MEMS 1052 – Heat and Mass Transfer – Section 1

Fall Semester 2023

Lecture Time: Wed. 13:50–16:25

Instructor: Prof. John Pien

Classroom: 4-202

Office: 4-223

Office Hours: Wed. 08:30–12:30; 16:30–17:30; Thu. 16:30–17:30

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Catalog Description

This course provides an in-depth treatment of the modes of heat transfer: conduction, convection, and radiation. Course topics include steady and unsteady-state conduction, heat sink applications, thermal resistance network, forced convection, heat exchangers and the fundamental principles of radiation. The similarities between heat transfer and mass transfer are also introduced. Prerequisites: ME0051

Textbook

Bergman and Lavine, *Incorpera's Principles of Heat and Mass Transfer*, Global Edition, Wiley

Course Objectives

Upon successful completion of this course, the students will be able to:

1. Provide an understanding and appreciation of the physical mechanisms of heat transfer.
2. Develop the ability to properly use the analytical and empirical descriptions of heat transfer mechanisms.
3. Use the knowledge of similarity relationship between heat transfer and mass transfer for simple geometrical objects to evaluate the results from mass diffusion.
4. Apply these descriptions to the analysis of thermal systems.

Course Outline

1. Introduction
2. Introduction to conduction
3. 1D steady-state conduction
4. 2D steady-state conduction
5. Transient conduction
6. Introduction to convection
7. External flow

8. Internal flow
11. Heat exchangers
12. Radiation: processes and properties

Course Grading

Homework	20%
Attendance/Quiz	15%
Midterm Exam I	20%
Midterm Exam II	20%
Final Exam	25%

Exam Schedule – Sec. 1 and Sec. 2 Together

Midterm Exam I	Fri., 2–4 p.m., Oct. 20th
Midterm Exam II	Fri., 2–4 p.m., Nov. 24th
Final Exam	Fri., 2–4 p.m., Dec. 29th

Late Assignment Policy

40% deduction

Evaluation Policy

Partial credit will be awarded to recognize that some portion of the work is correct. However, partial credit grading is only practical if the work is clearly developed, with clear and well-marked diagrams when fitting, with the appropriate equations prominently displayed, where the substitutions into the equations are quite clear, and the assumptions used are obvious to the grader. That is, it is the student's responsibility to present her/his work so clearly that the grader can quickly ascertain the location and nature of the error(s) and can follow the subsequent work through. If this is not clear on the work submitted, credit cannot be given (then or later). Partial credit is assigned at the discretion of the grader. It is therefore always in your best interest to practice clarity and completeness in your solutions when working homework problems. This is applicable to exam problems as well.

Copyrights

Academic Integrity

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the

instructor level, as outlined in the University Guidelines on Academic Integrity. This may include but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.