Principles of Thermodynamics

Spring 2017

Instructor:	Mitchell Paulus	**Time:**	MWF 4:10-5:00 PM
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Objectives: Theory and application of energy methods in engineering, energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles; and applications.

Office Hours: Mon. 5-6, Tues. 11-12, Wed. 3-4, or by appointment.

Main References: This is a restricted list of various interesting and useful books that will be touched during the course. You need to consult them occasionally.

- Moran, Shapiro, Boettner and Bailey. 2014. *Fundamentals of Engineering Thermodynamics, 8th edition.*

Prerequisites: MEEN 221 or MEEN 225, and MATH 251 or 253. It is the student's responsibility to ensure proper requirements are satisfied for enrollment in this course. Students not meeting course pre-requisites will be automatically dropped after the first week of class.

Examinations: Two midterm exams and a comprehensive final exam are scheduled. Unexcused absences will result in a grade of zero for missed examinations. Known absences for a scheduled exam must be brought to the attention of the instructor as soon as possible. The second exam is comprehensive with emphasis on material covered since the first exam. The final exam is comprehensive with emphasis on the material covered since the second exam. YOU WILL NOT RECEIVE YOUR FINAL EXAM, OR A COPY OF YOUR FINAL EXAM, AT THE END OF THE SEMESTER. You may stop by my office to review your graded final exam after establishing an appointment with me.

Grading Policy: Homework (15%), Quizzes (15%), Midterm 1 (20%), Midterm 2 (20%), Final (30%).

Important Dates:

Midterm #1 ..... Feb 22, 7:00-9:00 PM
Midterm #2 ..... April 5, 7:00-9:00 PM
Final Exam ..... TBA

Class Policy:

- Regular attendance is essential and expected.

Honor Code: "An Aggie does not lie, cheat, or steal, or tolerate those who do." Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules

does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: aggiehonor.tamu.edu

On all course work, assignments, and examinations at Texas A&M University, the following Honor Pledge is implied regardless if it is preprinted and signed by the student: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

ADA: The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 9798451637. For additional information, visit http://disability.tamu.edu.

Tentative Schedule

Lecture	/Week		Date	Topic (Lecture Coverage)	Text Coverage	Notes
1	1	W	18-Jan	Introduction, Concepts and Definitions		HW 1 Out
2	1	F	20-Jan	Units, Dimensions, Volume, Pressure		
3	2	M	23-Jan	Temperature, Problem Solving Methodology		
4	2	W	25-Jan	Mechanical Concepts of Energy, Basic Work Processes		HW 1 DUE; HW 2 Out
5	2	F	27-Jan	Energy Transfer by Heat, Closed System Energy Balance		
6	3	M	30-Jan	Cycle Energy Analysis		
7	3	W	1-Feb	Phases, Fixing the State		HW 2 DUE; HW 3 Out
9	3	F	3-Feb	Using Tables for Pressure, Temperature, and Specific Volume		
10	4	M	6-Feb	Using Tables of Energy and Enthalpy, Energy Balance with Properties		HW 3 DUE; HW 4 Out.
11	4	W	8-Feb	Specific Heats, Evaluating Properties of Solids and Liquids		
12	4	F	10-Feb	General Compressibility Charts and Ideal Gas Model		
13	5	M	13-Feb	Property Changes and Energy Balances of Ideal Gases		HW 4 DUE, HW 5 Out (HW5 material is covered on Exam 1)
14	5	W	15-Feb	Polytropic Processes		End of Exam 1 Material (through Lecture 14). Sample exam posted online.
15	5	F	17-Feb	Conservation of Mass		
16	6	M	20-Feb	Control Volume Conservation of Energy and Steady-State Analysis		HW 5 DUE.
		W	22-Feb	Optional Review in Class		
17	6	W	22-Feb	**EXAM 1**		EXAM 1 (7 - 9 PM), Location TBA
18	6	F	24-Feb	Nozzles and Diffusers		
19	7	M	27-Feb	Turbines, Compressors, and Pumps		HW 6 Out.
20	7	W	1-Mar	Heat Exchangers and Throttling Devices		
21	7	F	3-Mar	System Integration and Transient Analysis		
22	8	M	6-Mar	Introducing the Second Law, Statements of the Second Law		HW 6 DUE; HW 7 Out
23	8	W	8-Mar	Irreversible and Reversible Processes, Interpreting the Kelvin Plank Statement		
24	8	F	10-Mar	Second Law applied to Thermodynamic Cycles, Heat Engines		
				SPRING BREAK MAR. 13-17		
25	9	M	20-Mar	Refrigeration / Heat Pumps, Maximum Performance		HW 7 DUE; HW 8 Out
26	9	W	22-Mar	Carnot Cycle and Clausius Inequality		
27	9	F	24-Mar	Entropy and Property Data		
28	10	M	27-Mar	TdS Equations, Entropy Changes for Solids and Liquids		HW 8 DUE; HW 9 Out (HW 9 material is covered on Exam 2).

Lecture	Week		Date	Topic (Lecture Coverage)	Text Coverage	Notes
29	10	W	29-Mar	Entropy Changes of Ideal Gases, Internally Reversible Closed Processes		End of Exam 2 material (through Lecture 29). Sample exam posted online.
30	10	F	31-Mar	Closed System Entropy Balance		
31	11	M	3-Apr	Increase in Entropy Principle		HW9 DUE
		W	5-Apr	Optional Review in Class		
32	11	W	5-Apr	**EXAM 2**		EXAM 2 (7 - 9 PM), Location TBA
33	11	F	7-Apr	Control Volume Entropy Equation, Steady State Analysis		
34	12	M	10-Apr	Isentropic Processes, Isentropic Efficiencies		HW 10 Out.
35	12	W	12-Apr	Rankine Vapor Power Cycle		
		F	14-Apr	**Reading day, Good Friday, no class.**		
36	13	M	17-Apr	Rankine Vapor Power Cycle		
37	13	W	19-Apr	Gas Power Cycles		HW 10 DUE; HW 11 Out.
38	13	F	21-Apr	Gas Power Cycles		
39	14	M	24-Apr	Refrigeration and Heat Pump Cycles		
40	14	W	26-Apr	Refrigeration and Heat Pump Cycles		
41	14	F	28-Apr	Cushion	Notes	
42	15	M	1-May	Conclusion, Course Evaluation	Notes	HW 11 DUE.
43	15	T	2-May	Redined Day		
				Final Exam Review		TBD
				FINAL EXAM		TIME (Room: Ordinary Classroom).