ME 323, Heat Transfer, Spring 2008

Portland State University
Maseeh College of Engineering and Computer Science

Class meets: 4:00-5:50PM, Tuesdays and Thursdays, Rm 203, UTS

Course Objectives

Introduction to the fundamentals of Heat Transfer: conduction, convection, radiation, and combinations. The bases for the solution of many problems of practical interest to the design engineer are discussed by way of applied mathematics and empirical correlations.

Prerequisites: Admission to ME or CE programs, Mth 256, ME 321, EAS 361

Textbook

Fundamentals of Heat and Mass Transfer, F.P. Incropera and D.P. DeWitt, 6th edition, John Wiley and Sons, 2007.

Instructor/Grader

Yongkang Chen, Research Associate, Dept. of Mechanical Engineering
EB Room 402S, 725-2826, yongkang@cecs.pdx.edu
Web site for the course: http://web.pdx.edu/~yongkang/main/class/ME323.html
Office Hours: TTh 1:00-3:00pm, Rm 402S Engineering Bldg, or by appointment
Grader: Nathalie Neve, EB Rm 400, email: Nathalie@cecs.pdx.edu

Policies

The midterm exam will last one class period. The final exam will be semi-comprehensive and last one class period. Both exams are mandatory. Potential conflicts must be resolved well before the exam dates.

Students are expected to turn in homework assignments that are substantially the result of their own work. However, students are encouraged to participate in study groups to discuss assignments, share advice, ideas, etc. Copying homework, cheating on tests—still not good. Classic engineering format for homework, neat, clear, carry variables through derivations until end, box around solution, etc.

Grading

Cumulative grades will be based on the following tentative weights:

Homework 20%, Project 10% (?), Midterm Exam 35%, Final Exam 35%.

Approximate Course Outline

Class	Topic	Reading
1	Another "introduction to…" lecture Everything you need to know, all at once	1
2	Overview: Conduction, Convection, Radiation	1
3	Conduction Derivation of heat equation, coordinate systems, Boundary conditions	2
4	1-D Steady State Conduction Flat plate, cylinders, spheres, resistor analogy	3
5	Heat Transfer from Extended Surfaces (Fins) 1-D analysis, Fin efficiency	3.6
6	2-D Steady State Conduction Solution methods, Numerical examples	4
7	Transient Heat Conduction Lumped capacitance model, Biot number, Heisler chart	5
8	Fundamentals of Convection Heat transfer coefficient, forced convection, natural convection	6
9	Forced Convection: Internal Flow Fluid Mechanics, laminar and turbulent flow, heat transfer	8
10	Forced Convection: External Flow Fluid Mechanics, laminar and turbulent flow, heat transfer	7
11	Natural Convection (Free Convection) Mechanisms, design correlations	9
12	Midterm (week #6)	
13	Heat Exchangers Co-flow, Counter-flow, cross-flow, etc…	11
14	Heat Exchanger Analysis Coil-type HXs, Energy Balance, effectiveness	11
15	Radiation Fundamentals, radiation intensity, view factor, examples	12
16	Blackbody Radiation Stefan-Boltzman Law, view factor	13
17	Graybody radiation Emissivity, absorptivity, transmissivity, etc.	13
18	Phase Change Heat Transfer	10
19	What we missed…or project…or something	
20	General review	