

ME 431: HEAT TRANSFER

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 Textbook: Principles of Heat Transfer (8<sup>th</sup> Edition) – by Kreith & Manglik  
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Date (2025)	Lecture No.	Topics
Jan. 14	1	Basic concepts. Heat transfer systems and application. Classification -- conduction, convection, and radiation. Temperature as a driving force. Resistance and conductance. Energy conservation. (Chapter 1)
Jan. 16, 21	2, 3	The heat-conduction equation. Thermal conductivity. One dimensional steady-state conduction. Fins and extended surfaces. (Chapters 2, 3)
Jan. 23, 28, 30	4, 5, 6	One- and two-dimensional steady-state conduction. The method of separation of variables and finite-difference methods. (Chapter 4).
Feb. 4, 6, 11	7, 8, 9	Transient heat conduction. Lumped-parameter approximation. Heat-transfer coefficient as a convection boundary condition. More on finite-difference methods. (Chapter 4)
Feb. 13	-	<i>First Examination</i>
Feb. 18, 20	10, 11	Introduction to convection. Velocity and thermal boundary layers. Reynolds analogy. Turbulence. (Chapter 5)
Feb 25, 27	12, 13	External flow problems. Flat plate; tube banks. Fluidized beds. (Chapters 5,6)
<i>Feb 28</i>		<i>Last day to drop without a 'W'</i>
Mar. 4, 6, 11,	14, 15, 16,	Internal flow problems. Channel flow, flow in tubes, annular regions. (Chapter 7)
<i>March 13</i>		<i>Second Examination</i>
Mar 16-23		<i>Spring Break</i>
Mar 25, 27	17, 18	Buoyancy-driven convection. Correlations for flat plate. (Chapter 8)
April 1, 3	19, 20	More on buoyancy-driven convection. Correlations for flat plate vertical and horizontal cylinders. (Chapter 8)
Apr. 8, 10	21, 22	Phase-change heat transfer: boiling, condensation and evaporation. Heat pipes. (Chapter 9)
<i>April 11</i>		<i>Last day to drop with a 'W'</i>
Apr. 14, 17	23, 24	Heat exchangers. Co-current, counter-current and cross-flow systems. Log mean temperature difference (LMTD). (Chapter 10)
Apr. 22, 24	25, 26	Radiation heat transfer. Fundamental principles. Emission, irradiation and radiosity. Blackbody radiation. Absorption, reflection and transmission. Gray surfaces. (Chapter 11)
Apr. 29, May 1	27, 28	Radiation exchange between surfaces. View factors. Electrical analog method. (Chapter 11)
May 13 08:00-10:00 am	-	<i>Final Examination</i>

**Office Hours**

Sadhal: Tu Th 1:00-3:00 pm. Additional times by appointment

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Office hours TBA

**Grading Scheme:**

First Examination:	20 %
Second Examination	20 %
Homework	20 %
Final Examination	40 %
<b>Total</b>	<b>100 %</b>