CHE 233: Chemical Engineering Thermodynamics – I
Schaefer School of Engineering & Science
Department of Chemical Engineering and Materials Science

Spring 2023

Meeting Times:	Lectures: 12:00 – 12:50 pm (WF) Recitations: 12:00 – 12:50 am (M)
Classroom Location:	Lectures: Gateway South 216 (W), Gateway North 204 (F) Recitations: EAS 229 (M) **Virtual as needed: https://stevens.zoom.us/j/92851126566**
Instructor:	Jae Chul Kim
Contact Info:	jkim7@stevens.edu, Burchard 010B
Teaching Assistant:	Ayodeji Omoniyi (aomoniyi@stevens.edu)
Peer Mentor:	Sophie Cherayil (scherayi@stevens.edu)
Office Hours:	1:00 – 3:00 pm (W) or by appointment
Virtual Office Hours:	By appointment
Course Website:	Access via Canvas
Prerequisite(s):	CH-116: General Chemistry II, MA-221: Differential Equations, E-115: Introduction to Programming, PEP-111: Mechanics
Corequisite(s):	None
Cross-listed with:	None

COURSE DESCRIPTION
This course is designed to provide a generalized concept of macroscopic phenomena and atomistic processes in matters and between their reactions in the context of chemical engineering thermodynamics. Students will learn concepts of heat, work, and energy; First and Second Laws of thermodynamics for closed and open systems; reaction coordinates, thermodynamic functions with particular emphasis on systems of chemically pure substances. These theories and models will be the basis to study heterogeneous mixtures in Chemical Engineering Thermodynamics II.

STUDENT LEARNING OUTCOMES
After successful completion of this course, students will be able to

- Understand principles of thermodynamics, derive relationships between macroscopic properties, and describe the microscopic origin of thermodynamic properties
- Apply models to predict phase behavior of pure compounds

- Evaluate different chemical engineering systems and processes using the First and Second Laws of Thermodynamics

FORMAT AND STRUCTURE

This is a three-credit course comprised of two lectures and one recitation session per week. Students can obtain handouts on Canvas. Students are expected to take notes on the handout and engage in classroom activities.

COURSE MATERIALS

- Textbook(s): *Fundamentals of Chemical Engineering Thermodynamics* by Kevin D. Dahm and Donald P. Visco, Jr. 1st ed.
- Readings: Course-related readings and materials will be posted on Canvas.

TENTATIVE COURSE SCHEDULE

The following is a tentative course schedule. Any and all changes to this schedule will be communicated to you in class and via Canvas.

(1) Lectures

Week	Date	Class topic(s)	Text-book	Pset/Quiz
1	01/18	CHE233 Introduction / TD variables		
	01/20			
2	01/25	(Zoom) The first law of TD	Ch 1,2,7	
	01/27	Ideal and non-ideal gases		
3	02/01	Enthalpy / Entropy / The second law of TD	Ch 2,4	Quiz 1
	02/03			Pset 1
4	02/08	Enthalpy & entropy calculation / TD processes	Ch 4,5	
	02/10			Pset 2
5	02/15	TD equilibrium / Potentials / Free energies	Handout	Quiz 2
	02/17		Handout	Pset 3
6	02/22	No class (Monday schedule, Recitation)		
	02/24	**Exam 1**	Ch 6	Pset 4
7	03/01	Maxwell relation	Ch 6,8	
	03/03			
8	03/08	More on Maxwell relation	Ch 8,9	
	03/10			Pset 5
Spring Break				
9	03/22	Partial molar quantity / Chemical potential	Ch 9,11	
	03/24			Pset 6
10	03/29	Ideal mixtures		Quiz 3
	03/31	**Exam 2**	Ch 11	Pset 7
11	04/05	Vapor pressure	Ch 10,12,13	
	04/07	No class (Good Friday)		
12	04/12	Vapor-Liquid Equilibrium	Ch 13,14	
	04/14	Activities and solutions		Pset 8
13	04/19	Equations of state / Liquid-Liquid and Solid-Liquid Equilibrium	Ch 13	Quiz 4
	04/21			Pset 9
14	04/26	Ideal solutions	Ch 14	
	04/28			Pset 10
15	05/03	Phase separation	Ch 14	
	05/04	Friday Schedule Final exam review		Pset 11

(2) Recitations

Week	Date	Class topic(s)
1	01/23	**No recitation**
2	01/30	Recitation 1
3	02/06	Recitation 2
4	02/13	Recitation 3
5	02/20	**No recitation -** Recitation 4 on 02/22
6	02/27	**No recitation**
7	03/06	Recitation 5
Spring Break		
8	03/20	Recitation 6
9	03/27	Review for Exam 2
10	04/03	**No recitation**
11	04/10	Recitation 7
12	04/17	Recitation 8
13	04/24	Recitation 9
14	05/01	Review for Final

COURSE REQUIREMENTS

- Attendance: Attendance will not be checked.
- Problem sets: Problem sets will be assigned on Mondays and will be collected one week later at the end of Monday classes. Your lowest problem set grade will be dropped at the end of the semester. Late assignments will **NOT** be accepted. *In case of an emergency*, please contact me before the problem set is due to discuss if alternative arrangements are possible.
- Quizzes: Open-note quizzes will be given in Wednesday classes every other week and test material covered in lectures during the previous weeks. Your lowest quiz grade will be dropped at the end of the semester. **NO** make-up quizzes will be available. If you miss more than one quiz, you must have valid, documented excuses (such as a doctor's note) for *all* missed quizzes in order to be excused from more than one. In this case, your missed quiz will not be counted.
- Exams: There will be two open-book exams during the semester in addition to a final exam. The final exam time and location is TBA. For all three exams, you are allowed to bring one piece of paper (letter-size) filled front and back (hand-written) with any information you think relevant. No electronic device but a simple calculator is allowed for the exam. There will be **NO** make-up exams. If you miss a midterm for a documented, valid excuse, your final will be worth 45% (20% for the missing midterm + 25% for the final) of your grade. If you miss both midterms, your final will be still worth 45% of your grade, no matter what your excuses are. If you miss your final, the final grade will be zero.
- Bonus: Throughout the semester, students will be given opportunities to earn bonus points (in class participation, recitations, etc.) a maximum of 5% total grade.

GRADING PROCEDURES

Grades will be based on:

- Problem set (20%)
- Quizzes (15%)
- Exam I (20 %)
- Exam II (20%)
- Final (25%)
- Bonus (≤5%)

REGRADE REQUESTS

Any requests for regrades on problem sets, quizzes or exams must be submitted no later than one week after the graded assignment/quiz/exam was handed back.

ACADEMIC INTEGRITY

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at http://web.stevens.edu/honor/

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"*I pledge my honor that I have abided by the Stevens Honor System*."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

EXAM ROOM CONDITIONS

The following procedures apply to quizzes and exams for this course. I, as an instructor, reserve the right to modify conditions set forth below by printing revised Exam Room Conditions on the quiz or exam.

1. Students may use the following devices during quizzes and exams. Any electronic devices that are not mentioned in the list below are not permitted to solve problems.

Device	**Permitted?**	
	Yes	No
Laptops		X
Cell Phones		X
Tablets	X (Notes only)	
Smart Watches		X
Google Glass		X
Programmable Calculator		X

2. Students may use the following materials during **quizzes**. Any materials that are not mentioned in the list below are not permitted.

Material	Permitted?	
	Yes	No
Handwritten Notes	X	
Typed Notes	X	
Textbooks		X

3. Students may use the following materials during **exams**. Any materials that are not mentioned in the list below are not permitted.

Material	Permitted?	
	Yes	No
Handwritten Notes (Condition: one page, letter-size)	X	
Typed Notes		X
Textbooks		X

4. Students are not allowed to work with or talk to other students during quizzes and/or exams.

LEARNING ACCOMMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. Student Counseling and Disability Services works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, and psychiatric disorders in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from SCDS staff. The SCDS staff will facilitate the provision of accommodations on a case-by-case basis. These academic accommodations are provided at no cost to the student.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the office of Student Counseling, Psychological & Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/sit/counseling/disability-services. If you have any questions please contact:

Lauren Poleyeff, Psy.M., LCSW - Diability Services Coordinator and Staff Clinician in Student Counseling and Disability Services at Stevens Institute of Technology at lpoleyef@stevens.edu or by phone (201) 216-8728.

INCLUSIVITY STATEMENT

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in education and innovation. Our community represents a rich variety of backgrounds, experiences, demographics and perspectives and Stevens is committed to fostering a learning environment where every individual is respected and engaged. To facilitate a dynamic and inclusive educational experience, we ask all members of the community to:

- be open to the perspectives of others
- appreciate the uniqueness their colleagues
- take advantage of the opportunity to learn from each other

- exchange experiences, values and beliefs
- communicate in a respectful manner
- be aware of individuals who are marginalized and involve them
- keep confidential discussions private

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments are strongly encouraged and can be made by phone (201-216-5177) or in-person (on the 7th floor of the Howe Center). CAPS is open from 9:00 am – 5:00 pm Mondays, Wednesdays, Thursdays and Fridays and from 9:00 am – 7:00 pm on Tuesdays during the Fall and Spring semesters.

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. Other 24/7 resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text "Home" to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.