Faculty of Engineering

CBE 3330a – BIOREACTION AND BIOPROCESS ENGINEERING
Course Outline 2017-2018

Description

Prerequisites
CBE 2290a/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.

Corequisites
None

Antirequisites
None

Contact Hours
3 lecture hours, 3 laboratory hours, 0.5 course.

Instructor
Dr. D. Karamanev (TEB 445) Telephone 519-661-2221 ext: 88230 email: dkaraman@uwo.ca

Lab Technician
Mai Sakulchaicharoen (SEB 1083A) Telephone 519-661-2111 ext: 80536 email: nsakulch@uwo.ca

Undergraduate Assistant
Cole Handsaeme (TEB 477) Telephone 519-661-2131 email: jhandsae@uwo.ca
Required Text

Western University, Thompson Engineering Building, Room 477, 1151 Richmond Street, London, ON Canada N6A 5B9 t. 519.661.2111 ext. 82131 f. 519.661.3498 www.eng.uwo.ca/chemical/

Course Notes
Course notes will be available via OWL.

Laboratory Notes
Lab notes will be provided by the faculty member.

Reference Text

Laboratory
Laboratory attendance is mandatory. The laboratory includes the following experiments: enzyme kinetics with and without inhibition, calculation of kinetic constants, batch and continuous bioreactor growth of microorganisms.

Units
SI units will be preferred but other units (FPS, CGS) may be used.

General Learning Objectives
This course is the second of a series of three courses on Biochemical Engineering of the Environmental and Biochemical Engineering Option. The objective of this course is to emphasize the basic principles of bioreaction and bioprocess engineering, which includes: kinetics of enzymatic reactions and microbial growth, batch and continuous cell growth kinetics, products formation and nutrient utilization, bioreactor systems, mass transfer, sterilization processes and agitation in bioreactors.

Specific Learning Objectives
Main Learning Objective
To design a bioreactor system for the production or waste treatment processes

Enzyme Processes
At the end of this topic, students should be able to:

• determine kinetic parameters of enzyme processes
• determine the effect of mass transfer on macrokinetics
• design an enzyme bioreactor
**Microbial Processes**

At the end of this topic, students should be able to:

- select a microbial kinetic model and determine its parameters
- calculate the basic parameters of batch, fed-batch and continuous cultivation
- determine yield coefficients
- design a suspended cell bioreactor
- select a method for cell immobilization
- design an immobilized cell bioreactor

**Mass transfer in bioreactors**

- the volumetric mass transfer coefficient on the basis of bioreactor Determination parameters
- determine the volumetric mass transfer coefficient on the basis of experimental data
- design of a bioreactor based on the oxygen demand

**Sterilization of bioreactor inputs**

- design a sterilization system for liquid
- design a sterilization system for air

**Evaluation**

Students will be evaluated on the basis of assignments, in-class tests, and a final examination. The laboratory portion of the course will be evaluated on the basis of attendance, laboratory book and selected laboratory formal reports.

The final course mark will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Assignments and in-class tests</td>
<td>10%</td>
</tr>
<tr>
<td>Mid-term Examination</td>
<td>20%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>20%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50%</td>
</tr>
</tbody>
</table>

Assignments will be given during the semester. Students will have 2 weeks to complete each assignment. Five (5) percent of the total mark per day will be subtracted for late assignments.
Both the mid-term and final exams will be closed book, where only individual non-programmable calculators will be permitted. 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 higher than 50%, or the aggregate mark.

2) Students must turn in all laboratory reports, and achieve a passing grade in the laboratory component, to pass this course.

3) Assignments will be given during the semester. Students will have 2 weeks to complete each assignment. Five (5) percent of the total mark per day will be subtracted for late assignments.

4) Assignments are to be handed in the CBE 3301A locker (#457) in TEB on the specified due date provided by the Instructor.

**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 are 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 Undergraduate 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.

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 = 70% Engineering Design = 30%