

San José State University
Mechanical Engineering Department
ME 113 Thermodynamics, Section 2, Spring 2020,
Course ID: #24733

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Office Hours:	Mon/Wed 7:30am-8:00am, 9:40am-10:10am or by appointment
Class Days/Time:	Mon/Wed, 8:00am-9:40am
Classroom:	Section 1: ENG301
Prerequisites:	Phys 52 and Math 32, with a C- or better in each

CANVAS, Course Messaging, and Connect (McGraw-Hill)

Copies of the course materials such as the syllabus, exam review material, Powerpoint presentations, etc. may be found on the Canvas site for the class. This system will also show you your grades, and it allows you to have discussions or chat with the class. This feature may be especially helpful if you need assistance on a homework problem. Homework assignments and electronic classroom materials (such as Powerpoint slides) 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 SJSU One account. For questions on the use of Canvas, please visit:

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.

Also, “Connect” by McGraw Hill <https://connect.mheducation.com/class/e-thurlow-spring-2020-mw-8am-940am> will be used for homework postings, homework due dates, and homework information. The cost for “Connect” is listed below in “Required Text/Readings”. Homework solutions will be posted on CANVAS. You can view how to setup your account using your ME113 CANVAS website here: <https://vimeo.com/281874940>

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 causes and effects of global warming and variability involved with 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 including their definitions, and their dependencies on other parameters.
- 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 and Boles, 9th ed., McGraw-Hill, 2019. 7th and 8th editions and Ebook versions are OK too. The bookstore carries a cheaper shortened version of this text with chapters that we aren't using removed.

McGraw-Hill's homework system, "CONNECT" (3 Options). 1) If you purchased the textbook above at the SJSU bookstore, it comes bundled with Connect access and an access code can be found in the textbook. 2) If a textbook is purchased elsewhere, then a purchase of "CONNECT" access separately, at a cost of ~\$77.00, is required (2wk trial is still available). 3) If the McGraw-Hill *Thermodynamics* ebook is purchased and then you can register for "CONNECTPLUS" also, which also includes access to both the ebook and "CONNECT".

Either way, to log in to Connect use this web address for our class:

<https://connect.mheducation.com/class/e-thurlow-spring-2020-mw-8am-940am>

This link is added on CANVAS too.

Setting Up Connect System: <https://vimeo.com/281874940>

Classroom Protocol

Please do not use cell phones in class. Exams and most quizzes will be given at the beginning of class, so plan to be on time.

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/. 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

A+	Outstanding	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 (12 @ 1% each)+(Additional Hmwks to Pass Quizzes if Reqd)	12%
*Essay Project	3% or 100%
*Quizzes (4@ 4% each)	16% or 100%
*Midterms (2@20% each)	40%
*Final Exam	29%
*Extra Credit	up to 5%

An exceptionally good final exam (10% higher than your average score going into the final) may result in a grade slightly higher than what is shown here. No extra credit will be available.

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 **8-12hours 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

Four 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 two quizzes are "Gateway Quizzes". **You must pass these quizzes with a score of 70% or better to pass ME 113.** The quizzes will be offered multiple times. Your score the first time you take the quiz will be the one that counts in your class average. After that, the quizzes will be offered through the Canvas website and must be re-taken until you pass them with a 70% or better. These quizzes cover material absolutely necessary to pass the class. **If you do not pass a make-up quiz before the next mid-term, you will receive a failing grade for the class.** Three extra versions of each Gateway Quiz will be placed on Canvas. **If you fail the first two, you must meet with your instructor for a tutoring session before making a third attempt.** Give yourself

enough time to complete this before the next exam. Time is especially critical for the second gateway quiz, which comes the week before the first exam.

Homework

Homework will be assigned every week, and it will be due the Wednesday of the following week by 5:00pm unless otherwise announced. Homework is turned in via the Connect software. Some assignments will require you to scan and upload a solution done by hand, so make sure that you find a place to do this. These uploads must be uploaded as doc (Word) or pdf files. Camera phones typically will not provide enough resolution. You can also turn in Homework by the end of class on Tuesdays. If quiz retakes are necessary then you can complete additional homeworks that can be included in your homework score, you can even turn in these homeworks (and get credit for them) if you have already passed the current quiz.

As listed earlier, this is the web address for the Connect homework system:

<https://connect.mheducation.com/class/e-thurlow-spring-2020-mw-8am-940am>

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 13 assignments – 12 regular assignments and 1 completed in class. **The two lowest scores will be dropped.** No late homework is accepted without a university-authorized excuse. **A one-page essay is part of Assignment #2.** This essay is also a Gateway assignment which must be passed with a C or better to pass the class. Multiple attempts will be allowed.

EES modeling & Essay

In addition to regular homework assignments, some assignments will need to be completed using the software EES. This software will be made available to all students free of charge and can also be used in the department's computer labs (E213/215). Unfortunately, it does not work on Macs. A short tutorial will be conducted during class time. This software is a simultaneous equation-solver with thermophysical properties built in and can be used for solution of complicated thermodynamics problems as well as system optimization.

One short essay related to a contemporary environmental issue will also be assigned (Part of Assignment#2). 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 or copying another student's EES model, or allowing another student to copy their model, will receive a "0" for the essay or EES problems assigned.

Exams

Two exams will be given 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. The two mid-terms will be closed book except for the property tables and one page of notes (8.5"x11", one side only) for the first exam and two pages for the second. The final exam will be open book with no notes allowed. Bring your textbook to all exams. You are not allowed to share a textbook.

Extra Credit (Potential 5% of Grade)

During lectures "in class" or Learnsmart questions may be presented for you to complete. These are multiple choice questions that can be answered using an internet connected device (ie cell phone, laptop). Results are uploaded into CANVAS. Extra credit will be awarded based on a semester average of your responses/answers. If you do not respond to a question then you will not get any credit (so don't miss too many classes!).

>80% correct	5 points extra credit
60-79.9% correct	2 points extra credit
50-59.9% correct	1 point extra credit

If, for some reason, this system becomes unworkable during the semester, an alternate option for extra credit will be given. To get access to this system, please fill out this form during the first week of class:

We will start using this system after the add deadline for the class, which is Feb. 11.
Note: Extra Credit is limited at a 5% maximum for your grade.

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.

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.

Student Technology Resources

Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall and on the 2nd floor of the Student Union. Additional computer labs are available in ENG 213/215. Computers are also available in the Martin Luther King Library. The computer program EES, which is used in this class, is available for download through the CANVAS website. Please retain EES access to within SJSU and do not offer it to any student outside the MAE Department.. This copy should work until the end of the Fall 2017 semester. Your textbook may also include a copy of EES, but it is a very limited copy that does not allow you to copy or print.

Learning Assistance Resource Center

The Learning Assistance Resource Center (LARC) is located in Room 600 in the Student Services Center. It is designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. The center provides support services, such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development. The [LARC website](http://www.sjsu.edu/larc/) is located at <http://www.sjsu.edu/larc/>.

Additional tutoring may be available through the engineering honor societies. An announcement will be made in class when this becomes available.

Peer Mentor Center

The Peer Mentor Center is located on the 1st floor of Clark Hall in the Academic Success Center. The Peer Mentor Center is staffed with Peer Mentors who excel in helping

students manage university life, tackling problems that range from academic challenges to interpersonal struggles. On the road to graduation, Peer Mentors are navigators, offering “roadside assistance” to peers who feel a bit lost or simply need help mapping out the locations of campus resources. Peer Mentor services are free and available on a drop –in basis, no reservation required. The Peer Mentor Center website is located at <http://www.sjsu.edu/muse/peermentor/>

Tentative ME 113 Schedule Spring 2020, Section 2

Date	Topic	8th Edition reading
27-Jan	Syllabus Review, Basic Concepts, Pressure	Chapter 1
29-Jan	Forms of Energy, 1st law of Thermodynamics	2.1-2.8
3-Feb*	The Greenhouse Effect/ Essay Problem, Phase Changes, Property Diagrams	3.1-3.4
5-Feb	Property Tables	3.5
10-Feb**	Equations of State, Boundary Work	3.6-4.1
12-Feb	Gateway Quiz 1 Property Tables , Closed Systems, Specific Heat	4.1-4.4
17-Feb	Conservation of Mass, Flow Work, 1st Law for Steady Flow	5.1-5.4a
19-Feb	Steady Flow Processes and Devices	5.4
24-Feb	Steady Flow Problem-Solving**	
26-Feb	Unsteady-Flow Processes	5.5
2-Mar	Gateway Quiz 2 Steady-Flow Processes and Devices , Intro to EES	
4-Mar	Carnot Cycle, Second Law of Thermodynamics, Entropy	Chapter 6, 7.1-7.3
9-Mar	Isentropic Processes, Property Diagrams, T-dS Relation	7.1-7.6
11-Mar	Exam 1 Ch 1-5	
16-Mar	More Entropy Changes, Reversible Work, Isentropic Efficiencies	7.8-7.12
18-Mar	Isentropic Efficiencies cont., Entropy Balance	7.13
23-Mar	Ch 7 Problem-Solving Session, Quiz 3 Carnot Efficiencies and Entropy	7.13
25-Mar	Gas Power Cycle Intro, Otto Cycle, Diesel Cycle, Brayton Cycle	
30-Mar	Spring Recess, No Class	9.1-9.5
1-Apr	Spring Recess, No Class	9.6, 9.8-9.9
6-Apr	Cycle problem-solving, visit to jet engine or Los Esteros NG facility	
8-Apr	Vapor Cycles, Rankine vs. Ideal Carnot Cycle, Improving Efficiencies	10.1-10.4
13-Apr	Exam 2 Ch 6, 7, 9 (may move to Nov. 13 based on class vote)	
15-Apr	Reheat and Regenerative Cycles, Cogeneration	10.5-10.6, 10.8
20-Apr	Vapor-Compression Cycle, Refrigerants, Ozone Depletion, Mole and Mass Fraction	11.1-11.6, 13.1
22-Apr	Properties of Gas Mixtures	13.2-13.3
27-Apr	Quiz 4 Rankine Cycle , Mixture Problem-Solving	
29-Apr	Humidity, Psychrometric Chart	14.1-14.5
4-May	Air Conditioning Processes Problem Solving, Cooling Towers	14.6-14.7
6-May	Air Conditioning	14.7
11-May	Final Exam Review & Course Critique, Last Day of Instruction	
13-May	Field Trip/Guest Speaker	
14-May	May 14, Thursday, 7:15-9:30 Final Exam	

* Last day to drop a class is Feb. 4th. ** Last day to add a class is Feb. 11th.

**In-class assignment will count as part of your homework grade.