

Faculty of Engineering
CBE 2220a – Chemical Process Calculations
Course Outline 2025-2026

Description

The objective of this course is to introduce second year students to the field of chemical and biochemical engineering. The basic concepts employed in chemical and biochemical engineering will be covered. Examples of chemical, biochemical, and environmental industries will be presented. New directions in chemical and biochemical engineering will be introduced.

Prerequisites

Applied Mathematics 1411A/B, 1413, Chemistry 1024A/B or the former Chemistry 1050, 1020 or 023, Physics 1401A/B or the former Physics 1026

General Learning Objectives

The general objectives of the course are for students to be able to:

- Identify common processes in chemical and biochemical engineering
- Recognize the key process parameters in chemical engineering problems
- Utilize effective and efficient strategies to solving material and energy balances of chemical, biochemical and environmental processes
- Learn to offer engineering solutions based on ethical reasoning

Specific Learning Objectives*Unit I: Introductory Concepts*

By the end of the first unit, students should understand or become familiar with

- What is chemical and biochemical engineering
- Ethics, Equity and Professional Engineering concepts for choosing engineering solutions
- Common chemical and biochemical engineering processes
- Engineering units and conversion between units of different systems
- Dimensional consistency and dimensionless groups
- Accuracy, precision and significant figures

Unit II: Material Balances:

By the end of the second unit, students should be able to

- Understand the principles of material balances
- Find solution strategies for (and perform degree-of-freedom analysis) of material balance problems
- Perform material balances in a single unit
- Perform material balances involving multiple units, recycle, bypass and purge streams

- Integrate chemical reaction and elemental balances into material balances
- Identify limiting and excess reactants, calculate fractional conversion and fractional yield

Unit III: Energy Balances:

By the end of the third unit, students should be able to

- Understand forms of energy and energy exchange
- Perform a combined material and energy degree-of-freedom analysis
- Estimate the physical properties of process streams.
- Perform energy balances in non-reacting and reacting systems

Alignment with Faculty Wide Indicators: PR1, PR2, EE1,EE4, EPM1 Level: Introductory

Objective	Unacceptable	Below expectations	Meets expectations	Exceeds expectations
PR1: Familiarity with provincial engineering legislation and other relevant standards. PR3: Shows an awareness of the PEO and the role of licensing; EE1: Demonstrates knowledge of professional ethics. EE4: Awareness of the principles of equity EPM1: Demonstrate ability to incorporate economics into engineering problems	No familiarity or awareness of Professional engineering principles, engineering ethics and equity; unable to incorporate introductory economic principles into engineering problems	Some familiarity or awareness of Professional engineering principles, engineering ethics and equity; Able to incorporate introductory economic principles into engineering problems	Good awareness of Professional engineering principles, engineering ethics and equity; understands and to incorporate introductory economic principles into engineering problems	Very well versed in Professional engineering principles, and engineering ethics and equity; Expert in incorporating introductory economic principles into engineering problems

Contact Hours

3 lecture hours per week, 2 tutorial hours per week, 0.5 course.

Instructor

Dr. Amarjeet Bassi (TEB 469) Telephone: 519-661-2111 ext.: 81279, email: abassi@uwo.ca

Undergraduate Assistant

(TEB 477) Telephone: 519-661-2111 ext.: 82131 cbeugrad@uwo.ca

Recommended Text

Basic Principles and Calculations in Chemical Engineering, David M. Himmelblau, James B. Riggs, 9th Edition, Prentice Hall / Pearson Education, Upper Saddle River, NJ, 2012.

Lecture Materials

Lecture materials will be available for download from the course website on OWL.

Units

SI, FPS, and CGS units will be used.

Evaluation

The final course mark will be determined as follows:

Tutorial participation, Assignments and Quizzes	25%
Midterm Exam (in class, 2 h)	25%
Final Examination	50 %

Note

1) Assignments are posted on OWL and Quizzes must be handed in electronically on the specified due date provided by the instructor. Late submissions will be penalized and may receive a mark of zero.

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, tutorials and labs 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

Students must write their 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. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

The University of Western Ontario has software for plagiarism checking. Students may be required to submit their work in electronic form for plagiarism checking.

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 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 Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Notice

Students are responsible for regularly checking their Western email and notices posted on Sakai (Owl).

Consultation

Students are encouraged to discuss problems with their teaching assistants and/or instructor in tutorial sessions. Office hours will be arranged for the students to see the teaching assistants. Other individual consultation can be arranged by appointment with the instructor.

Accreditation (AU) Breakdown

Engineering Science 90%

Complementary studies 10%

Aug/2023