

COURSE SYLLABUS

COURSE INFORMATION

Course Number & Title: ME 420 Intermediate Heat Transfer
Course Credit Hours: 4 Credit Hours
Class Meeting Time: 13:00 – 13:50 Monday, Wednesday, Friday
Class Meeting Location: 1043 LuMEB
Course Canvas Page: <https://canvas.illinois.edu/courses/36747>
Prerequisites: ME 310 or TAM 335; ME 320;
an equivalent undergraduate heat transfer course

INFORMATION ABOUT THE COURSE INSTRUCTOR

Name of the instructor: Professor Bumsoo Han
Office Location: 3050 LuMEB
Phone number: (217) 300-0516
Email Address: bumsooh@illinois.edu
Office hours: 15:00 – 16:00 Monday and Wednesday or by appointment

INFORMATION ABOUT THE TEACHING ASSISTANT

Name of the TAR: Mr. Jiong Chen
Office Location: MEL 3420
Email Address: jiongch2@illinois.edu
Office hours: 9:00 – 10:00 Tuesday, Thursday and Friday @ MEB 0024-0030

COURSE DESCRIPTION

ME 420 is a dual-level course in heat and mass transfer that may be taken for graduate credits or as an undergraduate elective. Three basic transport modes will be covered - diffusion, convection, and radiation. Students are expected to gain an in-depth understanding of the underlying fundamentals and with improved analytical skills related to heat and mass transfer. The scope of the course includes following topics: Heat and mass transfer by diffusion in one-dimensional, two-dimensional, transient, and phase change natures. Convective heat transfer for external and internal flows. Similarity and integral solution methods. Heat, mass, and momentum analogies. Turbulence. Convection with phase change. Radiation exchange between surfaces and radiation transfer in absorbing-emitting media. Multimode heat transfer problems.

TEACHING PHILOSOPHY

My teaching philosophy is to educate students to be capable of critical thinking and interdisciplinary learning, and to prepare students for contemporary technical challenges and applications. To achieve this goal while providing a solid background in heat and mass transfer, students are expected to be critical thinkers who can effectively search out the necessary information, evaluate it, and apply it to real-world technical problems. Thus, I will use the inquiry-driven active learning method. Often, examples and quizzes will be given prior to lectures covering the topic. Students are expected to attempt to solve these examples and quizzes by themselves, and to correct their answers through in-class discussion and lectures.

LEARNING OBJECTIVES

By the end of the course, you will be able to:

1. Enhance the understanding of heat and mass transfer processes
2. Strengthen analytical skills and the ability to cope with complex problems
3. Provide experience in treating multimode heat and mass transfer processes
4. Experience modern computational and experimental techniques for heat/mass transfer research

LEARNING RESOURCES

Required Textbook

Fundamentals of Heat and Mass Transfer, by Bergman et al., 8th Edition or later

Additional References

This list of references is provided as a source of information, and not all the books in this list are needed for this course. Those with an asterisk are the most relevant for this course.

GENERAL

*Bird, R.B. Stewart, W.E. and E.N. Lightfoot, *Transport Phenomena*, John Wiley (2006).
Eckert and Drake, *Analysis of Heat and Mass Transfer*, McGraw-Hill (1972).

CONDUCTION & DIFFUSION

*Ozisik, M.N., *Heat Conduction*, John Wiley (1993).
Carslaw and Jaeger, *Conduction of Heat in Solids*, Oxford University Press (1959).

CONVECTION

Bejan, *Convection Heat Transfer*, John Wiley (2013).
*Kays, Crawford and Weigand, *Convective Heat and Mass Transfer*, McGraw-Hill (2005).
Collier and Thome, *Convective Boiling and Condensation*, Oxford (1996)

RADIATION

*Siegel and Howell, *Thermal Radiation Heat Transfer*, Hemisphere (2010)
Sparrow and Cess, *Radiation Heat Transfer*, McGraw Hill (1978).

SUPPORTING TOPICS

*Kreyszig, *Advanced Engineering Mathematics*, Wiley (2011)
Minkowycz, Sparrow, and Murthy, *Handbook of Numerical Heat Transfer*, John Wiley (2006).

COURSE LOGISTICS AND POLICIES

Course Grade

The course grade will be based on homework, quizzes, and examinations according to the following tentative distribution. Details on these assignments and exams, including rubrics to guide evaluation, and guidelines on discussion participation and evaluation will be posted on the course website.

- Homework Assignments (6 × 5 pt) = 30 points
- Quizzes (8 Quizzes × 2.5 pt) = 20 points
- Mid-term Exams (2 × 15 pt) = 30 points
- Final Exam = 30 points
- Total Score = 110 points

Grading Scale

In this class grades reflect the sum of your achievement throughout the semester. You will accumulate points as described above, with each assignment graded according to a rubric. At the end of the semester, final grades will be calculated by translating these points into the percentage (100% of total possible score) and following letters (there will be no partial points or rounding).

A+= 100 ~ 97,	A = 96 ~ 93,	A- = 92 ~ 90	
B+= 89 ~ 87,	B = 86 ~ 83,	B- = 82 ~ 80	
C+= 79 ~ 77,	C = 76 ~ 73,	C- = 72 ~ 70	
D+= 69 ~ 67,	D = 66 ~ 63,	D- = 62 ~ 60	F = Below 59

Attendance Policy

Classroom attendance is expected except in cases of illness, emergencies, or other special circumstances. In case of an absence, an email notice should be sent to the instructor before the lecture or as soon as possible. You will be responsible to get lecture notes, handouts and assignments of the missed lecture.

Quizzes

Multiple quizzes will be given in the lecture without prior announcement, typically at the beginning of the class. These quizzes are intended to highlight and review key concepts and pre-requisites, and also to gauge individual participation in the course. Quizzes may involve material from reading or homework assigned for the lecture or material developed during the lecture. *Remember to bring the textbook and a calculator to each lecture.*

Homework Assignment Due

All assignments should be uploaded at the course web site by 11:59pm of the due dates, unless mentioned otherwise. **No late homework will be accepted or graded.**

Academic Integrity

Academic integrity (see the UIUC Student Code, Article 1, Part 4) is one of the highest values that the University holds. All submitted work must be the result of an individual's own effort. Any violations of this policy breach the standard of academic integrity that is vital to the mission of the university. Note that plagiarism is "copying or imitating the language, ideas, and thoughts of other authors and passing off the same as one's original work" (Barnhart, 1968) and is a violation of academic integrity. Any student detected of cheating on assignments, examinations or not following proctor's instruction will receive a failing grade in the course, and report will also be filed at Faculty Academic Integrity Report (FAIR) portal, recommending termination from the University.

Students with Disabilities

If students anticipate or experience physical or academic barriers based on disability, the students inform the instructor and discuss alternative options. Students are also encouraged to contact the Disability Resource and Educational Services at: disability@illinois.edu or (217) 333-1970.

Course Etiquette

- Arrive before the class start time.
- Be seated and prepared to participate before the class begins. If you are late, be quiet as you enter and find a seat quickly and quietly.
- During tests and exam periods, all cell phones and other electronic devices must be turned off and kept away from the student's immediate view unless the instructor has given permission for use.

Sale of Class Materials or Note

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course including exams and solutions for homework assignments and quizzes. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise.

Students enrolled in the courses are permitted to take notes, which they may use for individual/ group study or for other non-commercial purposes.

Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor.

Emergency Protocol

- If we hear a **fire alarm**, we will immediately evacuate the building and proceed to the **west side grass of Transportation Building**.
- If we are notified of a Shelter in Place requirement for a tornado warning, we will shelter in **the hallway of the basement level of this building**.
- In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Information about changes will be available via: Canvas web page or E-mail and phone inquiries to the Instructor and Teaching Assistant.

Diversity and Inclusion Statement

We are committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach own potential. In pursuit of its goal of academic excellence, we seek to develop and nurture diversity.