ME 109, HEAT TRANSFER (3)

Fall 2018

MWF 3-4; 277 Cory

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Off. Hrs.: M 1-2, W 10-11

Text: *Fundamentals of Heat and Mass Transfer**

Bergman, Lavine, Incropera and De Witt

8th ed., John Wiley

GSI: Zacharias Vangelatos

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Problem Sets: Weekly posted on bcourses. Due by 4:00 pm on Fridays unless otherwise stated. Submit either in class or to the homework box on the first floor of Etcheverry Hall.

Exams: Two midterms, final examination

Week		Topic
1	8/22	INTRODUCTION: rates of energy transfer; modes of heat transfer;
2	8/27	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	9/3	**Holiday – Labor Day** Conduction with internal heat generation Extended surfaces (fins)
4	9/10	TWO-DIMENSIONAL, STEADY-STATE CONDUCTION Numerical steady-state heat transfer.
5	9/17	TRANSIENT (UNSTEADY) CONDUCTION: Lumped capacitance. Spatial effects: Plane wall; radial systems with convection.
6	9/24	Semi-infinite solid; Multi-dimensional systems. Numerical transient heat transfer.
7	10/1	Review
	10/5	**FIRST MIDTERM(Conduction)**
8	10/8	CONVECTION: Boundary layers; laminar and turbulent flow; convection transfer equations; approximations. dimensionless parameters; analogies; turbulence.
9	10/15	EXTERNAL FLOWS: Flat plate; cylinder; sphere, tube banks; packed beds.
10	10/22	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	10/29	HEAT EXCHANGERS Review of Convection – Problems

12	**11/5**	**SECOND MIDTERM(Convection)**
	11/7	RADIATION: Concepts - Intensity; blackbody radiation.
		Surface emission, absorption,
		reflection and transmission;
13	**11/12**	**Holiday - Veterans Day**
	11/14	Kirchoff's law; gray surface; environmental radiation
		RADIATION EXCHANGE BETWEEN SURFACES:
		View or shape factor; blackbody radiation exchange.
14	11/19	Radiation exchange between gray
		surfaces; other considerations
	11/23	**Holiday – Thanksgiving**
15	11/26	Radiation network method
	11/30	Review
	12/11	**FINAL EXAMINATION, Tue 7-10 pm**
		(Conduction, Convection, Radiation)

Grade to be weighted 10% on homework, 25% on each midterm exam, and 40% on the final exam.

Exams are closed book, notes and homework solutions/problems. 2 formula pages will be allowed in the 1st midterm, 4 pages in the 2nd midterm and 6 pages in the final exam.

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