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

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.

Corequisites
None
Antirequisites
None

Contact Hours:
Offered Online- asynchronously

Instructor:
Dr. Amarjeet Bassi (mail: abassi@uwo.ca)

Undergraduate Assistant
(TEB 477) Telephone: 519-661-2111 ext: 82131 email: cbeugrad@uwo.ca
Suggested Text

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

Units
SI, FPS, and CGS units will be used.

General Learning Objectives

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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 engineering design problems
- Utilize effective and efficient strategies to solving material and energy balances of chemical processes

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
- 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

Evaluation
Online Tutorial work submission and/or in-class quizzes, assignments 35%
Mid-term Examination 25%
Final Examination 40%

Both the Mid-term and the Final Examination may be limited open book or closed book or take home. The examination may use Proctor Track or other formats.

Notes
1) Assignments/Quizzes/Workshops are to be submitted online by the specified due date provided by the Instructor. Assignments will only be accepted until a specified time and date. Late assignments will receive a mark of zero. It is the student’s responsibility to ensure all of his/her assignments have been submitted, marked and returned.

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 lectures, laboratories 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
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. If under special circumstances, a student is given permission to write a special examination, the student should understand that the format of the special examination may differ from the format of the regular final or midterm examination.
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.

**Notices**
Students are responsible for regularly checking their Western email, the website of the course on OWL and notices posted on Instructors’ doors.

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

**Accreditation (AU) Breakdown**
Engineering Science 100%

**ONLINE COURSE POLICY**

**1. If using Proctortrack or alternative remote proctoring solution only:**
Tests and examinations in this course will be conducted using the remote proctoring service, Proctortrack. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:


Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link:

https://www.proctortrack.com/tech-requirements/.

**2. If using Zoom Only:**
Tests and examinations in this course will be conducted using Zoom. You will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session will not be recorded.*

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link:


Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link:

https://support.zoom.us/hc/en-us.
* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

3. If using both Zoom and Proctortrack or alternative remote proctoring solution:

Tests and examinations in this course will be conducted using both Zoom and the remote proctoring service, Proctortrack.

When Zoom is used for exam invigilation, you will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session using Zoom will not be recorded.*

Proctortrack will require you to provide personal information (including some biometric data). The session will be recorded. By taking this course, you are consenting to the use of this software. More information about remote proctoring is available in the Online Proctoring Guidelines at the following link:


Completion of this course will require you to have a reliable internet connection and a device that meets the system and technical requirements for both Zoom and Proctortrack. Information about the system and technical requirements are available at the following links:

https://support.zoom.us/hc/en-us.

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

Whether using Proctortrack, Zoom or a combination of both for remote proctoring, personal information will be collected, recorded, used and uploaded. Instructors using Proctortrack and/or Zoom should review the Online Proctoring Notice and Guidelines and provide all students in the course with the applicable notice.

Note that Proctortrack and Zoom may not be simultaneously used for the same assessment in this course.

Accommodation, Illness Reporting and Academic Considerations

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: Academic Accommodation for Students with Disabilities.

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student’s final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student’s final grade,
- if a student has already used the self-reporting portal twice during the academic year
If the conditions for a Self-Reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student’s Home Faculty.

For Western University policy on Consideration for Student Absence, see

Policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs

and for the Student Medical Certificate (SMC), see:


Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar.

Use of Recordings

The learning sessions for this course may be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals under special circumstances. Please contact the instructor if you have any concerns related to session recordings. Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Statements concerning Online Etiquette

Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- unless invited by your instructor, do not share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:
• if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
• remember to unmute your microphone and turn on your video camera before speaking
• self-identify when speaking.
• remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

• Keep in mind the different cultural and linguistic backgrounds of the students in the course.
• Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
• Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
• Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Participation policy for final exams

For the purposes of online courses, the phrase “is absent too frequently from” in the policy on Attendance Regulations for Examinations will be interpreted as “has not engaged sufficiently in.”