Western University
Department of Mechanical & Materials Engineering

MME 2234B – Heat Transfer and Dynamics

COURSE OUTLINE – 2025-2026

CALENDAR DESCRIPTION: To provide the student with an understanding of the basic concepts of heat transfer and dynamics of particles and rigid bodies.

COURSE INFORMATION:

Instructor: Christopher DeGroot, PhD, PEng

Email: christopher.degroot@uwo.ca

Lectures/tutorials/labs: See Draft My Schedule

CONSULTATION HOURS: By appointment only. To be booked using link on course website.

PREREQUISITES: ES 1022A/B/Y

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

ANTIREQUISITES: None

ACCREDITATION UNITS: Math = 10%, Engineering Science = 100%

TOPICS:

Part 1 – Dynamics
- Kinematics of particles
- Kinetics of particles: Newton's second law
- Kinetics of particles: Energy and momentum methods
- Planar kinematics of a rigid body

Part 2 – Heat Transfer
- Modes of heat transfer: conduction, convection, and radiation
- Conservation of energy
- One-dimensional steady-state conduction
- Heat transfer from extended surfaces
- Two-dimensional steady state conduction

LEARNING OUTCOMES: The Mechanical and Materials Engineering Program has been accredited by Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. Accredited programs provide the academic requirements for licensure as a professional engineer in Canada. Western Engineering has defined indicators of the 12 Graduate Attributes (GAs) that the CEAB expects graduating engineering students to demonstrate. The connections between course learning outcomes and Western Engineering's GA Indicators are identified below.

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

1. Demonstrate a conceptual understanding of engineering dynamics, including the force-acceleration and work-energy methods for analyzing particles and rigid bodies. (KB2)
2. Construct and solve mathematical models for systems involving particles and rigid bodies using force-acceleration and work-energy methods. (PA2)

3. Demonstrate a conceptual understanding of the fundamental principles of heat transfer, including conduction, convection, and radiation. (KB2)
4. Construct and solve mathematical models of systems involving conduction, convection, and/or radiation modes of heat transfer. (PA2)
5. Analyze enhanced heat transfer devices, such as cooling fins, to assess their thermal performance in cooling applications relevant to electrical systems. (PA2)

CONTACT HOURS: 3 lecture hours/week, 3 tutorial hours/week, half course

TEXTBOOK: No required textbooks.

REFERENCES: "Vector Mechanics for Engineers: Dynamics," Beer, Johnston, Cornwell, and Self, McGraw Hill. (Any edition)

"Fundamentals of Heat and Mass Transfer," Bergman and Lavine, Wiley. (Any edition)

UNITS: SI

EVALUATION: The final course grade will be determined according to the following weighting scheme:

- In-class participation (iClicker assessment): 10%
- Tutorial quizzes (closed book): 20%
- Dynamics Final Exam (closed book): 35%
- Heat Transfer Final Exam (closed book): 35%

Tests, tutorial assignments, and class participation will be carried out according to the following *tentative* schedule:

Item	Weight	Effort Type	Assigned	Due
Class participation	10%	Individual	Weekly	During the lecture
Tutorial quizzes	20%	Individual	Bi-Weekly	End of tutorial hour in which it is assigned
Dynamics Final Exam	35%	Individual	Monday February 23, 2026 6:30 – 9:30 pm	
Heat Transfer Final Exam	35%	Individual	To be scheduled by Office of the Registrar	

COURSE POLICIES: The following course-specific policies will be strictly enforced throughout the course:

Tutorial Quizzes

- Tutorial quizzes will take place during the second hour of the tutorials on an approximately bi-weekly basis. The remainder of the tutorial will be conducted by the course instructor and/or the teaching assistant and will focus on solving additional problems and answering student questions.
- No make-up sessions will be offered for those missing tutorial quizzes (irrespective of the reason).

- The tutorial quiz grade will be calculated as a simple average of all of the individual grades, excluding the lowest grade, for each part of the course. Since flexibility in terms of which items are assessed has been provided through this mechanism, all academic consideration requests for tutorial quizzes will be denied.

Exams

- Exams will be closed book. A standard formula sheet will be provided along with any other tables, figures, or data that are deemed by the instructor to be required for the test. Standard scientific calculators are permitted.
- Each of the two exams will be three hours long. The exam for the Dynamics section will be held during the tutorial period. The exam for the Heat Transfer section will be scheduled as a regular final exam during the April examination period.
- The Dynamics Final Exam is considered as the "designated assessment" in this course where self-reported absences may not be used. If a self-reported absence is submitted for this exam, it will be denied.
- If a student misses the Dynamics Final Exam **without** academic consideration, they will receive a mark of zero for that exam. If a student misses the Dynamics Final Exam **with** academic consideration, they will be eligible for a make-up exam. Students eligible for a make-up exam must make themselves available to write the make-up exam, otherwise they will receive a mark of zero for that exam.
- If a student misses the Heat Transfer Final Exam, they must follow the procedures described below in the section on "Exam Accommodation" under "General Faculty / University Policies" that apply for final exams.
- If a minimum of 50% is not obtained on each of the Dynamics and Heat Transfer Final Exams, the student will be assigned a grade of no greater than 48% for the course.

Term work

- If a minimum of 50% is not obtained on term work (class participation and tutorial quizzes), the student will fail the course irrespective of the mark obtained in the final examination.
- A student will be considered ineligible to write the final examination if, in the opinion of the instructor, they have not completed sufficient term work.

Generative Artificial Intelligence (AI)

- The general policy on use of AI is described below in the section on "Faculty of Engineering AI Policy" under "General Faculty / University Policies".
- To avoid any ambiguity, the use of AI is permitted as a study aid, but is prohibited for all course assessments, since these are intended as individual assessments.
- Students are encouraged to use AI responsibly to assist them with the course material (for example, asking to explain concepts or help solve suggested problems). Students should be aware, however, that large language models (LLMs) tend to directly give answers to questions instead of acting like a "tutor" that would help guide the student through a problem in a pedagogically beneficial manner. Studies have shown that this results in lower levels of student learning. Students wanting to use AI should consider developing prompts that instruct the LLM to act as a tutor. Example prompts can be found here, for example. Further studies have shown that use of a custom-prompted "AI tutor" can increase student learning.

In addition, please be aware of the following suggestions and information:

- Students who are feeling unwell are asked to refrain from coming to class, tutorials, labs, office hours, etc. This is a common courtesy to avoid transmitting illnesses to your classmates and the instructor. If students choose to come to class while ill,

although this is strongly discouraged, they are asked to, at a minimum, wear a well-fitted face mask. Face masks are provided at various locations on campus at no cost. The instructor will make every effort to assist students who miss class by providing complete notes and additional office hours to help students avoid falling behind due to illness.

- The instructor will also refrain from coming to campus in the event that he is feeling unwell. In such cases, lectures may be temporarily moved to an online format for a short time. If this occurs, students will be notified through Brightspace as soon as possible. The instructor will wear a well-fitted respirator upon returning from an illness until fully recovered.

General Faculty / University Policies

The Faculty of Engineering and Western University have overarching policies that prescribe how undergraduate courses should run. The course-specific policies described above should be considered *in addition to* those overarching policies, or as course-specific interpretations of them. In the event of contradictions or confusion between course-specific policies above and general Faculty / University policies, please contact your course instructor for clarification.

Western Engineering's undergraduate polices can be found by navigating to:
https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/policies.html

and then clicking the "*Engineering Undergraduate Policies framework*" link.