ENME 332 Transfer Processes

SPRING 2023
3 credits

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Class Hours: 3:00 pm – 4:50 pm, MW
Office hours: TTh 9:00-10:30 AM, MW10:00-11:00 AM
Textbook: Heat and Mass Transfer: Fundamentals and Applications, by Yunus Cengel, Ashfin Ghajar, 6th edition, 2020, MHEducation

Catalog Description
The principles of heat transfer; Conduction in solids; Convection; Radiation; Modern measurement techniques; Computer analysis.

Prerequisite: ENME 331 (Fluid Mechanics)
Designation: Required

Learning Outcomes:
Students successfully completing this course will demonstrate the following outcomes:
Student should be able to

1. Use heat transfer principles to understand the behavior of thermal systems.
2. Illustrate the development of the governing differential, algebraic and finite difference equations associated with thermal systems.
3. Identify, formulate and organize heat transfer problems in conceptual form as well as in terms of mathematical and physical models, and obtain the solution to the governing equation.
4. Apply boundary and initial conditions and system parameters on the resulting steady or transient response of the system.
5. Use the basic tools in thermal system design and heat transfer applications in industry.

Relationship of Course to Program Objectives:
The general objective of this course is for students to develop a firm understanding of the basic principles describing heat transfer, to learn fundamentals of heat conduction, convection, and radiation, and to apply the principles to basic heat transfer engineering problems.

Relationship to program outcomes
ENME 332 contributes directly to the following specific Mechanical Engineering Program Outcomes from ABET Criterion
(a) An ability to apply knowledge of mathematics, science, and engineering (Outcome 2, 4)
(b) An ability to design a system, component, or process to meet desired needs. (Outcome 1)
(e) An ability to identify, formulate, and solve engineering problems. (Outcome 3)
(k) An ability to use the techniques, skills, and modern engineering tools necessary for mechanical engineering practice. (Outcome 5)

Topics Covered

Introduction and basic concepts
Fundamentals of heat conduction
Steady state conduction
Transient heat conduction
Numerical Methods in heat conduction
Fundamentals of convection
External forced convection
Internal forced convection
Natural convection
Boiling and condensation
Heat exchangers
Fundamentals of thermal radiation
Radiation heat transfer

Subjects to be covered in the lectures

Chapters	Topics	Reading Assignment
Ch.1	Introduction	1.1-1.5
Ch.2	Introduction to Conduction	1.6, 2.1-2.6
Ch.3	Steady State Conduction	3.1- 3.6
Ch.4	Transient Heat Conduction	4.1- 4.4
Ch.6	Introduction to Convection	1.7, 6.1-6.11
Ch.7	External Flow	7.1-7.3
Ch. 8	Internal Flow	8.1-8.6
Ch. 9	Free convection	9.1-9.6
Ch. 10	Boiling and Condensation	10.1-10.5
Ch.11	Heat Exchangers	11.1,11.2, 11.3, 11.4, 11.5
Ch.12	Radiation Properties	12.1-12.5
Ch 13	Radiation heat transfer	1.8, 13.1-13.5

Attendance Policy

Regular attendance (at lectures, at lab, and at established team meeting times) is expected. Each student is responsible for inquiring about and obtaining course material delivered in their absence (from course colleagues). University policy excuses the absences of students for illness (self or dependent), religious observances, participation in University activities at the request of University authorities, and compelling circumstances beyond the student's control.

The student is responsible for explaining the reason for any absence to the instructor. If at all possible, the student should contact the instructor prior to the absence.

Students with written, excused absences are entitled to a makeup exam (or assignments if applicable) at a time mutually convenient for the instructor and student. For more information, see FSU policy on medically necessitated absences from class.

https://www.ugst.umd.edu/courserelatedpolicies.html

Homework

Homework problems will be assigned for each chapter.

Each homework problem should be organized into the following sections in order to have full credits.

(a) A statement for the given information and for what is required

(b) A diagram describing the problem when applicable.

(c) Basic equations

(d) Correct calculation and units

(e) Answers clearly indicated.

Students are expected to develop both personal and professional ethics. Individual work shall be the original work

Lab

Project

Grading

The course grade will be determined in the following distributions.

Homework/project	10%
Lab	15%
In-class Exams (3)	55%
Final Exam	20%
Total	100%
Total points for this class:	100

Grading Scale	**A**	90 – 100%
	B	80 – 89%
	C	70 – 79%
	D	60 – 69 %
	F	0 - 59%

Spring 2023 ENME 332

Tentative Schedule of Meetings and Reading Assignments

Week/Day	Chapter/Topic	Assignments
Week 1 1/25	Ch 1 Introduction Ch 1.1-1.5; Lab Kits set up	
Week 2 1/30	Video Energy balance Lab 1	
Week 3 2/6	Ch 2 Introduction to Conduction Ch 2.1-2.5	
Week 4 2/13	Chapter 3 Steady-state Conduction Lab 2 (workshop no. 10)	
Week 5 2/20	Ch 4 Transient conduction	
Week 6 2/27	Ch. 6 Fundamentals of Convection Lab 3 (workshop no 7)	
Week 7 3/6	Ch 6 Fundamentals of Convection Lab 4 (workshop no.3)	
Week 8 3/13	Ch 7 External flow	
Week 3/20	Spring Break	
Week 9 3/27	Ch 8 Internal flow Lab 5 (workshop no.4)	
Week 10 4/3	Ch 9 Natural convection Lab 6 (workshop no..8)	
Week 11 4/10	Ch 10 Boiling and convection	
Week 12 4/17	Ch 11 Heat exchanger	
Week 13 4/24	Ch 12 Radiation	
Week 14 5/1	Ch 13 Radiation heat transfer Lab 7 (workshop no. 13)	
Week 15 5/8	Make-up and Review class	
Week 16 5/15	Final Exam	