ME 419

Prerequisite: ME 303, 304
Corequisite: ME 400

Eng ME 419 - Heat Transfer

Spring 2015

Instructor
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Lecture Section A2: MW 2–4 pm, PHO 210
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Course Description

This course covers the fundamentals of heat transfer from a macroscopic view with emphasis both on understanding why matter behaves as it does and on developing practical problem solving skills. Topics will include: introduction to heat transfer; steady-state heat conduction; transient heat conduction; introduction to convective heat transfer; external forced convection; internal forced convection; natural/free convection; heat exchanger analysis and design; blackbody radiation and radiative properties; radiative exchange between surfaces.

Course Objectives

Apply scientific and engineering principles to analyze and design aspects of engineering systems that relate to conduction, convection and radiation heat transfer; use appropriate analytical and computational tools to investigate conduction, convection and radiation heat transfer; are both competent and confident in interpreting results of investigations related to heat transfer and thermal design; recognize the broad technological and historical context of where heat transfer is important.

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).

Course Website

All course materials will be posted on Blackboard (blackboard.bu.edu)

[1] Subject to change. Check the course website for the latest version.

Textbook
Yunus Cengel and Afshin Ghajar, "Heat and Mass Transfer," 4th Edition

Class/Laboratory Schedule
Four hours of lecture and one hour of discussion per week. There are two experimental labs for this course. Sign-up sheets will be posted once the labs have been scheduled. The experiments will be done in groups, but reports are individual. There will also be a numerical design project using the COMSOL software package. Homework and the due date/time will be announced in lecture and posted on the course website. Homework submitted late will not receive credit.

Quizzes and Exams
There will be five 20-minute quizzes this semester, given during the regularly scheduled class time. NO make-ups for quizzes for any reason. All of the quizzes will be open book, open notes.

There will be three exams, including two midterms and one comprehensive final exam. The exact dates are listed in the syllabus. All exams are open book, open notes. Calculators are strongly recommended on all exams and quizzes, but other electronic devices (cell phones, PDAs, laptops, etc.) are prohibited. The only valid reasons for missing an exam are: a funeral, serious illness (documented by a physician), or a conflict with a scheduled Boston University event. Make-up exams will be more difficult than the regularly scheduled exams.

Collaboration Policy
Students are allowed (in fact, encouraged) to work together on the homework and on the lab worksheets, and in groups on the project. Working together means truly working together, exchanging ideas, NOT copying. Copying another's work is cheating, as is allowing someone else to copy your work. All quizzes and exams must be done by each student individually. Anyone caught cheating may be subject to disciplinary action by the Committee on Student Conduct of the College of Engineering. Also, anyone found guilty of cheating will receive a 0 for that particular grade.

Grading Policy
Labs 10% Design Project 10% Homework 20% Quizzes 5%
Midterm 1 15% Midterm 2 15% Final Exam 25%

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Lecture and Exam Schedule[1]

Week	Date	Topics	Reading	Deadline	Other
1					
	01/21	Introduction	1-37		
2	01/26	Introduction to conduction	63-98		
	01/28	1-D steady state conduction& resistance network	63-98, 135-163		
3	02/02	1-D steady state conduction (cylinder, sphere) & conduction with internal heat generation	63-107	HW 1	
	02/04	Extended surfaces- Fins	163-179		Quiz 1
4	02/09	Transient conduction – lumped capacitance	22-25& 226-232	HW 2, Lab 1 starts	
	02/11	Transient conduction: slabs/spheres/cylinders	232-248		
5	02/17	Semi-infinite bodies	249-256	HW 3	
	02/18	General governing equation for conduction Multi-dimensional conduction	256-276		Quiz 2
6	02/23	Exam review		HW 4	
	02/25	Midterm 1			
7	03/02	Multi-dimensional conduction & Numerical Methods I	296-351	HW 5 Project starts	
	03/04	Numerical methods II & Introduction to convection, boundary layer	296-351 & 374-408	Lab 1 due	
8	**03/09**	**Spring Break (no class)**			
	03/11				
9	03/16	External Flow	418-446	Lab 2 starts	
	03/18	Internal flow	467-507	HW 6	Quiz 3
10	03/23	Natural convection & Boiling and condensation	520-563 & 582-617		
	03/25	Heat exchangers I	630-667	HW 7	
11	03/30	Heat exchangers II	630-667		Quiz 4
	04/01	Exam review		HW 8	
12	04/06	Midterm 2			
	04/08	Introduction to radiation	684-713	HW 9	
13	04/13	Blackbody radiation	732-748		
	04/15	View factor relations	732-748	HW 10	
14	**04/20**	**Patriot's Day Holiday**			
	04/22	Gray body networks	748-763	Lab 2 due	
15	04/27	Project presentation		HW 11, Project due	Quiz 5
	04/29	Final Exam Review			

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