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Fall 2021

# CHE 230-003: Chemical Engineering Thermodynamics I

Nellone Reid

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# ChE 230: Chemical Engineering Thermodynamics I
# Fall 2021

**Instructor:** Dr. Nellone Reid, Senior University Lecturer
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**Webex Link:** https://njit.webex.com/meet/ner3
**TA:** Fengqiao Li
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**Class Hours:**   Tuesday, 1:00 – 3:05 PM; Tiernan Hall 106
                      Friday, 8:30 – 10:35 AM; Kupfrian Hall 105
**Office Hours:**  Tuesday, 10:00 AM – 12:00 PM
                      Thursday, 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 | Lecture Topic | Van Ness (Ch) | Assessment |
|---|---|---|---|---|
| 1 | Sept. 3 | | | Homework |
| 2 | Sept. 7 | Introduction to Chemical Engineering Thermodynamics | Ch. 2 | |
| | Sept. 10 | | | **Quiz** |
| 3 | Sept. 14 | | | |
| | Sept. 17 | | Ch. 3 | Homework |
| 4 | Sept. 21 | Volumetric Properties of Pure Fluids | Ch. 3 | |
| | Sept. 24 | | Ch. 3 | **Quiz** |
| 5 | Sept. 28 | | Ch. 3 | |
| | Oct. 1 | | | **Exam 1** |
| 6 | Oct. 5 | Thermodynamic Properties of Fluid | | |
| | Oct. 8 | Rsesidual Properties | | Homework |
| 7 | Oct. 12 | | | |
| | Oct. 15 | Generaliized Property Correlations for Gases | | **Quiz** |
| 8 | Oct. 19 | | Ch. 6 | |
| | Oct. 22 | | | |
| 9 | Oct. 26 | Heat Effects | Ch. 4 | Homework |
| | Oct. 29 | | | |
| 10 | Nov. 2 | | | **Quiz** |
| | Nov. 5 | | | |
| 11 | Nov. 9 | | | **Exam 2** |
| | Nov. 12 | | | |
| 12 | Nov. 16 | Second Law of Thermodynamics | Ch. 5 | Homework |
| | Nov. 19 | | | |
| 13 | Nov. 23 | | | Homework |
| | Nov. 26 | **Thanksgiving Break** | | |
| 14 | Nov. 30 | | | |
| | Dec. 3 | Thermodynamics of Flow Processes | Ch. 7 | **Quiz** |
| 15 | Dec. 7 | | | |
| | Dec. 10 | Last Day of Classes - Final Review | | |

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