San José State University
Mechanical Engineering Department
ME 113: Thermodynamics – Section 1, Fall 2016

Course and Contact Information

Instructor:	Prof. Kathryn Gosselin
Office Location:	ENG 310K
Telephone:	408-924-8354 (email is better)
Email:	kathryn.gosselin@sjsu.edu
Office Hours:	Tuesday, 3:00-4:00 PM; Thursday, 10:30-11:30 AM; and by appointment. Appointments should be made via the Canvas scheduling function.
Class Days/Time:	Tuesdays & Thursdays, 8:40-10:20 AM
Classroom:	ENG 401
Prerequisites:	Phys 52, and Math 32, with a C- or better in each
Course Website:	https://connect.mheducation.com/class/sjsu-f16-113-01

Course Format

Canvas and Connect

All lectures will be delivered in class via PowerPoint and written notes. These presentations and notes will be posted to Canvas regularly, along with all grades, the syllabus, announcements, and other useful information. If you need to meet with me outside of office hours, you should make an appointment via Canvas's Scheduling function. You are responsible for checking the class page regularly to keep up to date on coursework. I strongly suggest having all announcements forwarded to an email address you check daily. To use Canvas, go to http://my.sjsu.edu, click "Canvas," and login with your 9-digit SJSU ID and password. If you have any questions about using Canvas, please see me or visit http://www.sjsu.edu/at/ec/canvas/student_resources/index.html.

All homework will be posted, submitted, and graded via a separate online system called McGraw-Hill Connect. You are required to purchase either the bundled book with access code from the bookstore, or otherwise purchase an access code (which gives you access to an e-book). In order to complete homework, you will need regular access to a computer (tablet, laptop, or desktop) with access to the internet. If you are not able to fulfill any of these requirements, please tell me within the **first week** of the semester. To start using Connect, visit https://connect.mheducation.com/class/sjsu-f16-113-01**.**

Course Description

This class covers properties of simple compressible substances, ideal gas and other equations of state, and the first and second laws of thermodynamics. Power cycles, refrigeration cycles, gas mixtures, and gas-vapor mixtures are also included.

Course Learning Outcomes (CLO)

Upon completion of this course, student should be able to

1. Discuss the causes of ozone depletion and global warming and the uncertainty involved in making long-term environmental predictions.
2. Discuss basic thermodynamic terms, such as enthalpy, entropy, specific and relative humidity, dew point, and adiabatic saturation and wet-bulb temperatures, in simple enough terms that someone outside the field of thermodynamics could understand what they are.
3. Understand how energy transfer processes (heat and work) affect the thermodynamic state of pure substances. This involves the ability to
    a. Use tabulated data, equations of state, and the computer program EES to determine the phase and properties (temperature, pressure, specific volume, internal energy, enthalpy and entropy) of a pure substance.
    b. Analyze the thermodynamic performance (i.e., calculate work or heat input or output, mass flow rates, and first and second law efficiencies) of common steady-flow engineering devices such as pumps, compressors, turbines, nozzles and diffusers, expansion valves, heat exchangers, and mixing chambers using the first and second laws of thermodynamics and the conservation of mass.
    c. Apply the first law of thermodynamics to simple unsteady-flow problems.
    d. Explain physical aspects of the first and second law of thermodynamics, and apply them in solving real engineering problems
4. Understand the operation of basic energy conversion devices and be able to analyze their performance, including calculation of work, heat input or output, mass flow rates, and first law efficiencies. This involves the ability to
    a. Analyze the performance of a simple Otto cycle and Diesel cycles
    b. Analyze the performance of a simple Brayton cycle and one with regeneration.
    c. Analyze the performance of a simple Rankine cycle and one with reheating and regeneration.
    d. Analyze the performance of a simple vapor compression cycle.
    e. Use EES to model and optimize thermodynamic cycles.
5. Understand engineering systems involving non-reacting mixtures and be able to analyze their thermodynamic performance. This involves the ability to
    a. Calculate properties of ideal and real gas mixtures.
    b. Explain why condensation forms using technical terms.
    c. Analyze different air-conditioning and cooling processes involving air-water vapor mixtures.

Required Texts/Readings

Textbook

The textbook for this course is the 8th edition of *Thermodynamics: An Engineering Approach*, by Çengel and Boles. The 5th-7th editions are also acceptable, as are e-books. The custom version from the bookstore (ISBN 9781259865947) will save you money, as it comes bundled with an access code for the online system

Other Materials

You will use Canvas and McGraw-Hill Connect regularly; see details above.

Course Requirements and Assignments

Prerequisites

To enroll in this course, you must have complete Phys 52 and Math 32, with a C- or better in each. You must turn in an unofficial transcript with the prerequisites highlighted by **September 1st**, or you will be dropped from the class.

Expected Time Commitment

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Effort and course performance are strongly correlated. I don't give A's for effort, but putting the time and energy into this class will give you a much better chance of performing well. You should plan to spend 2-3 hours outside of class for every hour of class; for a 4-credit class such as this one, you should expect to spend 8-12 hours outside of class every week. Some students may spend more or less time than this, but this is a good guideline. How you spend this time is dependent on how you best learn, but I would suggest reviewing your notes, reading pertinent sections of the book, doing or redoing homework problems, and completing LearnSmart activities (discussed subsequently).

Class Attendance

NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Attendance will not be counted toward your grading, but I strongly encourage you to attend every class. Like effort, class attendance strongly correlates with performance. Attending class allows you to hear supplementary explanations that may help you more than the book, to practice solving problems with immediate feedback, and to ask questions about things you do not understand. This kind of interaction is invaluable.

If you are unable to attend class for any reason, **you are responsible for making up any missed assignments, notes, and quizzes**. I will post all class PowerPoints on Canvas, but I do not hand out copies of any supplementary notes I write on the board. The final page of this greensheet lists the corresponding book sections for each lecture; this is a good place to start if you have missed class.

Homework

There will be 12 assignments throughout the semester. Homework will be assigned every week, and it will be due Tuesday of the following week at 11:59 PM unless otherwise announced. Homework is turned in via the McGraw-Hill Connect website. Some assignments will require you to scan and upload a solution done by hand. These uploads must be *.doc, *.docx, or *.pdf files. It is **your responsibility** to make sure that the scanned document is legible; many cellphones can take a legible photo, but please double check before submitting. If you are unable to scan and upload these files, you may turn them in during class on Tuesday mornings rather than submitting them online.

For problems done by hand, please include the following:

- List your name, date, and homework assignment number at the top of your assignment.

- Summarize the problem statement before beginning each problem. Give enough information that you could return to this problem a month or a year from now and understand what it is asking without looking up the problem in the book.
- Drawing a figure may be helpful as well, particularly on more complex problems.
- List all assumptions.
- Write down all equations in symbolic form first, before plugging in numbers.
- Write units next to all equations! This will keep you from making mistakes. If you learn nothing else from this class, please learn to keep track of your units.

Most homework problems are "algorithmic" problems, wherein Connect assigns everyone different numbers. However, at least one problem per week will be non-algorithmic. Each Thursday, we will spend time working on one non-algorithmic problem in groups at the beginning of class. You will still be required to submit the answers via Connect, and if you miss the in-class group work, you'll be required to complete the problem on your own.

No late homework will be accepted without a university-authorized excuse; however, **the two lowest homework scores will be dropped**. You may consider these assignments "freebies," if you wish, but use them wisely!

EES Modeling

In addition to regular, handwritten homework assignments, some assignments will require the use of Engineering Equation Solver (EES). This software is available to all students free of charge, and it can also be found on all the computers in the department's computer labs (E213/215). Unfortunately, it does not work on OS X (Macs). A short tutorial will be conducted during class time. This software is a simultaneous equation-solver with thermophysical properties built in, and it can be used to solve complicated thermodynamics problems and optimize systems.

Copying another student's EES model or allowing another student to copy yours **constitutes plagiarism and will result in a grade of 0 for the given assignment**.

LearnSmart Exercises

There will be 12 LearnSmart assignments throughout the semester. These are guided readings with theory-based questions, and they reinforce the course material. They are structured so that if you get a question wrong, it will ask you more questions on the same topic until you achieve 100% completion. These due dates coincide with our completion of the corresponding material in class.

Gateway Essay

One short essay related to a contemporary environmental issue will also be assigned. This essay is a "Gateway Assignment", **and it must be passed with a 70% or better in order to pass the class**. If you don't pass the first time, you will be allowed to revise and resubmit. However, the best grade you can get after resubmission is a 70%.

Copying any portion of your essay from another student or from a book or website without appropriate citations **constitutes plagiarism and will result in a grade of 0 for the assignment**. As this is a Gateway Assignment, this will result in you failing the course. This assignment will be submitted via Canvas and checked using plagiarism-detection software.

Quizzes

Four quizzes will be given in class. Some of them may be open book, so remember to bring your textbooks to class! If you use an e-book, please let me know ASAP so that we can figure out a workaround. The best way to study for these quizzes is to do the assigned homework and make sure that you understand it completely, including all physical concepts and definitions.

The first two quizzes are "Gateway Quizzes." These quizzes cover material absolutely necessary to pass the class. **You MUST pass these quizzes with a score of 70% or better to pass ME 113.** You may take the quiz several times. The score you achieve the **first** time you take the quiz will count toward your class average. If you do not pass the first time, you make retake the quiz via Canvas. You must re-take it until you achieve a grade of 70% or better. If you do not pass a make-up quiz before the next midterm exam, you will receive a failing grade for the class. Three versions of each Gateway Quiz will be available on Canvas. If you fail the first two re-takes, you must meet with me for a tutoring session before making a third attempt. Give yourself plenty of time to complete this before the next exam; this is especially critical for the second Gateway Quiz, which comes the week before the first exam.

Grading Information

General (Quizzes, Midterms, Final Exam)

In engineering, getting the right answer is obviously important, but right now, I am more concerned with helping you become good problem-solvers, not good answer-finders. This means that the process will be weighted more heavily than the question. For any given quiz or exam problem, my *approximate* grading scheme (subject to change, and not applicable to multiple-choice problems!) is as follows:

Getting the correct answer	10%
Using the correct units	10%
Using the correct equations…	40%
…in the correct way.	40%

If you attempt a problem, I will try my best to give you partial credit. The more clearly you write your solution, the easier it is for me to do this. A good solution contains the following:

- A figure depicting the system, with boundaries indicated where appropriate
- A list of assumptions
- All equations written in symbolic form first, before plugging in numbers
- Units included whenever applicable
- The final answer indicated clearly

McGraw-Hill Connect Assignments

The Connect system gives all homework problems an "all-or-nothing" score based on your answer being within 5% of the correct answer. However, there are cases in which a small error in an otherwise correct solution prevents you from getting the right answer, and Connect would assign you a 0, which doesn't seem fair. If you cannot get Connect to accept your answer **and** you have sought help from me before 5 PM the day the assignment is due, you may upload a legible image of your solution to the problem. I will review your solution and assign partial credit as I see fit.

Grading Policy

		A	93.0-100	A-	90.0-92.9
B+	87.0-89.9	B	84.0-86.9	B-	80.0-83.9
C+	77.0-79.9	C	74.0-76.9	C-	70.0-73.9
		D	60.0-69.9		

Homework	10%
LearnSmart Assignments	10%
Essay	3% (or 100%*)
Quizzes (4@ 3% each)	12% (or 100%*)
Midterms (2@20% each)	40%
Final Exam	25%

An exceptional final exam (10 or more points higher than your course average going into the final) will result in the final exam being weighted at 35% of the final grade, and the weight of the other items being decreased proportionally. **No extra credit** beyond what is discussed in this greensheet will be made available.

*As discussed, you must pass the essay and the two "Gateway Quizzes" with a grade of 70% or higher in order to pass this course. Inability to do so will result in a grade of zero for the class.

Classroom Protocol

Please place your cellphones on silent and refrain from using them during class. If you absolutely must take an emergency phone call, please leave the room quietly to do so. Exams and quizzes will be given at the beginning of class, so please be punctual.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/.

"SOS!"

Sometimes, life happens. If you are really struggling with the course material, and/or if something is going on outside of class that may significantly disrupt your studies (financial concerns, upheaval in your home life, physical or mental health issues, etc.), I will do everything I can to help you succeed. If I am personally unable to help you, I will direct you to the appropriate resource. If you aren't comfortable talking to me about a personal issue, that's fine, too! I will maintain a list on Canvas of all the resources available to you as an SJSU student. The earlier you ask for help with a problem, the easier it is to solve.

ME 113: Thermodynamics Section 1, Fall 2016, Tentative Course Schedule

Date	Topics, Readings, Assignments, Deadlines	Reading	Assignments Due
Aug-25	Basic Concepts	Chapter 1	
Aug-30	Pressure, Forms of Energy, 1st Law of Thermodynamics	2.1-2.7	LS1, LS2
Sep-1	Ozone Depletion, The Greenhouse Effect, Phase Changes, Property Diagrams	2.8, 11.6, 3.1-3.4	IC1
Sep-6	Property Tables	3.5	LS3, HW1
Sep-8	Equations of State, Boundary Work	3.6-4.1	IC2
Sep-13	Closed Systems, Specific Heat	4.2-4.4	LS4, HW2
Sep-15	**Gateway Quiz 1: Property Tables**		IC3
Sep-20	Conservation of Mass, Flow Work, 1st Law for Steady Flow	5.1-5.3	HW3
Sep-22	Steady Flow Processes and Devices	5.4	IC4, GW
Sep-27	Steady Flow Processes and Devices (cont'd)	5.4	HW4
Sep-29	Unsteady Flow Processes	5.5	IC5
Oct-4	**Gateway Quiz 2: Steady Flow Processes and Devices,** Introduction to Engineering Equation Solver		LS5, HW5
Oct-6	2nd Law of Thermodynamics, Entropy	Ch. 6, 7.1-7.3, 7.6	
Oct-11	**Exam 1: Chapters 1-5**		
Oct-13	Isentropic Processes, Property Diagrams, T-dS Relation, More Entropy Changes	7.4-7.5, 7.7-7.9	IC6
Oct-18	Reversible Work, Isentropic Efficiencies	7.10-7.12	LS6, HW6
Oct-20	Isentropic Efficiencies cont., Entropy Balance	7.12-7.13	IC7
Oct-25	**Quiz 3: Entropy,** Gas Power Cycle Intro	9.1-9.4	LS7, HW7
Oct-27	Otto Cycle, Diesel Cycle, Brayton Cycle	9.5-9.6, 9.8-9.9	IC8
Nov-1	*Gas Power Cycles Review and Problem-Solving*		LS9, HW8
Nov-3	Carnot Vapor and Rankine Cycles, Improving Efficiencies	10.1-10.4	IC9
Nov-8	Reheat and Regenerative Cycles, Cogeneration	10.5-10.6, 10.8	LS10, HW9
Nov-10	**Exam 2: Chapters 6, 7, 9**		
Nov-15	Vapor-Compression Cycle	11.1-4, 11.7	LS11
Nov-17	**Quiz 4 Rankine Cycle,** Mole and Mass Fraction	13.1	IC10
Nov-22	Properties of Gas Mixtures	13.2-13.3	LS13, HW10
Nov-24	**NO CLASS – Happy Thanksgiving!**		
Nov-29	Humidity, Psychrometric Chart	14.1-14.5	HW11
Dec-1	Air Conditioning Processes	14.6-14.7	IC12
Dec-6	*Air Conditioning Review and Problem-Solving*		LS14, HW12
Dec-8	Review		
Dec-16	**FINAL EXAM: 7:15-9:30 AM**		

IC: In-class group problem solving is done on Thursdays, usually at the beginning of class. This consists of one problem from the corresponding homework assignment.
LS: LearnSmart assignments are due on Tuesdays at 11:59 PM via Connect. The number denotes the chapter number of the assignment.
HW: Homework assignments are due on Tuesdays at 11:59 PM via Connect.
GW: The Gateway Essay is due September 22nd at 11:59 PM via Canvas.