Western University
Department of Mechanical & Materials Engineering

MME 2204a – Thermodynamics I

COURSE OUTLINE - 2024-2025

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:	M. Z. Hossain, Ph.D., P.Eng.
	Email: mhossa7@uwo.ca
Lectures:	See Draft My Schedule
Tutorial:	Two hours per week. See Brightspace for details.
Labs:	2 Lab exercises will be conducted during the term. These will 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 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, 0.5 laboratory hour, half course.

TEXT: "Thermodynamics, An Engineering Approach", 10th Edition. Yunus A. Cengel, Michael A. Boles, Mehmet Kanoglu; McGraw-Hill.

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

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 Test 1 (2 hours, closed book):	15%
Term Test 2 (2 hours, closed book):	15%
Final Examination (3 hours, closed book):	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 student misses a term test **with** academic consideration, the weighting of the final examination will be adjusted accordingly, but if misses **without** academic consideration will get zero mark in that term test.

This course has 8 tutorials with only 6/8 tutorials counted towards your final grade. Academic consideration will not be granted for missed tutorials. If students miss 2/8 tutorials, the remaining 6 tutorials will be used in the calculation of the final grade. If students miss greater than 2 tutorials, they will receive a grade of zero on each missed tutorial.

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

LABORATORY SESSIONS:

All students are to attend the laboratory section to which they signed up. 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). 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.

COURSE POLICY: USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI):

Use of generative artificial intelligence (AI) tools/software/apps is unacceptable in this course.

General Faculty / University Policies

In the event of contradictions between course-specific policies above and general Faculty / University policies described below, please contact your course instructor for clarification.

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 Associate Dean Academic (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean Academic, the student will be debarred from taking the regular examination in the course.

Missed/Late Accommodation Policy

1. Students missing a test/assignment/lab or examination you will report the absence by submitting an Academic Consideration Request form through STUDENT ABSENCE PORTAL.

2. **Documentation must be provided as soon as possible.**

Exam Accommodation

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (below for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not

considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an Academic Consideration Request Form through STUDENT ABSENCE PORTAL.

   PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

Late Assignments

1. Advise the instructor if you are having problems completing the assignment on time (prior to the due date of the assignment).

2. Be prepared to submit the Academic Consideration Request Form and provide documentation if requested by the instructor (see below for information on documentation).

3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.

4. Some courses may have built-in flexibility for assignment deadlines or the total number of assignments that will be graded. See course-specific policies for details.

5. Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

   Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

Medical Accommodation

1. The Academic Consideration Request Form is available through the STUDENT ABSENCE PORTAL.

2. Requests for academic consideration must include the following components:
   a. Indication of the course(s) and assessment(s) affected by the request
   b. Medical note, and
   c. Additional supporting documentation as relevant

3. Requests for academic consideration without a medical note or other supporting documentation may be accepted once per term, per course.

4. Undocumented absences cannot be used for examinations scheduled by the Office of the Registrar during official examination periods (including take-home final exams and December mid-year exams for full courses) and practical laboratory and performance tests typically scheduled in the last week of the term. Undocumented absences also cannot be used for the "designated assessment" in each course. When flexibility in assessment exists and is clearly stated on the course outline, both undocumented absences and academic consideration requests with documentation may be denied.

5. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**

6. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

   Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Registration.

7. An instructor may deny academic consideration for any assessment that is not required in the calculation of the final grade (e.g., "8 of 10 quizzes"). Assessment flexibility must be indicated on the course outline.

8. An instructor may deny academic consideration relating to the timeframe submission of work where there is already flexibility in the submission timeframe (e.g., 72-hour submission window). This assessment flexibility must be indicated on the course outline.

Religious Accommodation

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning

the work done in classes from which they are absent and to take appropriate action.

Academic Integrity

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

Academic Offences

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. 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.

All required papers may be subject to submission for textual similarity review to commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com). Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Faculty of Engineering AI Policy

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.

GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

Use of English Policy

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work except for the final examination 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.

Accessibility

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for information on accessibility-related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

Inclusivity, Diversity, and Respect

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

Health and Well-Being

- Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.
- Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.

- Gender-Based Violence and Survivor Support - Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Links

- **WESTERN ACADEMIC CALENDAR**
- **ACADEMIC RIGHTS AND RESPONSIBILITIES**
- **ENGINEERING PROGRESSION REQUIREMENTS AND ACADEMIC REGULATIONS**
- **UNIVERSITY STUDENTS' COUNCIL (USC) - SERVICES**
- **IMPORTANT DATES AND DEADLINES**
- **ACADEMIC CONSIDERATION FOR MEDICAL ILLNESS - UNDERGRADUATE STUDENTS**
- **ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS**
- **SCHEDULING OF ASSIGNMENTS, TESTS, AND EXAMINATIONS**
- **STUDENT FORMS**
- **OFFICE OF THE REGISTRAR**
- **RETENTION OF ELECTRONIC VERSION OF COURSE OUTLINES (SYLLABI)**
- **ACADEMIC APPEALS**
- **STUDENT ABSENCE PORTAL**

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines:

First term half course (i.e. "A" or "F")	September 13, 2024
Full courses and full-year half course (i.e. "E", "Y" or no suffix)	September 13, 2024
Second term half course (i.e. "B" or "G")	January 14, 2025

***Drop Deadlines*:**

First term half course without penalty (i.e. "A" or "F")	November 12, 2024
Full courses and full-year half courses without penalty (i.e. "E","Y" or no suffix)	December 2, 2024
Second term half or second term full course without penalty (i.e. "B" or "G")	March 7, 2025

Contact Information:

Undergraduate Services Office:	SEB 2097
Phone: 519-661-2130	E-mail: engugrad@uwo.ca
Mechanical Engineering:	SEB 3002
Phone: 519-661-4122	E-mail: mmeundergraduate@uwo.ca
Chemical & Green Process Engineering:	TEB 477
Phone: 519-661-2131	E-mail: cbeugrad@uwo.ca
Civil Engineering:	SEB 3005
Phone: 519-661-2139	E-mail: civil@uwo.ca

Computer, Electrical, Mechatronic Systems & Software Engineering TEB 279

Phone: 519-661-3758	E-mail: eceugrad@uwo.ca
Integrated Engineering	ACEB 2410
Phone: 519-661-6725	E-mail: engceli@uwo.ca
Office of the Registrar/Student Central	WSSB 1120
Phone: 519-661-2100	