

ME 109, HEAT TRANSFER (3)
Spring, 2018

MWF 12.0—1.00 PM; 105 North Gate

Text: *Fundamentals of Heat and Mass Transfer**
Bergman, Lavine, Incropera and De Witt
7th ed., John Wiley

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Off. Hrs.: Th 5.00-6.00 PM

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Problem Sets: Problem Sets: Weekly posted on bspace. Due at 4:00 pm on Fridays unless otherwise stated. Submit to **Homework Box#3** located on first floor of Etcheverry Hall (Northside elevator).

Exams: Two Midterms, final examination

Week	Topic
1 1/17	INTRODUCTION: Why should you study heat transfer; modes of heat transfer;
2 1/22	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 1/29	Conduction with internal heat generation Extended surfaces (fins) TWO-DIMENSIONAL, STEADY-STATE CONDUCTION
4 & 5 2/5	Numerical steady-state heat transfer. TRANSIENT (UNSTEADY) CONDUCTION: Lumped capacitance. Spatial effects: Plane wall; radial systems with convection.
6 2/19	Holiday: President's day Semi-infinite solid; Multi-dimensional systems.

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

2/23 Numerical transient heat transfer.
Review

Week		Topic
7	2/26	FIRST MIDTERM (Conduction) CONVECTION: Boundary layers; laminar and turbulent flow; convection transfer equations; approximations.
8	3/5	Similarity; integral method; dimensionless parameters; analogies; turbulence.
9	3/12	EXTERNAL FLOWS: Flat plate; cylinder; sphere, tube banks; packed beds.
10	3/19	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	3/26	Spring Break
12	4/2 4/4 4/6	HEAT EXCHANGERS Review of Convection – Problems SECOND MIDTERM (Convection)
13	4/9	RADIATION: Concepts Intensity; blackbody radiation. Surface emission, absorption, reflection and transmission; Kirchoff's law; gray surface; environmental radiation RADIATION EXCHANGE BETWEEN SURFACES: View or shape factor; blackbody radiation exchange.
14	4/16	Radiation exchange between gray surfaces; other considerations
15	4/23 4/25 4/27	Radiation network method Phase change heat transfer Review

05/09

**FINAL EXAMINATION, Tue 3.00 – 6.00 pm
(Conduction, Convection, Radiation)**

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

Exams are open book however students are strongly advised to develop formula sheets to save time during the exams.