Mechanical Engineering
MECHENG 3R03
Heat Transfer
Winter 2026

Instructor Information

Keena Trowell
Email: trowellk@mcmaster.ca
Please add "ME 3R03" at the beginning of the subject line for all emails

Office Hours: Tuesdays 3:00-4:00 or by appointment

TA Information

Name: Mercy Budu (Tutorials) Email: budum@mcmaster.ca
Name: Lateefat Akande (Grader) Email: akandel@mcmaster.ca
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Class Times

Lectures:
Tuesday 11:30–12:20*
Wednesday and Friday 12:30–1:20
Tutorials:
Tuesdays 12:30–1:20*

*Note that the tutorial and the lecture times on Tuesdays have been swapped

MIDTERM DATES
Midterm 1 – Tuesday, February 10th (NO MAKE-UP)
Midterm 2 – Tuesday, March 17th (NO MAKE-UP)

Midterms will take place during the normal lecture and tutorial times (11:30–1:20PM); location TBD

Class Format

In Person
Course Dates: 01/05/2026 - 04/07/2026
Units: 3.00
Course Delivery Mode: In Person
Course Description: Application of the laws of conduction, convection and radiation to problems in heat transfer. Steady and transient conduction in solids. Laminar and turbulent convection. Radiation heat transfer processes. Boiling and condensation heat transfer. Three lectures, one tutorial; second term Prerequisite(s): MATH 2Z03 and MATH 3I03; and MECHENG 2W04 or ENGPHYS 2NE3; and MECHENG 3O04

Course Evaluation and Details

Weekly assignments – 20% of final grade
Midterm 1 – 15% of final grade – Thursday, February 13th
Midterm 2 – 15% of final grade – Thursday, March 20th
Final Exam – 50% of final grade

Assignments – Assignments are to be submitted on Crowdmark. There are 11 assignments and the grades from the best 10 will be counted. Late assignments will not be accepted without Associate Dean's approval (MSAF) or an SAS accommodation. When using an MSAF, the assignment is due the day after the MSAF ends. There is no need to email me. I receive an automatic email informing me of your MSAF and I will extend the deadline accordingly.

Missed midterms – Midterms will be held during class + tutorial time, location TBD. Midterms are cumulative and will cover all course material presented up until the day of the midterm. The weight of any missed midterm with the Associate Dean's approval (MSAF) will be added to the final exam. All other missed midterms will receive a grade of zero.

Final Exam – The final exam will cover all lecture material.

Course Learning Outcomes

1. Explain the general conduction equation and use it to solve heat transfer problems in various coordinate systems
2. Demonstrate the ability to identify the influence of material selection based on the application of the general conduction equation
3. Differentiate between free and forced convective heat transfer and solve the relevant equations
4. Apply fundamentals of radiative heat transfer to analyze problems, integrating emissivity, absorptivity, and temperature
5. Solve heat transfer problems in common steady and unsteady systems
6. Identify the relevant elements of a heat transfer problem and use the principles of conductive, convective, and radiative heat transfer to formulate a solution

Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with the Learning Outcomes in this course.
1.1: Competence in Mathematics
2.1: Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem.
2.2: Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions.

Important Links

Mosaic | Avenue to Learn | Student Accessibility Services - Accommodations
McMaster University Library | eReserves

Course Schedule

Section	Week*	Bergman & Lavine**	Topic
Introduction	1	1.1 – 1.3	Introduction to the three modes of heat transfer
Conduction	2	2.1–2.4, 3.1–3.5	General conduction equation, boundary conditions and 1D Steady state conduction
Conduction	3	3.5, 3.6.1–3.6.5	1D steady state conduction with thermal energy generation, 1D steady state conduction with thermal energy generation with extended surfaces
Conduction	4	4.1 - 4.2, 5.1–5.3	2D steady state conduction, transient 1-D conduction without spatial effects
Conduction	5	5.4–5.6	Transient 1-D conduction with spatial effects
Convection	6	6.1–6.2	Introduction to convection
Convection	7	6.4–6.5	Boundary layer equations
Convection	8	7.1-7.6	External flows & their empirical relationships
Convection	9	8.1–8.5	Internal flows
Convection	10	9.1–9.6, 10.1–10.3	Free convection, pool boiling & condensation
Radiation	11	12.1–12.2, 12.4–12.9	Fundamentals of radiation, blackbody radiation, emission from real surfaces
Radiation	12	13.2–13.5	Blackbody radiation exchange, graybody radiative exchange, multimode heat transfer

*Schedule may be adjusted as needed
**These chapters are from the 8th edition, other editions may vary

Required Materials and Texts

Textbook Listing: https://textbooks.mcmaster.ca
The suggested textbook for this class is ***Fundamentals of Heat and Mass Transfer* 8th *Edition*** by Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt.
Calculators: Only McMaster Standard Calculator (Casio fx-991) may be used during term tests and the final examination.

Generative AI: Use Prohibited

Students are not permitted to use generative AI in this course to help with homework assignments or any other work submitted for assessment. In alignment with McMaster academic integrity policy, it “shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source”. This includes work created by generative AI tools. Also state in the policy is the following, “Contract Cheating is the act of “outsourcing of student work to third parties” (Lancaster & Clarke, 2016, p.639) with or without payment.” Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

Grading Scale

The McMaster 12 Point Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49

APPROVED ADVISORY STATEMENTS

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-proceduresguidelines/
The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be

expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.
Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**
It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Academic Advising

For any academic inquires please reach out to the Office of the Associate Dean (Academic) in Engineering located in JHE-Hatch 301.
Details on academic supports and contact information are available from:
https://www.eng.mcmaster.ca/programs/academic-advising

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the Policy on Requests for Relief for Missed Academic Term Work.

Academic Accommodation for Religious, Indigenous, or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.
The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be

communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.