

**San Jose State University**  
**Mechanical Engineering Department**  
**ME 113 Thermodynamics, Section 1, Fall 2018**

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<b>Office Hours:</b>	Tu/Th 2:00-3:00 PM, or by appointment
<b>Class Days/Time:</b>	Tu/Th 12:00-1:40 PM
<b>Classroom:</b>	Eng 329
<b>Prerequisites:</b>	Phys 52 and Math 32, with a C- or better in each

You must turn in proof of prerequisites to me on or before the second day of class in order to stay enrolled. Please hand in a copy of your unofficial transcript with the prerequisite courses highlighted. For courses taken elsewhere, you do not need to provide the articulation agreement. Please hand these in rather than emailing them to me.

### **Canvas and Course Messaging**

Copies of the course materials such as the syllabus and Powerpoint presentations, etc. may be found on the Canvas site for the class. This system allows you to have discussions or chat with the class and may be especially helpful if you need assistance on a homework problem. Homework assignments and electronic classroom materials are posted on this site.

To log in, go to the Canvas URL <http://sjsu.instructure.com>. Log in with your 9-digit digit SJSU ID and password you use for your SJSUOne account. For questions on the use of Canvas, please check out [http://www.sjsu.edu/at/ec/canvas/student\\_resources/index.html](http://www.sjsu.edu/at/ec/canvas/student_resources/index.html)

You are responsible for regularly checking with the messaging system through Canvas. You can set up your Canvas account to forward all email sent to your Canvas account to any other email address you wish.

All homework will be posted, submitted, and graded via a separate online system called McGraw-Hill Connect. 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 <http://connect.mheducation.com/class/d-abdollahian-section-1-tuth-1200---140-pm>

## 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 Goals and Student Learning Objectives

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

*Thermodynamics: An Engineering Approach*, by Cengel, Boles, and Kanoglu 9th ed., McGraw-Hill, ebooks are acceptable. The custom version from the bookstore will be more cost effective, it comes bundled with access code for the online system.

### Other Material

We will be using McGraw-Hill's homework system, called Connect, in this class. If you purchased the textbook at our bookstore, it comes bundled with Connect access. You should find an access code in the book. If you purchase your own text, you'll need to purchase Connect access separately. You can get a two week free trial and convert it at the end of the trial period if you wish. If you wish to use their ebook, you can register for ConnectPlus instead, which also includes access to the ebook.

### Classroom Protocol

- Please arrive in class on time.
- Turn your cell phones off or place them on silent. Do not answer your cell phones during class and no texting. During exams, all cell phones must be put away out of sight.
- Exams and most quizzes will be given at the beginning of class, so plan to be on time.
- Complete the assigned reading before class. We will be covering a significant amount of material and not all the reading material will be covered in class. It will be helpful to better understand the lecture if the material is reviewed before the class.
- Students are encouraged to ask questions in the classroom and during the office hours. Special arrangements can also be made for consultation with the instructor.

### Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the [current academic calendar](http://www.sjsu.edu/academic_programs/calendars/academic_calendar/) web page located at [http://www.sjsu.edu/academic\\_programs/calendars/academic\\_calendar/](http://www.sjsu.edu/academic_programs/calendars/academic_calendar/). The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy/) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising/) at <http://www.sjsu.edu/advising/>.

## Assignments and Grading Policy

### Grade Distribution

Homework	13%
Essay	2%
Quizzes (3@ 5% each)	15%
Midterms (2@20% each)	40%
Final Exam	30%

Letter grades will be assigned based on overall class performance, with Grade C+ or B- to be the median of the overall class grade distribution.

An improving trend for grades in subsequent exams or an exceptionally good final exam may result in a slightly higher overall grade.

### Expected Time Commitment

According to university rules: “Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of forty-five hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

Many students who do poorly in ME 113 appear to do so because they do not devote enough time to learning and practicing the subject material. You should plan to spend 2-3 hours outside of class for every hour in class, for a total of 8-12 hours outside of class minimum. This time should be spent reviewing notes, reading the book, doing homework problems, and studying for exams. Some student may need to spend more time than this.

### Quizzes

Three quizzes will be given in class. Some of them may be open book, so remember to bring your textbooks to class. 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 quiz will be a “Gateway Quiz”. **You must pass this quiz with a score of 70% or better to pass the class.** The quizzes will be offered multiple times until you pass with a score of 70% or better. However, if you don’t pass the first time, the maximum score you can get from subsequent tries will be 70%.

There will be no make-up for quizzes except for students with extenuating circumstances. Supporting documentation such as a medical doctor’s note or jury summons is required to support such request.

## Homework

Homework will be assigned every week, and it will be due the Thursday of the following week at 5:00 pm unless otherwise announced. Homework is turned in via the Connect software. Homework assignments submitted past the due date will not be accepted.

Some assignments may require you to scan and upload a solution done by hand, so make sure that you find a place to do this. These solutions must be uploaded as doc (Word) or pdf files. Camera phones typically will not provide enough resolution, it is your responsibility to make sure the scanned documents are legible. If you find it difficult to scan and upload these files, you may turn them in on Thursday morning in class instead of submitting them to Connect.

The amount of homework assigned is the minimum necessary to understand the material. Many of you will need to complete more problems.

For problems done by hand, include your name, date, and homework assignment number at the top of your assignment.

- Begin each problem by summarizing the problem statement. Give enough information that someone could understand the problem without looking up the problem in the book/handout. A figure is often helpful, particularly as problems become more complicated later in the semester.
- List all assumptions, where appropriate.
- Write down all equations in symbolic form first, before putting in numbers.
- Keep units with all equations. This step is very important.

There will be twelve homework assignments through the class but the two lowest homework scores will be dropped. No late homework is accepted without a university-authorized excuse.

There will also be 12 additional assignments on Connect called “Learnsmart” assignments. These are assignments to help you learn the theory. They are not required, but to motivate you to do them, you will receive extra credit on your quiz score if you complete them. If you get questions wrong on these assignments, you are able to do them again, so scores should be very high on these assignments. Note the due dates on Connect for the Learnsmart assignments to count. You can’t simply do them all at the end of the semester if your grades are lower than you would like – you must be completing them throughout the semester.

6 Learnsmart assignments completed with a score of 70% or better: 3 points will be added to quiz average.

11 Learnsmart assignments completed, score of 70% or better: 5 points will be added to quiz average

## Essay

One short essay related to a contemporary environmental issue will also be assigned. This essay is a “Gateway Assignment” which must be passed with a C or better 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 C.

Any student caught plagiarizing on their essay will receive a “0” for this entire assignment.

## Exams

There will be two midterms in addition to the final exam. They must be taken on the scheduled dates except for documented emergencies (for example, you're ill and have a note from a doctor or the SJSU health center, were in a car accident on the way to class, or had a death in the family). If you have an un-avoidable scheduling conflict (such as travel for work or for a sports competition), arrangements must be made in advance. All work must be shown clearly on exams.

- This is an engineering course. As such, students are expected to be *precise* in answers to problems in quizzes and examinations. Partial credits will be given in quizzes and examinations with incorrect answers only if correct method is used in solution procedure.
- All the assumptions for the calculations or the basis for applicability of an equation should be clearly stated.
- Students are encouraged to use pocket electronic calculators in quizzes, midterms, and final examination. However, they must show the proper procedures used in solutions. Use of lap-top computers is not allowed during exams. Also, students are not allowed to share calculators and written materials with others during the examinations.
- There will be no make-up for quizzes or exams except for students with extenuating circumstances. Supporting documentation such as a medical doctor's note or jury summons is required to support such request.

## University Policies

### Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The [University's Academic Integrity policy](http://www.sjsu.edu/senate/S07-2.htm), located at <http://www.sjsu.edu/senate/S07-2.htm>, requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sa.sjsu.edu/judicial_affairs/index.html) is available at [http://www.sa.sjsu.edu/judicial\\_affairs/index.html](http://www.sa.sjsu.edu/judicial_affairs/index.html).

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy S07-2 requires approval of instructors.

A major problem in ME 113 is that many students copy homework from one another or else rely very heavily on assistance from friends in completion of homework. This may improve your homework grade, but it will result in poor or even failing exam grades. The best way to handle homework is to struggle through it in your own first. Use your book and notes to help you. Then if you're stuck, ask your instructor or friends from class for hints. You are welcome to compare homework answers or solution methods with your friends after you have completed your problems.

**Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the [Disability Resource Center](http://www.drc.sjsu.edu/) (DRC) at <http://www.drc.sjsu.edu/> to establish a record of their disability.

# Tentative ME 113 Schedule Fall 2018, Section 1

Date	Topic	reading	HW due
Aug 21	Basic Concepts,	Chapter 1	
Aug 23	Pressure (Chapter 1) , Forms of Energy,	2.1-2.2	
Aug 28	Energy Transfer, 1st law of Thermodynamics	2.3-2.6	
Aug 30	Conversion Efficiency, Ozone Depletion, The Greenhouse Effect, Phase Changes,	2.7,2.8, 11-6, 3.1-3.3	√
Sep 4	Property Diagram, Property Tables	3.4-3.5	
Sep 6	Equations of State, Boundary Work	3.6,3.7	√
Sep 11	<b>Quiz 1: Property Tables;</b> Closed Systems, Specific Heat	4.1-4.2	
Sep 13	Closed Systems Problem Solving	4.3-4.4	√
Sep 18	Closed Systems Problem Solving, Internal energy of solids and liquids	4.5	
Sep 20	Conservation of Mass, Flow Work, 1st Law for Steady Flow	5.1-5.3	√
Sep 25	Steady Flow Processes and Devices	5.4	
Sep 27	<b>Quiz 2: Steady-Flow Processes and Devices;</b> Steady Flow Problem-Solving	5.4	
Oct 2	Steady Flow Problem-Solving	5.4	
Oct 4	<b>Exam 1: Ch 1-5</b>		
Oct 9	Unsteady Flow problems -Thermal Reservoirs and Heat Engines	5.5, 6.1-6.3	
Oct 11	Refrigerators/Heat Pumps, Carnot Cycle, Carnot Heat Engine and Refrigerators	6.4-6.6-6.11	√
Oct 16	Entropy	7.1-7.3, 7.6	
Oct 18	Isentropic Processes, Property Diagrams, T-dS Relation	7.4, 7.5, 7.7	√
Oct 23	Entropy Changes, Reversible Work, Isentropic Efficiencies, Entropy Balance	7.8-7.13	Essay Due
Oct 25	<b>Quiz 3: Entropy;</b> Gas Power Cycle Intro	9.1-9.4	√
Oct 30	Otto Cycle, Diesel Cycle,	9.5-9.6	
Nov 1	Brayton Cycle	9.8-9.9	√
Nov 6	Chapters 6-9 problem solving		
Nov 8	<b>Exam 2: Ch 6, 7, 9</b>		
Nov 13	Carnot Vapor and Rankine Cycles, Improving Efficiencies	10.1-10.4	
Nov 15	Reheat and Regenerative Cycles, Cogeneration	10.5-10.6, 10.8,	√
Nov 20	Vapor-Compression Cycle,	11.1-11.4, 11.7	√*
Nov 22	Thanksgiving Holiday		
Nov 27	Mole and Mass Fraction, Properties of Gas Mixtures	13.1-13.3	
Nov 29	Humidity, Psychrometric Chart	14.1-14.5	√
Dec 4	Air Conditioning Process Problem Solving	14.6-14.7	
Dec 6	Final Review		
<b>Dec 14</b>	<b>Final Exam 9:45-12:00 PM</b>		

\*Homework will be due on Tuesday 5:00 PM instead of Wednesday