

Fall 2020

## CHE 230-001: Chemical Engineering Thermodynamics I

Xiaoyang Xu

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## Chem Engineer Thermodynamics I - CHE 230 - 001

**Instructor:** Professor Xiaoyang Xu  
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### Class hours:

Type	Time	Days	Where	Date Range	Schedule Type	Instructors
Class	9:00 pm - 11:05 am	Monday Wednesday	KUPF 210	Sep 2, 2020 - Dec 23, 2020	Lecture	Xiaoyang Xu (P)

**Office Hour:** Wednesday 11:10 am- 12:10 pm (Office: Tiernan Hall, 362); Please make appointments for in person meeting other than regular office hours.

**TA and TA office hour: Fengqiao Li** ([fl266@njit.edu](mailto:fl266@njit.edu))

Office Hour: Thursday 12:00 pm- 1:00 pm (CME graduate office, Tiernan hall 324)

**Estimated Workload:** Lectures ~4 hours per week; quizzes/homework ~Please plan to spend a **minimum** of 10-12 hours per week on your homework problems for this course. Failure to meet this goal will seriously jeopardize your successful completion of this course and will harm your efforts in the junior and senior year.

**Textbook:** Introduction to Chemical Engineering Thermodynamics Chemical Engineering Thermodynamics (ISBN# is 9780073104454)

Supporting textbook: Donald P. Visco, Jr. Kevin D. Dahm "Fundamentals of Chemical Engineering Thermodynamics" ISBN: 9781111580711

**Required Hardware:** A working computer equipped with a working webcam and a working microphone. Note - tablet devices are not acceptable for this course.

**Required Software:** Google Chrome browser or Firefox browser; Respondus Lockdown Browser, Microsoft Word.

**Internet Access:** You must have a reliable internet connection for your device.

**Calculator:** A calculator is required for solving problems.

**Description:** 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. Therefore, it is in your best interest to learn these subjects well now.

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

**Course Goal:** To help each student develop his/her problem-solving ability and gain insight into the process of Problem solving, with emphasis on thermodynamics. Specifically, this course is designed to help students 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.

**Topics to be covered:**

1. Basic concepts; heat & work; steam tables
2. Energy balances in open and closed systems, including reacting systems
3. Thermodynamics quantities: enthalpy, entropy, internal energy, free energies
4. Steady state and unsteady-state processes
5. First and second laws of thermodynamics
6. Engines and power systems; Carnot and Rankine cycles
7. Turbines, pumps, and compressors, and refrigerations
8. Maxwell's relations; thermodynamic transformations
9. PVT behavior of ideal gases; equations of state

**Lectures**

- This course is a **converged course** (Course meeting partially face-to-face and partially synchronous online). You have the option of attending online, rather than in person. However, attending the class sessions either in person, or online is mandatory.
- Days when you may attend in person are determined by the phone app. You will be required to sit in a seat which matches your color code when you come to class.
- **Wearing face mask** is required and please always **ensure social distancing** in the classroom.
- Food and drink are expressly prohibited in the classroom.
- Cellphones should be turned off during lectures.

- Students are expected to be in the classroom or logged in to the WebEx online meeting room by the start time of each class.

**Attendance:** Attendance is mandatory. You must notify the instructor in advance if possible, of any absence by sending an email stating the date and reason for the absence. If you are absent for up to two class periods because of illness or injury, an email message stating the reason for absence will be sufficient. If you are absent from more classes because of illness or injury, verification of a visit to a health care professional may be required. Two times class absence (without verification/notification) will disqualify your final exam for this course.

**Special Needs:** If you need accommodations due to a documented disability please contact Office of the Dean of Students to discuss your specific needs. A Letter of Accommodation Eligibility authorizing your accommodations will be required.

**Homework:** Problems will be assigned. Homework will not be graded but similar problems will be tested in quiz, midterm exam or final exam. You are strongly recommended to work on homework by yourself and bring questions to lecture or office hour.

#### **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.
- Students must upload a professional-looking head shot for their Canvas profile.
- Students are strongly encouraged to attend office Hours. 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, having a greeting or a signature.
- To assure quick response to your emails, please add "ChE230" in the subject of your emails.

#### **Examinations**

**All exams will take place remotely- Please don't come to the physical classroom on exam day!**

There will be two 90 mins examinations during the term and a 150 mins final examination. The exams will be closed-notes and closed-book unless otherwise announced. Tutorial reviews will be held prior to each exam.

**Quizzes:** There will be quizzes occasionally at the beginning of the class. If you miss the class, you will miss the quiz that day. **There will be no makeup quiz!** Close book and close notes!

**Policy on exams (other than final):** A student must have a compelling reason to miss an exam. Documentation of the reason (e.g., doctor's note) is needed for the instructor to consider giving a make-up exam. A student who cannot make it to an exam needs to either e-mail or call and leave a voice message for the instructor **before** the exam is held. A student missing (for any reason) the first two exams has to withdraw from the course. A single (comprehensive) make-up exam will be given on the reading day (TBD) for those who have missed an exam for documented/ legitimate reasons.

**Policy on final exam:** The final exam will be based on the entire course material. Students missing the final exam without a documented serious excuse fail the course. Students missing the final exam with a documented serious reason get an Incomplete.

**Proctoring:** All quizzes and exams will be proctored using Respondus Lockdown Browser and Respondus Monitor automated proctoring services. These services record your webcam and microphone feed and monitors your behavior. Suspicious behavior will be flagged for review and will be reported to the instructor. A calculator is allowed to solve the calculation problems. Any unauthorized electronic materials will be considered as a violation of academic integrity. The proctoring is subject to slight changes.

**Academic Dishonesty:** Misrepresentation of a student's involvement in any required academic work will result in the instructor invoking the academic dishonesty policies of the university. This could result in an "F" grade being assigned for the course. Collaboration is expected for group activities, but not for individual assignments (such as exams). Instructions for each assignment should be followed. If in doubt, ask the instructor.

**Grading:**

Grades for the subject will be based on a total of 500 points:

<b>ACTIVITIES</b>	<b>POINTS</b>
Two 90 mins midterms exams	100 (each)
Quizzes	135
Final exam	165

Grading Scale (minimum cutoffs are firm):

85-100% A

80-84.9% B+

75-79.9% B

70-74.9% C+

65-69.9% C

55-64.9% D

<55% F

### Quizzes and Exams grading

- Student handwriting must be legible in order to receive points.
- A student must show full details when solving a problem during an exam or a quiz. Not showing the work will cause the losing points even if the final answer is correct.
- Partial credit can be given for solving the exam and quiz problems, though no partial credit will be given if there are not enough details to follow.
- A student can dispute the exam scores within a week after the announcement of the score. Exam scores can only be disputed during the official Office Hours, not during class time or via email.
- A letter grade is based on the final score in accordance with the Tables given in this syllabus. The assigned letter grade is final and cannot be negotiated.
- Students will get zero for not coming to quizzes and there is no makeup quiz.
- Students will get zero for not coming to exams. 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 the case of official approval from the Dean of Student's office, may a make-up be given at the discretion of the instructor.

### 2020 Fall Semester Class Schedule:

September	1	Tuesday	First Day of Classes
September	5	Saturday	Saturday Classes Begin
September	7	Monday	Labor Day
September	8	Tuesday	Monday Classes Meet
September	8	Tuesday	Last Day to Add/Drop a Class
September	8	Tuesday	Last Day for 100% Refund, Full or Partial Withdrawal
September	9	Wednesday	W Grades Posted for Course Withdrawals
September	14	Monday	Last Day for 90% Refund, Full or Partial Withdrawal - No Refund for Partial Withdrawal after this date
September	28	Monday	Last Day for 50% Refund, Full Withdrawal
October	19	Monday	Last Day for 25% Refund, Full Withdrawal
November	9	Monday	Last Day to Withdraw

November	25	Wednesday	Friday Classes Meet
November	26	Thursday	Thanksgiving Recess Begins
November	29	Sunday	Thanksgiving Recess Ends
December	10	Thursday	Last Day of Classes
December	11	Friday	Reading Day 1
December	12	Saturday	Saturday Classes Meet
December	13	Sunday	Sunday Classes Meet
December	14	Monday	Reading Day 2
December	15	Tuesday	Final Exams Begin
December	21	Monday	Final Exams End
December	23	Wednesday	Final Grades Due