Western University
Department of Mechanical & Materials Engineering

MME 2204a – Thermodynamics I

COURSE OUTLINE - 2025-2026

CALENDAR DESCRIPTION:

Properties of a pure substance, first law of thermodynamics, processes in open and closed systems, second law of thermodynamics; ideal gases, compressors and energy conversion systems.

COURSE INFORMATION:

Instructor: Prof. A. G. Straatman, Ph.D., P.Eng., FCSME, FCAE
Room SEB 3002A
Email: agstraat@uwo.ca
Telephone: 519-661-2111, ext. 88249

Lectures: See Draft My Schedule

Tutorial: See Draft My Schedule

Labs: 2 Lab exercises will be conducted during the term. These will be scheduled during your allocated lab times on specific dates to be determined.

PREREQUISITES: NMM 1412A, NMM 1414B

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: CBE 2214a/b; MSE 2214a/b

ACCREDITATION UNITS: Science = 40%, Engineering Science = 60%

TOPICS:

- Introduction and definitions
- Properties of a pure substance
- Work and heat; first law and the closed system
- First law and the open system
- First law application
- Second law of thermodynamics
- Power Cycles and Refrigeration Cycles
- Entropy changes of closed, open, reversible, and irreversible systems
- 1st and 2nd law relationships and the universal principal of entropy increase
- Second law application

Introductory lectures will be selected from the following topics:
Reciprocating machines; Steam power cycles; Refrigeration cycles.

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. Apply fundamental theories of classical thermodynamics including equilibrium, irreversibility and state postulate; (PA1, PA2)
2. Characterize the thermodynamic state of a pure substance in any phase or combination of phases; (KB2, KB3, KB4, IN2, IN3)
3. Classify a thermodynamic system as isolated, open or closed, identify transfers of energy via work and heat, and apply the first and second laws of thermodynamics; (KB2, PA1, PA2)
4. Characterize thermal efficiency and isentropic efficiency of systems and devices in terms of the laws of thermodynamics and corollaries of these laws. (KB4, PA3)

CONTACT HOURS:

3 lecture hours, 2 tutorial hours per week, two labs activities lasting 3 hours each, half course.

TEXTBOOK:

"Thermodynamics, An Engineering Approach", 10th Edition. Yunus A. Cengel, Michael A. Boles, Mehmet Kanoglu; McGraw-Hill. (*Western Bookstore*)

Students are welcome to purchase second-hand or earlier editions of this textbook. Editions 8, 9 are acceptable; all assignments are based on edition 10.

REFERENCES:

"Fundamentals of Engineering Thermodynamics," 6th Edition, Copyright 2008; Michael J. Moran & Howard N. Shapiro, John Wiley & Sons Inc. ISBN 978 0470 106747

UNITS:

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

EXAMINATIONS AND QUIZZES:

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

EVALUATION:

Weekly collaborative tutorial exercises (best 6 of 8):	10%
Laboratory exercises (schedule to be announced):	10%
Term Tests: Oct. 2, 2025, 1:30pm-3:30pm (Designated Assessment):	15%
Oct. 30, 2025, 1:30pm-3:30pm:	15%
Final Examination:	50%

In addition, 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.

If a minimum mark of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.

COURSE POLICIES:

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

1. Tutorial Exercises will be conducted weekly in the second half of the tutorial session. The Exercises will be done in groups of up to four students and the 10% grade will be calculated based on your best 6 of 8 Exercises. Since this

flexibility in terms of grading is being provided, any requests for academic consideration will be denied.
2. There are no makeup tests for missed Term Tests. Students who miss a Term Test for a legitimate reason will have its weighting transferred to the Final Exam.
3. Term Test 1 (Scheduled for Oct 2, 2025) is a designated assessment.

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.

The above topics and outline are subject to adjustments and changes as needed.

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.