

Western University  
*Department of Mechanical & Materials Engineering*

## MME 3307b – Heat Transfer II

### COURSE OUTLINE – 2022-2023

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**CALENDAR DESCRIPTION:** Transient heat conduction. Forced and natural convection heat transfer. Radiation heat transfer, including surface properties and shape factor. Heat exchanger design. Applications of heat transfer in engineering systems.

**COURSE INFORMATION**

Instructor: Dr. J.M. Floryan, PEng.  
Room: SEB 2051  
Email: floryan@uwo.ca

Lectures: Mon: 12:30 - 13:20 HSB-240  
Th: 13:30 - 14:20 SEB-2100  
Fri: 8:30 - 9:20 SEB-2100

Tutorials: Th: 14:30 - 16:20 SEB-2100

Labs: SEB 1077 Mon 8:30 - 11:30 SEB-1077  
SEB 1077 Tue 8:30 - 11:30 SEB-1077  
SEB 1077 Wed 9:30 - 12:30 SEB-1077  
SEB 1077 Wed 12:30 - 15:30 SEB-1077  
SEB 1077 Th 8:30 - 11:30 SEB-1077  
SEB 1077 Fri 15:30 - 18:30 SEB-1077

**PREREQUISITES** MME 2204A/B, MME 2273A/B.

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.

**ACCREDITATION UNITS:** Science = 25%, Engineering Science = 75%

**TOPICS:**

Conduction

- Transient conduction

Convection

- Introduction to convection
- Forced convection - external flows
- Forced convection - internal flows
- Free convection

Heat exchangers

Radiation

- Radiation processes and properties
- Radiation exchange between surfaces

**LEARNING OUTCOMES:**

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

- identify heat transfer processes occurring in a problem of interest;

- contrast the three modes of heat transfer;
- apply the appropriate terminology used in the field such as heat flux, thermal conductivity, energy balance, etc.;
- determine the heat flow through conduction, convection and radiation;
- carry out heat balance analyzes and predict thermal performance of simple engineering systems;
- to recommend strategies for increasing/decreasing heat fluxes;
- to analyze and select heat exchangers;
- to conduct investigation using experiments, analysis and interpretation of data, and synthesis of information to reach valid conclusion.

**CONTACT HOURS:**

3 lecture hours and 2 tutorial hour per week, 0.5 laboratory hours per week, half course.

**CONSULTATION HOURS:**

Wednesdays 16:30-17:30 PM in SEB 2051, or by appointment.

**TEXT:**

Fundamentals of Heat and Mass Transfer, 8th Edition, by T.L. Bergman and A. S. Lavine, John Wiley (editions 5, 6, 7 are also acceptable; all assignments are based on edition 8).

**REFERENCES:**

Lecture notes and the course website.

**EXAMINATIONS:**

The term tests and final examination are **open book type**. Only non-programmable pocket calculators are allowed.

**UNITS:**

SI will be used; however, English units may be introduced through examples as required.

**EVALUATION:**

Participation in weekly (lecture) meetings:	10%
Weekly in-tutorial exercises:	10%
Laboratory exercises:	10%
Term Test 1 (open book):	15%
Term Test 2 (open book):	15%
Final Examination (open book):	40%

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

Evaluation Format	Weight	Effort Type	Assigned	Due
Class participation	10%	Individual	Weekly	During the lecture
In-tutorial assignments	10%	Team	Weekly except Jan.12, Jan. 19, Feb.2, March 9, April 6	End of tutorial hour in which it is assigned
Term test 1	15%	Individual	February 2 during tutorial time	At the end of midterm
Term test 2	15%	Individual	March 9 during tutorial time	At the end of midterm
Lab 1	3.33%	Team	Weeks of Jan. 23 – Feb.6.	At the end of lab session

Lab 2	3.33%	Team	Weeks of Feb.13 – March 6	At the end of lab session
Lab 3	3.33%	Team	Weeks of March 13 – March 27	At the end of lab session

Problems will be assigned from the textbook on a weekly basis. These problems will not be handed in or graded but will be discussed each week during the tutorial sessions.

***COURSE  
POLICES:***

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

**Laboratory sessions**

- Students need to be familiar with laboratory manual and objectives of each experiment. This knowledge will be tested at the beginning of each lab session. Student who does not demonstrate proper knowledge of the material will not be allowed to carry out experiment.
- Students need to watch video for each experiment before coming to laboratory session.
- All students are to attend the laboratory section to which they signed up.
- Lab schedule will be posted 2-3 weeks before the beginning of labs.
- Failure to pass the laboratory component of the course will attract automatic course failure.
- Passing of the laboratory component is equivalent with obtaining more than 50% on the laboratory component of the course.
- A make-up session will be offered to students who have missed a laboratory session **with** academic consideration.
- Missing of a laboratory session **without** academic consideration will translate into a mark of zero for that laboratory session.
- When academic consideration has been obtained for a particular laboratory session, it is the student's responsibility to contact the instructor of the course in a *timely* fashion in order to seek alternate arrangements for the missed laboratory session (*i.e.*, within maximum three days after consideration has been obtained from the Engineering Undergraduate Services Office).
- Academic consideration for laboratory sessions (less than 10% weight) can be obtained from MME Undergraduate Coordinator.
- Missing more than one lab without academic consideration will result in the course failure.
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

**Term Tests**

- Term tests will be open book.
- Each of the two term tests will be two hours long.
- **No** make-up term test option will be offered regardless of the circumstances for which the term test was missed.
- Missing of a term test **without** academic consideration will translate into a mark of zero for that term test.
- Missing the term test **with** academic consideration will automatically shift the weight of the missed term test into the final exam.

- Academic consideration for quizzes (greater than or equal 10% weight) can be obtained from Engineering Undergraduate Services.
- Students are required to contact the instructor of the course for any other circumstances that appear not to be covered by the non-exhaustive list above.

### **In-Tutorial Assignments**

- In-tutorial assignments will take place during the second hour of the tutorials (dates specified above) where the first hour will consist of help session and practice problem solving conducted by the course instructor and/or the teaching assistant.
- The in-tutorial assignment will consist of problems to be solved by the team formed by the course instructor.
- No make-up sessions will be offered for those missing the in-tutorial assignment (irrespective of the reason).
- If the in-tutorial assignment is missed **with** academic consideration, then its weight will be equally distributed into the rest of in-tutorial assignments.
- If the in-tutorial assignment is missed **without** academic consideration, then the mark for the missed exercise will be zero.
- Students who are absent from more than three in-tutorial assignments (in total, both with and without consideration) will have the weight of the in-tutorial assignments missed with consideration added to the final exam.
- Academic consideration for in-tutorial assignments (less than 10% weight) can be obtained from MME Undergraduate Coordinator.
- Please note that whenever individual contributions to the team effort are not equitably shared by the team members, individual adjustments of the marks might occur at the discretion of the instructional team of the course (*i.e.*, course instructor and teaching assistants).
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

### **Term work**

- If a minimum of 50% is not obtained on term work (class participation, term tests, in-tutorial assignments, and laboratory sessions), the student will fail the course irrespective of the mark obtained in the final examination.
- Please note that whenever possible, due warning on this topic will be given. Nonetheless, appeals on this topic will not be accepted, such that students are required to self-monitor their academic progress in the course throughout the entire term.

### **Final examination**

- If a minimum of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.
- The exam will take place during the April examination period.
- The exam will be open book.
- The length of the final exam will be three hours.
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

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**Submissions**

- In-tutorial assignments are due at the end of the tutorial hour in which they were assigned. No late submissions will be accepted.
- Lab reports will be due at the end of laboratory period. No late submissions will be accepted.
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

**UNITS:** Metric and US customary.

**ENGLISH:** In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

**ATTENDANCE:** Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

**CHEATING:** University policy states that cheating, including plagiarism, is a scholastic offense. The commission of a scholastic offence is attended by academic penalties which might include expulsion from the program. If you are caught cheating, there will be no second warning. (see Scholastic Offence Policy in the Western Academic Calendar).

**SSD:** Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

**NOTE:** Students who have failed an Engineering course (i.e. < 50%) must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.