

Fall 2020

## CHE 230-003: Chemical Engineering Thermodynamics I

Nellone Reid

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# ChE 230: Chemical Engineering Thermodynamics I

## Fall 2020

**Instructor:** Dr. Nellone Reid, Senior University Lecturer

**Office:** 364 Tiernan Hall, Phone: 973-596-2995, E-mail: nellone.e.reid@njit.edu

**Webex Link:** <https://njit.webex.com/meet/ner3>

**TA:** TBD

**Class Hours:** Tuesday, 2:30 PM – 4:35 PM; Wellness and Events Center Lecture Hall  
Friday, 7:30 – 9:35 AM; Kupfrian Hall 205

**Office Hours:** Tuesday, 10:00 AM – 12:00 PM  
Wednesday, 2:00 PM – 3:00 PM

## Course Description and Requirements

Thermodynamics is a science and, more importantly, an engineering tool used to describe processes that involve changes in temperature, transformation of energy, and the relationships between heat and work. The three introductory courses in the sophomore year, ChE 210, ChE230 and ChE240, and ChE 342 are the basic courses in chemical engineering fundamental principles. What you learn in these three courses will appear over and over again throughout your junior and senior courses.

**Pre-Requisites:** Chem 126, (or Chem 123), Math 112, Phys 111, (or Phys 106). Corequisite Math 211 (or Math 213).

## Course Objectives

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

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

## Learning Materials

**Textbook** Required: Introduction To Chemical Engineering Thermodynamics (ISBN-13: 978-1259696527); 8th edition; (note: That's ok if you have 7th edition)

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

**Other Learning Material:** 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

Week	Date	Topic	Van Ness (Ch)	Assessment	Group	
1	Sept. 1	Introduction to Chemical Engineering Thermodynamics	Ch. 2	Homework	1	
	Sept. 4				2	
2	Sept. 8				<b>Quiz</b>	2
	Sept. 11					1
3	Sept. 15	Volumetric Properties of Pure Fluids	Ch. 3	Homework	1	
	Sept. 18				2	
4	Sept. 22				<b>Quiz</b>	2
	Oct. 2					1
5	Oct. 6			<b>Exam 1</b>	1	
	Oct. 9	Thermodynamic Properties of Fluids	Ch. 6		2	
6	Oct. 13	Residual Properties		Homework	2	
	Oct. 16				1	
7	Oct. 20	Generalized Property Correlations for Gases			<b>Quiz</b>	1
	Oct. 23				2	
8	Oct. 27	Heat Effects	Ch. 4	Homework	2	
	Oct. 30				1	
9	Nov. 3				<b>Quiz</b>	1
	Nov. 6					2
10	Nov. 10			<b>Exam 2</b>	2	
	Nov. 13	Second Law of Thermodynamics	Ch. 5		1	
11	Nov. 17	Second Law of Thermodynamics		Homework	1	
	Nov. 20				2	
12	Nov. 24	Second Law of Thermodynamics			Homework	2
<b>Thanksgiving Break</b>						
13	Dec. 1	Thermodynamics of Flow Processes	Ch. 7		1	
	Dec. 4				2	
14	Dec. 8	Review	Review		2	
<b>Final</b>						

## Assessment and Grading

Homework/Quizzes	25%
Exams	45%
Final Exam	30%
	100%

**A = > 90; B+ = 89.99 – 85; B = 84.99 – 75; C = 74.99 – 65; D = 64.99 – 60; F = < 59.99**

## 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 ([Chantonette.Lyles@njit.edu](mailto:Chantonette.Lyles@njit.edu); 973-596-5417), 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 the designated time above, 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 should 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 “ChE230” 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 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.

- 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 makeup 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.
- 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.

### **Rules Governing Online Exams/Quizzes**

These rules specifically apply to online exams and quizzes conducted via Webex and Canvas. They are generally applicable and subject to change for a specific exam/quiz in view of the needs of the instructor to ensure that potential misconduct is prevented. Hence, the rules below are general, and additional more stringent rules may be imposed during the proctoring of a specific exam/quiz, which will be announced to the students.

1. Please sign in webex, turn webcam on, and mute mode so that exam can start the exam at the designated time promptly. Also make sure student opens a screen on Canvas/Quizzes.
2. Please make sure that the webcam shows student's desk and papers and the upper half of his/her body. So, please optimize the webcam before the exam starts.
3. Please get all materials needed (notes, book, calculator, cell phone, water, candy, chocolate, coffee, etc.) on the desk and visit the restroom before the exam because leaving the desk during the exam is considered cheating. If student has any medical condition that requires a visit to the restroom during the exam, please inform the instructor before the exam indicating the medical situation.
4. If students have questions during the exam, they must use chat functionality in webex. If the question pertains to the whole class, instructor will respond to everybody in chat or by voice.
5. Do not worry about the webcam during the exam unless it freezes for the whole duration; then instructor will contact you. Due to bandwidth issues, sometimes, the videos freeze. Do not worry. Just make sure that turn on your camera at the beginning of the exam, optimize the view, and do NOT turn it off!
6. The submission procedure for Canvas starts with generation of a PDF file of your answer to an exam question through its uploading to the Quiz question page in Canvas. Please make sure you write your name on all answer sheets. Also, when you download the pdf from your gmail account to your laptop/pc, please click on the file name and change the name of the pdf file from what CamScan generates to Lastname Exam2 Q1. Then, submit the renamed pdf file to Canvas.
- 7. The use of cell phone is reserved for scanning and sending email only toward the end of each question period. The use of laptop/pc is reserved for webex, reading the question on Canvas, and uploading your solution PDF to Canvas. Student's use of cell phone beyond the above task or frequent use of laptop/pc will be flagged for misconduct investigation.**
8. If student finishes a question early (before the 5-6 min that should be reserved for scanning/uploading toward the end of duration allotted for each question), he/she should go over the solution because there are many potential mistakes the student might have made like unit conversions, calculations, etc. etc. Toward the last 5-6 minutes of time allotted for each question, just spend the time for submission. There will be NO EXCUSE and the student will get 0 score if he/she cannot submit the answer sheets via Canvas during the allotted time for each question. Please use the allotted time for each question wisely, watch the time counter in Canvas and allow for 5-6 min for upload.

9. In a truly extenuating circumstance like your laptop crashes, wifi dies, etc., use your cell phone to inform me via webex or gmail email indicating what happened. Then connect to Canvas and see the question or email me and I will send you the question. Only for these extenuating circumstances, at the end of the exam, student will immediately send me an email with a single PDF attachment of all the student's work for Q1, Q2, etc. and explain his/her circumstance in detail. Instructor may not accept student's explanation and ask him/her to retake another exam with different questions.

### **CRITICAL NOTES TO STUDENTS FOR ONLINE EXAMS**

1. **Do NOT use scrap paper.** Write directly on the answer sheet that you plan to scan and submit. Your scanned papers will be used for grading, not your scrap papers.

2. **SHOW ALL WORK, do not skip anything!!!** Write down all fundamental equations, numerical values/units of all variables and parameters. Show all intermediate calculations by plugging numbers into the equations. Show results of intermediate calculations. You will lose a lot of points if your equations are missing. **You will get minimal score, mostly 0, for each step regardless whether your answer is correct or not if the calculations and numbers leading to the answer are missing.**

3. **If the values of parameters, variables, and intermediate calculations are missing or worse incorrect, yet your intermediate calculations and/or final answer are correct, first you will get minimal partial scores, close to 0 points per step, and additionally your paper will be flagged for misconduct investigation.**