** (preliminary, subject to changes)
1	Tuesday	2-Sep	Basic Thermodynamics Concepts (Ch. 1)
2	Thursday	4-Sep	-
3	Tuesday	9-Sep	-
4	Thursday	11-Sep	The First Law of Thermodynamics (Ch. 2)
5	Tuesday	16-Sep	-
6	Thursday	18-Sep	-
7	Tuesday	23-Sep	-
8	Thursday	25-Sep	-
9	Tuesday	30-Sep	The Second Law of Thermodynamics (Ch. 3)
	Thursday	2-Oct	Wellness Day. No class.
10	Tuesday	7-Oct	Midterm 1
11	Thursday	9-Oct	-
12	Tuesday	14-Oct	-
13	Thursday	16-Oct	-
14	Tuesday	21-Oct	-
15	Thursday	23-Oct	Equations of State and Intermolecular Forces (Ch. 4)
16	Tuesday	28-Oct	-
17	Thursday	30-Oct	-
18	Tuesday	4-Nov	Midterm 2
19	Thursday	6-Nov	Nov. 10 is the last day to withdraw
20	Tuesday	11-Nov	-
21	Thursday	13-Nov	-
22	Tuesday	18-Nov	The Thermodynamic Web (Ch. 5)
23	Thursday	20-Nov	-
24	Tuesday	25-Nov	-
	Thursday	27-Nov	Thanksgiving Day. No class.
25	Tuesday	2-Dec	-
26	Thursday	4-Dec	-
27	Tuesday	9-Dec	-
28	Thursday	11-Dec	Last Day of Classes
		14-Dec	Final exams begin
		20-Dec	Final exams end

Important Dates

- Midterm exams: October 7, November 4, 2025
  The dates can be adjusted depending on the pace of the class and other circumstances
- Final exam: between December 14 and 20, 2025
- Last day to withdraw from classes: November 10, 2025

Assessment and Grading

Homework: Homework assignments will be given regularly, expect approximately ten assignments per semester. The assignments will be posted on Canvas. The homework (including both reading

and problems assignments) must be completed within 6 days, unless otherwise is explicitly stated. E.g. if the homework is assigned on Thursday it is due on next Wednesday at 11:59PM. The written part of the homework should be uploaded on Canvas and will be graded for completion (weight of each homework is 0.4% of the total grade). All the uploaded files for homeworks should be in PDF format, unless otherwise is explicitly stated. If a cell-phone camera is used for scanning, a PDF file should be generated using one of the tools for creating legible, correctly oriented documents (e.g. CamScanner App).

Homework will be also assessed through the problem quizzes. The reading assignments will be assessed through the concept 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 any class. All quizzes will be closed book. The quizzes will often take place at the beginning of the class, so being on time is strongly encouraged.
Missed Quizzes: There will be approximately 10 quizzes. Two quizzes will be dropped for the grade calculations. Therefore, one can miss up to two quizzes without any consequence for the quizzes part of the grade. Two quizzes will be dropped irrespective of whether they were missed with an excused or unexcused absence.

If a student misses more than two quizzes they receive zero for all the missed quizzes above the two which are dropped. If more than two quizzes are missed due to a legitimate reason (absence approved by the Dean of Students), the 3rd, 4th, etc. quizzes are excluded from the calculation, and the weights of the quizzes are scaled proportionally. Make-up quizzes will not be offered.

Exams: There will be two midterm exams and one final exam. The final exam will be cumulative. All exams will be closed book, however a handwritten formula sheet (double-sided, letter size) for midterm exams will be allowed. The formula sheet may only include formulas and notes about their application. You may not include worked-out problems on your formula sheet. Formula sheets will be collected with the exam. For the final exam, two sheets are allowed.
Missed Exams: If a student misses an exam, they receive a zero for it, unless there is a documentation from the Dean of Students, confirming an excused absence. In this case the student will be allowed to take a make-up exam. Note that the assignment on the make-up exam will differ from the original assignment. The opportunity to take a make-up exam will be offered only during the official office hours within two weeks after the missed exam or after the student's return from absence (whichever is later).

Late submissions: Late submissions (homeworks, quizzes, exams) will not be accepted.

Homeworks and Quizzes	20%
Midterm Exam 1	25%
Midterm Exam 2	25%
Final Exam	30%
	100%

Percent	Grades
$\geq 85\%$	A
$\geq 80\%$	B+
$\geq 75\%$	B
$\geq 70\%$	C+
$\geq 65\%$	C
$\geq 55\%$	D
$< 55\%$	F

Policies on Assignments and Grading

- 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. There is no curve.
- A student must show as many details as possible when solving a problem during an exam or a quiz. Not showing the work will result in losing points even if the final answer is correct.
- Partial credit can be given for solving the exam problems.
- No partial credit will be given if there is not enough details to follow.
- The final answer should always be 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.
- Student handwriting must be legible in order to receive points.
- 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.

Other Policies

In-class Policies

- Attendance is strongly recommended and will be taken. The examples discussed in the class are not necessarily from the main textbook and therefore missing a class will have consequences for exam preparation.
- The classes start at 1:00, and the students must be in class by that time. Being late to class may have consequences for the grade, since quizzes will be often given in the beginning of the class.
- Cellphones should be turned off during lectures, in-class activities, quizzes, and exams.
- Laptops will be permitted only when necessary for in-class activities.
- No photo, audio, or video recording is allowed without explicit permission.
- Eating is not allowed during class.

Correspondence, Canvas and Office Hours

- All the communications should be done via course email, gorcheme@gmail.com, so that the TAs have the opportunity to help. E-mails will be responded to within 24 hours during the work days.
- The students have to upload a professional-looking head shot for their Canvas profile.
- Canvas messages are not checked, please use E-mail instead.
- The students are strongly encouraged to attend Office Hours.
- Questions regarding grades can be discussed only during the Office Hours.

Statement on Academic Integrity: (as formulated by Provost Pelesko) "*Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and*

following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"

More on Academic Integrity Among other things, the following actions are considered violations of academic integrity:

- Cooperation on any of the graded assignments
- Using online resources (e.g. Chegg, ChatGPT, etc.) to solve graded assignments
- Sharing or posting online any course resources or assignments without an explicit permission of the instructor

Special Needs: If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu, or visit us in Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is required.