Spring 2023

ME 234A – MECHANICAL ENGINEERING THERMODYNAMICS

Class Schedule: Mon/Wed/Fri 11:00-11:50 AM; Babbio 321

Textbook: *Fundamentals of Engineering Thermodynamics*, 9th edition, Wiley, 2018
by M.J. Moran, H.N. Shapiro, D.D. Boettner, and M.B. Bailey
ISBN# 9781119503118: WileyPLUS one-term access ($62.50)
ISBN# 9781119721901: WileyPLUS one-term access + loose leaf text ($94.50)

Instructor: Prof. Chang-Hwan Choi (cchoi@stevens.edu, Carnegie 205)

Office Hours: Mon/Wed/Fri 1-2 PM (prior appointment for other days/times, Zoom ID: 8119755935)

TA & Office Hours: Mengqi Fang (mfang3@stevens.edu, 201-204-8549)
Tue and Thu 1:30 - 3:00 PM; Burchard 512/513

Grading Scheme:

Homework	40 %
Quiz (3 @ 10%)	30 %
Final Exam	30 %
Total	100 %

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Score	90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	50-54	45-49	0-44

Homework: Homework is to be submitted **online through Canvas (WileyPLUS link)**. A reasonable amount of time (~1 week) will be given to complete all homework assignments. Late homework will **NOT** be accepted past the due date.

Quiz and Exam: All quiz and exam are **closed** textbook, but you may bring an equation sheet. You are allowed **one** sheet (front and back) of **hand-written** equations for quiz; **two** sheets for the final exam. **NO SOLVED PROBLEMS** are allowed for the equation sheet. You must write your name on the equation sheet and submit it with your quiz/exam. The TA will look over your equation sheet to confirm there are no solved problems. Any violation of this policy will be forwarded to the Honor Board. There are some tables in the appendix that will be necessary for quiz/exam. The instructor will provide those tables at the quiz/exam so that you do not have to include them on your equation sheet. **No phones, computers, or other devices** (except calculators) allowed during the quiz and exam. ***No make-up quiz or exam*** will be given. No credit will be given for a missed quiz or exam unless you have a valid excuse substantiated by a document or **prior** instructor approval in which case the missed quiz (but not a final exam: a final exam must be taken) will be prorated based on your performance ***relative to the class average***, using the other quizzes and final exam.

Course Objectives:

1. You are able to demonstrate a solid understanding of equations of state (Ideal gas, incompressible, etc) and evaluating thermodynamic properties.
2. You are able to apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (turbines, pumps, compressors, nozzles, diffusers, heat exchangers, throttling devices, etc.) to estimate required balances of heat, work and energy flow.
3. You are able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in various thermodynamic systems.
4. You are able to explain the concepts of reversibility/irreversibility of various thermodynamic processes, to represent these in terms of changes in thermodynamic state, and determine how these would impact the performance of various thermal systems.
5. You are able to demonstrate a solid understanding of entropy and the increase of entropy principle.
6. You are able to apply the principles of conservation of mass, conservation of energy, and the second law of thermodynamics to various thermodynamic systems.
7. You are able to apply ideal cycle analysis to simple power cycles (such as ideal Rankine Cycle) and to refrigeration/heat pump cycles to estimate thermal efficiency, coefficient of performance, heat, and work as a function of pressures and temperatures at various points in the cycle.
8. You are able to analyze the performance of basic power and refrigeration/heat pump cycles and to compare them with the case of maximum theoretical performance.
9. You are able to design operating conditions for a thermodynamic system based on specified requirements.

Tentative Course Timeline:

Month	Date	Day	Subject	Reference	*HW Due*	Quiz
January	18	W	Introductory Concepts and Definitions	Chapter 1		
	20	F				
	23	M				
	25	W	Energy and the First Law of Thermodynamics	Chapter 2		
	27	F				
	30	M			*HW1*	
February	1	W				
	3	F				
	6	M			*HW2*	
	8	W				
	10	F	Evaluating Properties	Chapter 3		
	13	M			*HW3*	
	15	W				
	17	F				
	22	W				***Quiz 1 (Ch. 1-2)***
	24	F			*HW4*	
	27	M				
March	1	W				
	3	F			*HW5*	
	6	M				
	8	W	Control Volume Analysis Using Energy	Chapter 4		
	10	F			*HW6*	
	20	M				
	22	W				***Quiz 2 (Ch. 3)***
	24	F				
	27	M			*HW7*	
	29	W				
	31	F				
April	3	M	The Second Law of Thermodynamics	Chapter 5	*HW8*	
	5	W				
	10	M				
	12	W				***Quiz 3 (Ch. 4)***
	14	F				
	17	M	Using Entropy	Chapter 6	*HW9*	
	19	W				
	21	F				
	24	M				
	26	W			*HW10*	
	28	F				
May	1	M				
	3	W				
	4	R			*HW11*	
May	**TBA**	**TBA**	***Final Exam***	***Ch. 1-6***		