

ME 109, HEAT TRANSFER (3)

Fall 2017

MWF 2-3; 277 Cory

Text: *Fundamentals of Heat and Mass Transfer* *
Bergman, Lavine, Incropera and De Witt
8th ed., John Wiley

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Off. Hrs.: W, Th 10-11:30

Problem Sets: Weekly posted on bspace

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Problem Sets: Weekly posted on bspace. Due at 4:00 pm on Fridays unless otherwise stated.

Submit to homework box 2 on the first floor of Etcheverry Hall.

Exams: Two Midterms, final examination

<u>Week</u>		<u>Topic</u>
1	8/23	INTRODUCTION: rates of energy transfer; modes of heat transfer;
2	8/28	CONDUCTION: rate equation; boundary and initial conditions; thermal properties. ONE-DIMENSIONAL, STEADY-STATE CONDUCTION: plane wall, cylinder and sphere; composite walls; equivalent thermal circuits.
3	9/4	Holiday – Labor Day Conduction with internal heat generation Extended surfaces (fins)
4	9/11	TWO-DIMENSIONAL, STEADY-STATE CONDUCTION Numerical steady-state heat transfer.
5	9/18	TRANSIENT (UNSTEADY) CONDUCTION: Lumped capacitance. Spatial effects: Plane wall; radial systems with convection.
6	9/25	Semi-infinite solid; Multi-dimensional systems. Numerical transient heat transfer.
	9/29	Review

* Earlier editions of the text or the international edition will be adequate.

Week		Topic
7	10/2 10/4	FIRST MIDTERM (Conduction) CONVECTION: Boundary layers; laminar and turbulent flow; convection transfer equations; approximations.
8	10/9	Similarity; integral method; dimensionless parameters; analogies; turbulence.
9	10/16	EXTERNAL FLOWS: Flat plate; cylinder; sphere, tube banks; packed beds.
10	10/23	INTERNAL FLOWS: Hydrodynamic and thermal considerations; energy balance, correlations. FREE CONVECTION: Physical; phenomena; equations; similarity; laminar and turbulent flows. empirical correlations: free and enclosed flows.
11	10/30	HEAT EXCHANGERS Review of Convection – Problems
	11/3	SECOND MIDTERM (Convection)
12	11/5	RADIATION: Concepts Intensity; blackbody radiation. Surface emission, absorption, reflection and transmission;
	11/10	Holiday - Veterans Day
13	11/17	Kirchoff's law; gray surface; environmental radiation RADIATION EXCHANGE BETWEEN SURFACES: View or shape factor; blackbody radiation exchange.
14	11/20	Radiation exchange between gray surfaces; other considerations
	11/24	Holiday – Thanksgiving
15	11/27	Radiation network method
	12/1	Review
	12/12	FINAL EXAMINATION, Tue 11:30-2:30 pm (Conduction, Convection, Radiation)

Grade to be weighted 15% on homework, 20% on each midterm exam, and 45% on the final exam.

Exams are closed book, notes and homework solutions/problems. One double-sided formula sheet will be allowed in the 1st midterm, two double-sided formula sheets will be allowed in the 2nd midterm and three double-sided formula sheets will be allowed in the final exam.