# Syllabus ChE 230 Chemical Engineering Thermodynamics I Spring 2025

# Otto H. York Department of Chemical & Materials Engineering New Jersey Institute of Technology

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January	20	Monday	Martin Luther King, Jr. Day	
January	21	Tuesday	First Day of Classes	
January	25	Saturday	Saturday Classes Begin	
January	27	Monday	Last Day to Add/Drop a Class	
January	27	Monday	Last Day for 100% Refund, Full or Partial Withdrawal	
January	28	Tuesday	W Grades Posted for Course Withdrawals	
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund	
			for Partial Withdrawal after this date	
February	17	Monday	Last Day for 50% Refund, Full Withdrawal	
March	10	Monday	Last Day for 25% Refund, Full Withdrawal	
March	16	Sunday	Spring Recess Begins - No Classes Scheduled - Univ Open	
March	22	Saturday	Spring Recess Ends	
April	3	Thursday	Wellness Day - No Classes Scheduled - University Open	
April	7	Monday	Last Day to Withdraw	
April	18	Friday	Good Friday - No Classes Scheduled - University Closed	
April	20	Sunday	Easter Sunday - No Classes Scheduled - University Closed	
May	6	Tuesday	Thursday Classes Meet	
May	7	Wednesday	Friday Classes Meet	
May	7	Wednesday	Last Day of Classes	
May	8	Thursday	Reading Day 1	
May	9	Friday	Reading Day 2	
May	10	Saturday	Final Exams Begin	
May	16	Friday	Final Exams End	
May	18	Sunday	Final Grades Due	

#### Spring 2025 AcademicCalendar

#### **General course information**

**CHE 230 - Chemical Engineering Thermodynamics I.** Thermodynamics serves as a powerful engineering tool used to describe processes that involve changes in temperature, transformation of energy, and the relationships between heat and work. Thermodynamics is the basic course in chemical engineering fundamental principles. The fundamentals of thermodynamics are applied to chemical engineering processes. Thermophysical properties and their engineering correlations are covered. Applications include chemical engineering and related fields such as environmental and biomedical engineering. Basic thermodynamic concepts underly Fluid Mechanics and Heat Transfer.

**Days/ Times/Location:** Tuesday and Thursday, 3:15 PM - 5:20 PM, FMH 409 **Pre-requisites:** Chem 126, (or Chem 123), Math 112, Phys 111, (or Phys 106). Corequisite Math 211 (or Math 213). **Course coordinator/instructor** Dr. Boris Khusid Faculty Memorial Hall 215 (office); 973-596-3316 (phone); Please use <u>khusid@njit.edu</u> for communication <u>http://chemicaleng.njit.edu/people/khusid.php</u> (website)

**Office Hours:** Faculty Memorial Hall R215, Tuesday, 8:30 am-11:30 am by arrangement to ensure proper social distancing.

**Note:** You can always schedule an appointment or a WebEx session by email if the office hour time conflicts with your classes.

# Specific course information

**Textbook Required:** *J.M. Smith, H.C. Van Ness, M.M. Abbott, M. Swihart, Introduction to Chemical Engineering Thermodynamics, 9th edition,* McGraw Hill, 2022, ISBN10: 1260721477; ISBN13: 9781260721478. <u>https://www.mheducation.com/highered/product/introduction-chemical-engineering-thermodynamics-van-ness-abbott/M9781260721478.html</u>

- 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.
- Lecture notes will be posted on the Canvas class website to provide a summary of the course material. Please print and have them along with your textbook and computer in the class. You will make additional notes during the lectures.
- The use of artificial intelligence (AI) tools will be helpful in preparing for classes.
- 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 office hours.
- E-mail correspondence is intended only for quick questions. Questions which require a detailed discussion should be discussed in person during the office hours.
- For quick response to your emails, please add "ChE230" in the subject of your emails.

**Required Software:** MS Office, MATLAB, Adobe Reader. All software can be downloaded from NJIT IST webpage. Students will have access to/accounts in Canvas via NJIT directly. If you do not have access for any reason, please contact NJIT Help Desk as soon as possible.

# Course delivery: Face-to-face mode

Specific goals for the course: The student will be able 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.

# Tentative weekly listing of topics (15-week schedule)

Weak Topic Resources
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1	Introduction	Ch 1	
2-3	The First Law and Other Basic Concepts	Ch 2	
3-5	Volumetric Properties of Pure Fluids	Ch 3	
5-7	Heat Effects	Ch 4	
7-8	Exam 1		
8-9	The Second Law of Thermodynamics	Ch 5	
9-10	Thermodynamic Properties of Fluids	Ch 6	
10-11	Applications of Thermodynamics to Flow Processes	Ch 7	
11-12	Production of Power from Heat	Ch 8	
12-13	Exam 2		
13-15	Refrigeration and Liquefaction	Ch 9	
15	Presentation of projects/ Course review		

Changes to the above outline may occur, depending on the overall performance of the class and the time required to cover the most important concepts and approaches.

#### Grading

Your performance will be graded on an absolute scale, so your grade is not affected by how others do. Final letter grades will be awarded based on your weighted average score as follows:

Homework +Quizzes +Short Project	20%
Midterm exam 1	25%
Midterm exam 2	25%
Final exam	30%

Letter grades will be assigned automatically by an Excel code based on the following totals:

A (Superior)	85% and above
B+ (Excellent)	80%-84.9%
B (Very Good)	75%-79.9%
C+ (Good)	70%-74.9%
C (Acceptable)	65%-69.9%
D (Minimum)	55%-64.9%
F (Inadequate)	Less than 54.9%

For success, you are strongly advised to

**<u>Review/work on</u>** the material of the previous lecture before the next class.

**<u>Read</u>** the lecture notes and covered sections of the required textbook.

<u>Use</u> the printed lecture notes in class along with the computer and calculator.

Take additional notes during the lectures.

<u>Work out</u> all derivations and examples in the lecture notes and in-class examples on your own after each lecture.

In case of questions, please see the instructor during Office Hours or raise questions in the class. Do not delay it to the exam week.

# Policies on assignments/exams and classroom policy

Homework is an integral part of the course:

- Homework (HW) assignments will be posted on Canvas and <u>must be uploaded into</u> Canvas in DOC or PDF format by the due date. <u>Do not send images taking with cell</u> <u>phone</u>! Late HW will not be accepted for grading without an excuse authorized by the NJIT Dean of Students Office. All HW assignments will be individual.
- Homework format: Failure to observe the following HW conventions will result in a downgrade of the HW score.
- File name should include student's first and last names, HW assignment No.
- **Header:** The top of each sheet of a HW assignment must contain the following information from left to right:

Student's first	Course	HW assignment	Date	Page No/total
& last names	No	No	due	pages

- Writing: Homework should be printed carefully and legibly. If it can't be read, it can't be graded!
- **Problem-solution format**: Problems should be clearly labeled and include the HW problem number, brief problem statement and often diagram to illustrate the process, and present basic steps and calculations.
- **Calculations** Homework should include complete calculations for every calculation presented to demonstrate how results were obtained.
  - Include all units for each term in each equation.
  - Indicate the final solution by boxing it in with a rectangular.
- Feedback on the homework will be provided during lectures, solutions will be discussed and posted on the class website. Therefore, late homework will not be accepted!
- Each problem will be graded individually (up to 5 points). You are allowed to discuss HW problems with peer students, but cannot copy the solution.

# **Group Project Assignment**

Form a team to carry out a short review project on applications of the course topics to chemical processes & equipment, prepare and post the progress/final reports & slides on the **class website**, and give an **oral presentation** to the class.

**Guidelines** for preparing a project and **detailed criteria** for grading the project report and oral presentation are posted on the class website.

**CME Department policy on electronic devices:** Electronic devices (i.e., cell phones, tablets, and laptops) are allowed for using in class only when the work assigned requires live external connection for data, online meetings or during in-class presentations.

# **Classroom policies:**

• Attendance in the classroom meeting is required. There is a high correlation between failure and poor class attendance.

- Eating and drinking are not allowed during the class.
- Behave professionally and show respect to fellow students and the instructor.
- Cellphones should be turned off during the class.

# Quizzes:

There will be quizzes occasionally in the class. If you miss the class, you will miss the quiz that day. *There will be no makeup quiz*.

#### Exams:

Midterm and final exams are open book & lecture notes, calculators and computers can be used. The date of a midterm exam will be announced a couple of weeks before.

- The comprehensive final exam during Finals' week will cover the course materials.
- The midterm and final exams must be completed individually, in accordance with the NJIT Honor Code.
- Use the HW format for presenting solutions of exam problems.
- Each exam problem will be graded independently (up to 5 points).

• A missed exam will be averaged into the final grade as zero, unless an excuse is obtained. Excuses are granted only for very serious circumstances attested to by the NJIT Dean of Student Office. A student who has been excused will be required to take a makeup exam.

• In the case of an excused absence from the final examination, a student will receive an incomplete grade until a make-up exam is completed.

#### Disputing a grade on tests/assignments:

If a student has questions about the grade received for an exam, homework, or classwork he/she must talk to the instructor (or the teaching assistant where appropriate) **no later than a week** after the graded activity has been returned to students. Exam scores can only be disputed during the official Office Hours, not during class time or via email.

Accommodations due to disability: Students who need academic accommodations in connection with a disability must initiate the request with NJIT Office of Accessibility and Resources (OARS). Students need to register with the Office of Accessibility in order to officially disclose their disability status to the College and to determine eligibility for appropriate reasonable accommodations (including any prior IEPs or 504s). Please contact OARS at the start of the semester (or as soon as possible) to coordinate any accommodation request/s: <a href="https://www.njit.edu/accessibility">https://www.njit.edu/accessibility</a>, Room 201 (Kupfrian Hall) or email us at OARS@NJIT.EDU.

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: <a href="https://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf">https://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf</a>.

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 <a href="https://www.njit.edu/dos/">https://www.njit.edu/dos/</a>