Heat Transfer (Fall 2025)

ME 109, HEAT TRANSFER (3) Fall 2025

Costas P. Grigoropoulos, Professor
6129 Etcheverry Hall
Laser Thermal Lab: http://ltl.berkeley.edu/.

Office Phone: (510) 642-2525
e-mail: cgrigoro@berkeley.edu

OHs: TBA

GSIs: TBA

Lectures: MWF 1-2 Stanley 105

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

Discussions: Tu: 9 -10; Tu: 2 – 3 ; Th: 11-12

HWK Problem Sets: Weekly posted on bcourses

Exams: Two Midterms, final examination

The midterms will be given in the regular class lecture times

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

Class Schedule

Week	Date	Topic
1	8/27	Introduction: rates of energy transfer; modes of heat transfer -the differential equation of heat conduction
	8/29	Steady 1D heat conduction without heat generation plane wall, cylinder and sphere; composite walls; equivalent thermal circuits

2	9/3	Steady 1D heat conduction with internal heat generation
	9/5	Extended surfaces – fins
3	9/8	Steady 2D heat conduction
	9/10	Finite difference equations and solutions
	9/12	Transient heat conduction: Lumped capacitance model
4	9/15	Spatial effects: Plane wall; Radial systems with convection
	9/17	Semi-infinite solid
	9/19	Numerical transient heat transfer
5	9/22	Review of heat conduction
	9/24	**FIRST MIDTERM (Conduction)**
	9/26	Convection: Boundary layer flow and heat transfer
6	9/29	Integral method for laminar boundary layers – momentum
	10/1	Integral method for laminar boundary layers – thermal
	10/3	Exact solutions for laminar boundary layer momentum and heat transfer
7	10/6	Turbulent boundary layer
	10/8	Flow and heat transfer over cylinders and spheres
	10/10	Internal flow; Hydrodynamic and thermal considerations; energy balance, correlations
8	10/13	Internal flow (continued)
	10/15	Natural (free) convection
	10/17	Natural (free) convection (continued)
9	10/20	Heat Exchangers
	10/22	Review of Convection – problems
	10/24	**SECOND MIDTERM (Convection)**
10	10/27	Boiling – Pool Boiling
	10/29	Forced convection boiling
	10/31	Condensation

11	11/3	RADIATION: Concepts ; Intensity; solid angle
	11/5	Blackbody distribution
	11/7	Radiation fractions
12	11/10	Emissive power; irradiation; radiosity
	11/12	Absorptivity; emissivity; reflectivity; transmissivity; Kirchoff's Law
	11/14	Solar flux; solar absorptivity and energy balance
13	11/17	Radiation exchange between surfaces - View factors
	11/19	View factors (continued)
	11/21	Radiation exchange between gray surfaces – net radiation method
14	11/24	Radiation network
15	12/1	Radiation network (continued)
	12/3	Radiation exchange with participating media
	12/5	Review
	12/17	**FINAL EXAMINATION, W 7-10 pm**