

**The University Of Western Ontario
Faculty of Engineering****DEPARTMENT OF CHEMICAL AND BIOCHEMICAL ENGINEERING****CBE 2220A – Chemical Process Calculations
Course Outline 2015-2016****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, 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:

3 lecture hours, 2 tutorial hours, 0.5 course.

Instructor:

Dr. Amarjeet Bassi, P.Eng. (TEB 467) Telephone: 519-661-2111 ext: 88324 email:
abassi@uwo.ca

Teaching Assistant(s)

TBD

Undergraduate Assistant

 Ingrid Timusk (TEB 477) Telephone: 519-661-2111 ext: 82131 email: ingrid.timusk@uwo.ca
Suggested Text

 Basic Principles and Calculations in Chemical Engineering, David M. Himmelblau, James B. Riggs
8th Edition, Prentice Hall International Series, NJ, NY 2012.

Reference Text

Introduction to Material and Energy Balances, G.V. Reklaitis, John Wiley & Sons.

Lecture Materials

Lecture materials such as in class course notes will be available for download from the course website on UWO New OWL.

Units

SI, FPS, and CGS units will be used.

General Learning Objectives

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|-------------------|---|-------------------|---|----------------------------------|---|
| Knowledge Base | X | Individual Work | X | Ethics and Equity | |
| Problem Analysis | X | Team Work | X | Economics and Project Management | |
| Investigation | X | Communication | | Life-Long Learning | X |
| Design | | Professionalism | | | |
| Engineering Tools | X | Impact on Society | X | | |

Specific Learning Objectives
Introductory Concepts:

- Understand what is chemical and biochemical engineering.
- Convert from one set of engineering units to another
- Compare dimensionless groups
- Interconvert mass, volume and moles and their flows
- Interconvert between different temperature scales

Material Balances:

- Introduction to Material Balances and Solution Strategies
- Perform material balances for systems with recycle, bypass and purge streams
- Calculate the limiting reactant, excess reactants, fractional conversion and fractional yield
- Determine combustion processes
- Perform elemental balances

Energy Balances:

- Estimate the physical properties of process streams
- Learn how to use tabular data
- Perform a combined material and energy balance analysis for a system
- Explain the selection of a reference point
- Perform energy balances

Evaluation

The final course mark will be determined as follows:

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| Assignments +Tutorials (18) and Attendance (7) | 25% |
| Mid-term Examination | 25% |
| Final Examination | 50% |

Both the Mid-term and the Final Examination may be limited open book or closed book. The final examination will be 3 hours in length.

Notes

- 1) Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned 48% if the aggregate mark is more than 50% or the aggregate mark.
- 2) Assignments are to be handed in to the CBE 2220A locker in TEB on 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 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%

September 8, 2015/it

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC ACCOMMODATION WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC ACCOMMODATION WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2015 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or exam that is worth MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097. Otherwise, you will report to your department office to request accommodation.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your Department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM TESTS

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request accommodation. Otherwise, you will report to your department office to request accommodation.
3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page 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, 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 sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. It is the student's responsibility to check the date, time and location of the special examination.

D. 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 provide documentation if requested by the instructor (see reverse side 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 Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
 - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
 - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or Ms. Karen Murray in the Undergraduate Services Office, if you are in first year.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctors notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

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

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2015 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness: <http://www.westerncalendar.uwo.ca/2015/pg117.html>
Academic Accommodations for Students with Disabilities: <http://www.westerncalendar.uwo.ca/2015/pg118.html>
Academic Accommodations for Religious or Holy Days: <http://www.westerncalendar.uwo.ca/2015/pg118.html>
Course Withdrawals: <http://www.westerncalendar.uwo.ca/2015/pg157.html>
Examinations: <http://www.westerncalendar.uwo.ca/2015/pg129.html>
Scheduling of Term Assignments: <http://www.westerncalendar.uwo.ca/2015/pg97.html>
Scholastic Offences: <http://www.westerncalendar.uwo.ca/2015/pg113.html>
Student Medical Certificate: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf
Engineering Academic Regulations: <http://www.westerncalendar.uwo.ca/2015/pg1442.html>

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.

Drop Deadlines:

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| First term half course (i.e. "A" or "F"): | November 5, 2015 |
| Full courses and full-year half courses (i.e. "E", "Y" or no suffix): | November 30, 2015 |
| Second term half or second term full course (i.e. "B" or "G"): | March 7, 2016 |

Contact Information:

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| Undergraduate Services Office: | SEB 2097 | Telephone: (519) 661-2130 | Fax: (519) 661-3757 |
| Dept. of Chemical and Biochemical Engineering & Green Process Engineering: | TEB 477 | Telephone: (519) 661-2131 | Fax: (519) 661-3498 |
| Dept. of Civil and Environmental Engineering: | SEB 3005 | Telephone: (519) 661-2139 | Fax: (519) 661-3779 |
| Dept. of Electrical and Computer Engineering, Software Engineering & Mechatronics Engineering: | TEB 279 | Telephone: (519) 661-3758 | Fax: (519) 850-2436 |
| Dept. of Mechanical and Materials Engineering: | SEB 3002 | Telephone: (519) 661-4122 | Fax: (519) 661-3020 |