Syllabus
ChE 230 Chemical Engineering Thermodynamics I
Spring 2024

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

Spring 2024 AcademicCalendar

January	15	*Monday*	*Martin Luther King, Jr. Day*
January	16	Tuesday	First Day of Classes
January	20	Saturday	Saturday Classes Begin
January	22	Monday	Last Day to Add/Drop a Class
January	22	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	23	Tuesday	W Grades Posted for Course Withdrawals
January	29	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	12	Monday	Last Day for 50% Refund, Full Withdrawal
March	4	Monday	Last Day for 25% Refund, Full Withdrawal
March	10	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	16	Saturday	Spring Recess Ends
March	29	Friday	Good Friday - No Classes Scheduled - University Closed
March	31	Sunday	Easter Sunday - No Classes Scheduled - University Closed
April	1	Monday	Last Day to Withdraw
April	30	Tuesday	Friday Classes Meet
April	30	Tuesday	Last Day of Classes
May	1	Wednesday	Reading Day 1
May	2	Thursday	Reading Day 2
May	3	Friday	Final Exams Begin
May	9	Thursday	Final Exams End
May	11	Saturday	Final Grades Due
May		TBA	Commencement

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 404
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 khusid@njit.edu for communication
http://chemicaleng.njit.edu/people/khusid.php (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. https://www.mheducation.com/highered/product/introduction-chemical-engineering-thermodynamics-van-ness-abbott/M9781260721478.html

• 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.
• 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 Webex and Canvas via NJIT directly. If you do not have access for any reason, please contact NJIT Help Desk as soon as possible.
MATLAB will be used for solving home, class, and exam problems. You can download MATLAB from https://ist.njit.edu/matlab;
tutorial https://www.mathworks.com/support/learn-with-matlab-tutorials.html
https://www.mathworks.com/help/matlab/getting-started-with-matlab.html

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
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 (individual)   15%
Project/group activities   30%
Midterm exams (individual)   25%
Final exam (individual)   30%

Letter grades will be assigned automatically by an Excel code based on the following totals:
A (Superior)   90% and above
B+ (Excellent)   80%-89.9%
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
    Review/work on the material of the previous lecture before the next class.
    Read the lecture notes and covered sections of the required textbook.
    Use the printed lecture notes in class along with the computer and calculator.
    Take additional notes during the lectures.
    Work out 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 **must be uploaded into Canvas in DOC or PDF format by the due date**. *Do not send images taking with cell phone*! 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 & last names	Course No	HW assignment No	Date due	Page No/total 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.
- ➢ 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 (up to 3 students) 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, WebEx 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: If you need accommodations due to a disability please contact Center for Student Success 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.

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: https://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 https://www.njit.edu/dos/