Western Engineering

Department of Chemical & Biochemical Engineering

CBE 2224B - CHEMICAL ENGINEERING THERMODYNAMICS

COURSE OUTLINE 2025-2026

Course Description: This course provides the basics of the thermodynamics involved in chemical engineering, emphasizing thermodynamic properties of fluids, solution thermodynamics, and reaction equilibria. Emphasis is placed on the application of thermodynamics to practical problems in phase equilibria and on solutions and reaction equilibria in separations and reaction engineering.

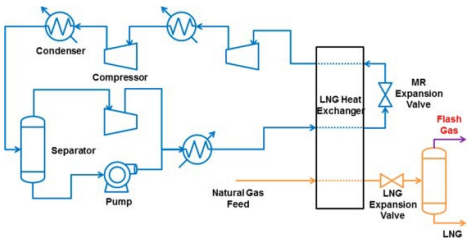
Course Learning Objectives: At the end of this course, students should be able to:

1) Describe the volumetric behavior of non-ideal fluids from appropriate equations of state (EoS) over a wide range of temperature and pressure and apply thermodynamic concepts to phase equilibria of pure fluids (**Chapters 1 - 3**).

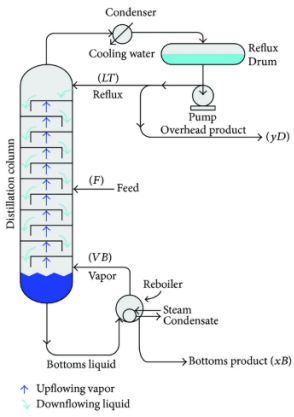
 http://www.lanphan.com/	**Relevant Applications:** Transportation and storage of gases, liquids, and gas-liquid mixtures, and safety considerations in designing storage tanks for compressed fluids.

Note: this learning objective aligns with and is selected for the assessment of the Graduate Attribute for **Problem Analysis** "**A3–Demonstrate ability to reach substantiated conclusions"** at the intermediate level.

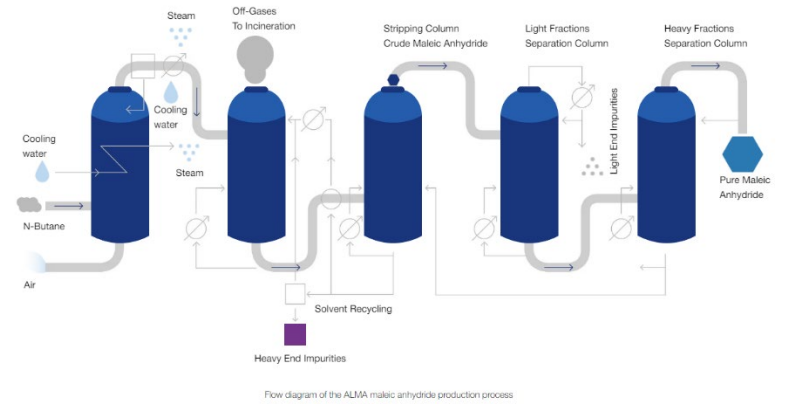
2) Use primary and secondary thermodynamic functions (internal energy, enthalpy, entropy, and Gibbs energy) together with appropriate EoS to determine the thermodynamic properties of fluids (**Chapter 2**).

 Chem Eng Res and Design 132 (2018) 89–114	**Relevant Applications:** Fluid cooling and liquefaction, constant pressure and constant volume fluid heating, energy requirements for fluid transportation.

3) Apply thermodynamic principles to understand solution thermodynamics (fugacity, partial molar properties, chemical potential, vapour-liquid equilibrium, and activity coefficients for non-ideal fluid systems) (**Chapters 4 & 5**).

	**Relevant Applications:** Property changes in mixing (volume and enthalpy), thermodynamics of distillation, and gas absorption

4) Apply thermodynamic principles to reacting systems (gas-phase, liquid-phase, heterogeneous) and determine the maximum allowable conversion at given reaction conditions **(Chapter 6).**

	**Relevant Applications:** Equilibrium (i.e., maximum allowable) conversion in batch and steady-state flow reactions, reaction heat addition/removal, combined reaction and distillation.

Note: this learning objective aligns with and is selected for the assessment of the Graduate Attribute for Design "**D2– Demonstrate ability to generate a diverse set of candidate engineering design solutions**" at the intermediate level.

Prerequisites. CBE 2214A/B or MME 2204 A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may 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.

Co-requisites: None.

Anti-requisites: None.

Contact Hours (per week). 3 lecture hours, 2 tutorial hours, 0.5 course.

Instructor

Dr. Kibret Mequanint (TEB 439) Telephone: 519-661-2111 X 88573
email: kmequani@uwo.ca

Undergraduate Assistant

TEB 477 Telephone: 519-661-2111 X 82131

Teaching Assistants:

Milad Vahidi (mvahidi2@uwo.ca)

Reem Safwan Shomal (rshomal@uwo.ca)

Course Notes

"Chemical Engineering Thermodynamics – M12288" booklet is available at the University Book Store. The cost of the bound notes(booklet), according to the bookstore, is around $40 per copy. You should get a copy of this. Although a variation of the used course booklet may be available from past students, it is likely that some contents, page numbers and equation numbering may have been changed; thus, it is recommended that you get a copy of the latest booklet from the bookstore.

Laboratory and Laboratory Notes: The course has no lab component.

Units: SI (mainly) and other engineering units will be used.

Evaluation

The final course mark will be determined as follows:

Quizzes (3 Quizzes/tests)	15% (see OWL Brightspace site for dates)
Midterm Examination	15% (tentatively Thursday, February 12, 2026 @6PM)
Group Design Project	15% (due date will be announced later)
Attendance and/or participation	5%
Final Examination	50%

Assignments. There will be **no** assignments in this course. In lieu of assignments, problem sets will be posted in owl for you to practice. It is strongly recommended that you take the time to solve these problems.

The midterm examination is tentatively scheduled on Thursday, Feb 12, 2026 @6PM.

All exams will be **closed-book**; however, an equation sheet may be provided or may be allowed by the instructor during the examinations. Only **non-programmable** calculators will be permitted. The midterm examination will be 3 hours and the final examination will be 3 hours. The final exam will take place during the regular examination period.

> **Note:** There will be no make-up midterm exams. If you are unable to write the midterm exam for medical or any other reasons, you must provide the appropriate documentation and the weighting of the final exam will be adjusted accordingly. Failure to provide adequate documentation will result in a mark of 0.

Repeating All Components of the Course

In accordance with Senate and Faculty Policy, 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

Use of 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 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.

Attendance
Attendance in all lectures and tutorials is mandatory. 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 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 (see Scholastic Offence Policy in the Western Academic Calendar).

Plagiarism
All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in 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 Western University and Turnitin.com (http://www.turnitin.com).

Conduct
Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others.

Sickness and Other Problems

- Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

- Students should immediately consult with the instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented. The student should seek advice from the instructor or Department Chair regarding how best to deal with the problem. Failure to notify the instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

- 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 Accessible Education at 661-2111 x 82147 for any specific questions regarding an accommodation.

Statement on gender-based and sexual violence
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.

Notices
Students are responsible for regularly checking their Western e-mail and notices posted on the OWL Brightspace website.

Consultation
Students are encouraged to discuss problems with their teaching assistants and/or instructor in tutorial sessions. Other individual consultations can be arranged by appointment with the instructor.

Additional information on Policy Framework: Missed Classes, Late Work, AI Policy and Academic Integrity Absence/Late Accommodation Policy.

- https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/UG-Policy-Framework-Missed-Classes-Late-Work-and-Academic-Integrity1.pdf

Accreditation (AU) Breakdown
Engineering Science = 75 %
Engineering Design = 25 %

January 2, 2026/km