UNIVERSITY OF ILLINOIS
DEPARTMENT OF NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING
NPRE 349: Introduction to NPRE Heat Transfer (2 credit hours)
Spring 2024

Prof. Caleb Brooks
111C Talbot Laboratory
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Engineering principles in heat transfer with emphasis on applications in NPRE will be covered. Specifically, the focus in this course will be on heat conduction, convection, radiation, and boiling.

Prerequisite: MATH 285, credit or concurrent registration in TAM 335 or ME 310

Course Grading Policy:

Quiz	15%
Homework	25%
Lab	5%
CP	10%
Midterm exam	20%
Final Exam	25%

All assignments (quiz, homework, Labs, CP) will be submitted through Gradescope. Quizzes are done at the beginning of lecture and cover a fundamental concept from the previous lecture or assigned reading material (with some exceptions). **You must have at least a 75% quiz average to pass the course, lowest four quizzes are dropped, no makeup quizzes will be offered.** One week from day assigned is given for completing Homework and they are due by 11:59 pm. 10% will be deducted for late submission (and additional 10% every 24hrs) unless extenuating circumstances have been discussed with the instructor and an extension has been approved prior to the due date.

Required Text:
Bergman et al., Fundamentals of Heat and Mass Transfer, 8th Edition, 2019

Office hours:
Prof. Brooks, csbrooks@illinois.edu
Office: 111C Talbot Laboratory
Directly following class or by appointment

Sohaib Malik, msmalik2@illinois.edu
Student Lounge
Tuesdays, 5:15-7pm or by appointment

Contact hours:
Course will meet for 50 minutes, two times per week, for 16 weeks

Learning outcomes/objectives:
- Proficiency in fundamentals of heat transfer
- Application of heat transfer principles to nuclear power systems
- Collect and analyze heat transfer data

Tentative Schedule

Week	Class	Topic	Reading	Assignment
1	Mon	*No Class, University Holiday*		
	Wed	Introduction to heat transfer	1.1-1.7	HW1
2	Mon	Introduction to conduction	2.1-2.5	
	Wed	One-dimensional steady state conduction	3.1-3.2	HW2
3	Mon	One-dimensional steady state conduction	3.3-3.5	
	Wed	One-dimensional steady state conduction	3.3-3.5	HW3
4	Mon	Examples in NPRE systems		
	Wed	Conduction in fins	3.6	HW4
5	Mon	Two-dimensional conduction	4.1-4.6	
	Wed	Conduction CP		CP
6	Mon	Transient conduction	5.1-5.3	
	Wed	Introduction to convection	6.1-6.2	HW5
7	Mon	Laminar and turbulent flow	6.3-6.4	
	Wed	Boundary layers	6.4-6.9	HW6
8	Mon	*Review for midterm exam*		
	Wed	*Midterm exam*		
9	Mon	*No Class, Spring break*		
	Wed	*No Class, Spring break*		
10	Mon	Internal flow	8.1-8.4	
	Wed	Turbulent internal flow	8.5-8.10	HW7
11	Mon	Free convection	9.1-	
	Wed	Introduction to two-phase	10.1-10.2	HW8
12	Mon	Pool Boiling	10.1-10.4	
	Wed	Pool Boiling Lab		LAB
13	Mon	Forced convection boiling	10.5	
	Wed	Examples in NPRE systems		HW9
14	Mon	Condensation	10.6-10.8	
	Wed	Condensation	10.8-10.11	HW10
15	Mon	Radiation heat transfer	12.1-	
	Wed	Radiation heat transfer	13.1-	HW11
16	Mon	Examples in NPRE systems		
	Wed	Review for Final		
17	TBD	Final Exam		