Price Faculty of Engineering
Department of Mechanical Engineering

MECH 3460 Heat Transfer (CRN 51296, A01)
Winter 2024 (R2)

Course Outline

Instructor
Dr. Scott J. Ormiston
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(204) 474-8639

Office Hours
M: 11h30 to 12h30
or by appointment

Teaching Assistants
- Patrick Gareau
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- Josephine Zhao
zhaoj6@myumanitoba.ca

Prerequisites
ENG 1460, MECH 2150, and MATH 3132

Pre- or Co-Requisites
MECH 3492

Course Information
Log into UM Learn

Contact Hours
4 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours
- Tutorials
2 hours x 12 weeks = 36 hours

Important Dates

Term Tests
During tutorial time: Jan 31 (7%), Feb. 28 (9%), Mar. 20 (12%), Apr. 3 (12%)

Voluntary Withdrawal
Mar. 20, 2024

Holidays & Term Break
- Louis Riel Day: Feb. 19
- Term Break: Feb. 20 to 23

Course Textbook and Learning Resources
Bergman, T.L. and Lavine A.S., Fundamentals of Heat and Mass Transfer, 8th Ed., John Wiley and Sons, 2017.

Course Content
This is a first course in heat transfer. Topics covered include (1) fundamental concepts relevant to heat transfer analysis, (2) steady-state and transient conduction, (3) forced and free convection, (4) external and internal flows, (5) heat exchangers, and (6) fundamentals of radiation.

The following topics will be covered:
Chapter 1: **Introduction**
Chapter 2: **Introduction to Conduction** - Read section 2.2.1 for interest only.
Chapter 3: **One-Dimensional Steady-State Conduction** (excluding Sections 3.1.5, 3.5, 3.6.4, 3.6.5, and 3.7).
Chapter 5: **Transient Conduction** (excluding Sections 5.3, 5.7 to 5.10).
Chapter 6: **Introduction to Convection** (excluding material related to mass transfer and the concentration boundary layer such as Sections 6.1.3 and 6.2.2). Sections 6.4 and 6.5 will be covered differently in class. Omit Section 6.7.
Chapter 7: **External Flow** (excluding material related to mass transfer). Omit Sections 7.2.4, 7.2.5, 7.7, and 7.8. Exclude the derivation of Equations (7.19), (7.20) and (7.23) in Section 7.2.1; these equations, however, will be used.
Chapter 8: **Internal Flow** (Section 8.6 is partially covered. excluding Sections 8.7 to 8.9).
Chapter 9: **Free Convection** (excluding Sections 9.7-9.10). Sections 9.2-9.4 will be covered differently in class.
Chapter 11: **Heat Exchangers** (excluding finned surfaces in Section 11.2 and Equations (11.1b) to (11.4); we will use Equations (11.1a) and (11.5)). Omit Section 11.6.

Course Components

Component	Location	Days of the Week	Time
Lectures	E2-350	Tuesday and Thursday	10h00 to 11h15
Tutorials	E2-160	Wednesday	11h30 to 13h20

Responsibilities and Academic Integrity
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. Students must act in accordance with the *General Academic Regulations and Requirements.* Students are reminded that plagiarism or any other form of cheating in examinations, assignments, reports, or term tests is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

Copyright

Student Support and Resources
An extensive range of *resources and support services are available to students*, including Academic Resources, Counselling, Advocacy and Accessibility.

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 100%
- Engineering Design: 0%

Graduate Attributes

KB: knowledge base
PA: problem analysis
IN: investigation
DE: design
ET: engineering tools
IT: individual and team work
CS: communication skills
PR: professionalism
IE: impact of engineering on society / environment
EE: ethics and equity
EP: economics and project management
LL: life-long learning

Competency Levels

I - Introduced
D - Developed
A - Advanced

Grading Scale

Letter	Mark
A+	≥90
A	80-89.9
B+	75-79.9
B	70-74.9
C+	65-69.9
C	60-64.9
D	55-59.9
F	<55

The historical grade boundaries are shown above. These grade boundaries are subject to modifications at the conclusion of the course and are also subject to departmental review.

Technology and other Resource Requirements

Students must be able to access UM Learn and will also require access to Microsoft Office and MATLAB.

Learning Outcomes

1. Comprehend the meaning of the terminology and physical principles associated with heat transfer.
2. Apply an understanding of the pertinent transport phenomena for the analysis of a process or system involving heat transfer.
3. Calculate heat transfer rates and/or material temperatures using the requisite inputs for complex thermal loading scenarios.
4. Develop models representing real processes and systems and draw conclusions concerning process/system design or performance from the resulting analysis.

Expected Competency Levels

Learning Outcome	Attribute											
	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	D											
2	A	D										
3	A	A										
4	D	D			D							

Evaluation

Assessment Tool	Value (%)	Attributes Being Assessed	Feedback
Assignments (8)	8%	KB.3: Knowledge base for fundamental engineering PA.2: Develops or implements a strategy PA.3: Analyzes and solves problems ET.1: Uses tools to complete engineering activities	Summative & Formative
Computing Assignment (MATLAB)	2%	PA.2: Develops or implements a strategy PA.3: Analyzes and solves problems ET.3: Adapts tool for specific analysis	Summative & Formative
Term Tests (4)	40%	KB.3: Knowledge base for fundamental engineering PA.2: Develops or implements a strategy PA.3: Analyzes and solves problems ET.1: Uses tools to complete engineering activities ET.2: Evaluates and selects appropriate tools	Summative & Formative
Final Exam	50%	KB.3: Knowledge base for fundamental engineering PA.2: Develops or implements a strategy PA.3: Analyzes and solves problems PA.4: Evaluates solution ET.1: Uses tools to complete engineering activities ET.2: Evaluates and selects appropriate tools	Summative

- Submitted work will be graded and returned within 2 weeks of submission
- Please view the schedule on UM Learn for a list of assessment and course component dates
- At least three term tests must be written to be eligible to write the final exam.

Requirements and Regulations

- Please see the **MECH 3460 Supplementary Information** document for additional information on assignments, tests, expectations, advice on how to succeed in this course, copyright, recording lectures, course technology, class communication, academic integrity, and student accessibility services.