ME 419: HEAT TRANSFER

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	Office hours: Monday 4:30–5:30 pm, ENG 408				

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Textbook: Heat and Mass Transfer by Çengel and Ghajar, any edition.

Website: https://learn.bu.edu/ \longrightarrow "ME419 A1/A2 Heat Transfer"

Course Description

Heat transfer is a discipline of engineering dealing with the exchange of thermal energy (heat) between physical systems. This course covers the fundamentals of heat transfer from a macroscopic perspective, focusing on the mechanisms of thermal conduction (heat transfer by diffusion), thermal convection (heat transfer by fluid motion), and thermal radiation (heat transfer by photons). There will be a heavy emphasis on the use of modeling and simplifying approximations to solve real-world engineering problems. Examples will be taken from a number of fields including manufacturing, electronics, consumer products, and energy systems. The course includes two hands-on experimental labs and a group project

Course Prerequisites

Students are expected to be familiar with fluid dynamics (ME 303 or equivalent), thermodynamics (ME 304 or equivalent), and engineering mathematics with partial differential equations (ME 400 or equivalent).

Homework, Quizzes, and Exams

Homework will be posted weekly on the course website. Homework submitted late will not receive credit.

There will be five short quizzes this semester, given during the regularly scheduled class time. There are NO make-ups for quizzes for any reason. All of the quizzes will be open book and notes and are based on the previous homework assignment.

There will be two exams during the semester and a comprehensive final exam. All exam dates dates are listed in the syllabus. The exams are closed book and notes except for one handwritten sheet of equations (front and back). Calculators will be necessary for all exams and quizzes, but other electronic devices (phones, laptops, tablets, etc.) are prohibited. The only valid reasons for missing an exam are a family emergency or serious illness (with doctor's a note). Make-up exams will be more difficult than the regularly scheduled exams.

Collaboration Policy

Students are allowed (and encouraged) to work together on the homework. Working together means truly working together, exchanging ideas, not copying. Copying anothers work is cheating, as is allowing someone else to copy your work. Anyone caught cheating on any assignment or exam will receive a zero for that particular grade and will be subject to disciplinary action by the Committee on Student Conduct of the College of Engineering.

Grading

 $50\%\,$ Two mid-term exams (15% each) and a comprehensive final exam (20%)

 $10\%\,$ Lab report

15% Project

20% Homework

 $5\%\,$ Quizzes and Participation

Schedule

Week	Date	Topics	Reading	Homework	Other	
1 -	1/22	Introduction	1–37			
	1/24	Introduction to conduction	61–97			
2	1/29	Steady-state conduction, thermal resistance	61–97, 131–159			
	1/31	Thermal resistance, internal heat generation	97–107	Homework 1		
3	2/5	Extended surfaces: Fins	159–174		Quiz 1	
	2/7	Transient conduction - lumped capacitance	217–224	Homework 2	Lab 1 starts	
4	2/12	1D Transient conduction	224–240			
	2/14	1D Transient conduction, semi-infinite bodies	240–248	Homework 3		
5	2/20	Semi-infinite bodies			Quiz 2	
	2/21	Multidimensional conduction, Intro to numerical methods	248–256, 285–334	Homework 4		
6	2/26	Exam Review				
	2/28	EXAM 1				
7	3/5	SPRING BRFAK				
	3/7					
8	3/12	Intro to convection, boundary layers	Chapter 7			
	3/14	External flow correlations			Lab 1 due	
9	3/19	Internal flow	Chapter 8		Lab 2 starts	
	3/21	Internal flow		Homework 5		
10	3/26	Natural convection, boiling and condensation	Chapter 9 & 10		Quiz 3	
	3/28	Heat exchangers I	Chapter 11	Homework 7		
11	4/2	Heat exchangers II			Quiz 4	
	4/4	Exam Review		Homework 8		
12	4/9	EXAM 2				
	4/11	Introduction to radiation	Chapter 12			
13	4/16	PATRIOTS DAY				
	4/18	Blackbody radiation, surface properties				
14	4/23	Radiation exchange, view factors	Chapter 13		Lab 2 due	
	4/25	View factors, Gray body networks		Homework 9	Quiz 5, Project due	
15	4/30	Extra topics				
	5/2	Final exam review		Homework 10		
		FINAL EXAM				