

MBIO 4520: Industrial Bioprocesses
Course Outline
Fall 2017

Instructors:

Lectures: Dr. Y. Acebo

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Laboratory: Dr. Damien Rivers

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Office hours: Available for questions after class. Other times are available by appointment.

Recommended readings:

- Brock Biology of Microorganisms 14th ed. with assigned reading and introduced lecture material.
- Waites, MJ et al. 2001 Industrial Microbiology publ Blackwell.
- Demain, A.L. and Davies, J.E. 1999 "Manual of Industrial Microbiology and Biotechnology" ASM Press.
- Butler, M. 2004. Animal Cell Culture Technology publ. Bios Scientific, Oxford.

The course will cover bioprocesses for a range of commercially important health care and industrial products including antibiotics, enzymes, vaccines, steroids, therapeutic recombinant proteins, monoclonal antibodies and ethanol. Bioreactor design and control for these bioprocesses, metabolite engineering for product enhancement, applied engineering, animal cell technology and downstream processing will also be included.

Course Content:

1. General Introduction to Bioprocesses
2. Bioreactor design
 - a. Stirred tank
 - b. Fluidized-bed
 - c. Air-lift
3. Methods of fermentation
 - a. Batch, fed-batch
 - b. Continuous, perfusion
4. Energetics of growth, cell yields
5. Nutrient requirements and culture media
6. Metabolic engineering
7. Requirements for scale-up
 - a. Multiple vs unit systems
 - b. Agitation systems/ control
 - c. Oxygen/ pH control
 - d. Microcarriers
8. Fermentation of bioproducts by microorganisms
 - a. Primary metabolites

- b. Secondary metabolites
- 9. Animal Cell technology
 - a. Cell types
 - b. Genetic technology for production
 - c. Principles of using animal cells in large-scale process
- 10. Products from animal cells
 - a. Viral vaccines
 - b. Monoclonal antibodies
 - c. Recombinant proteins

Assessment:

Mid-term examination:	20%
Seminars:	10%
Final examination:	50%
Laboratory assessment:	20%

The grades for the midterm will be returned prior to the voluntary withdrawal date.

For this course, a grade of 45% in the final exam is required to pass the course. The grading scheme generally but not exactly follows that used by the Rady College of Medicine https://umanitoba.ca/faculties/health_sciences/medicine/admissions/8847.html.

A+ (>90%)

A (80-89.9%)

B+ (75-79.9%)

B (70-74.9%)

C+ (65-69.9%)

C (60.0-64.9%)

D (50-59.9%)

F (<50%, or <45% in final exam)

Deferred exams: There will not be a deferred Midterm exam. Students with notes from a counselor, physician, or clergy will write the Final exam for 70% of their final mark. Students without notes who did not write the exam will receive 0% for their Midterm mark. The same rules will apply to seminars.

The use of electronic devices (for example, cellphones, laptops, tablets) during exams is strictly forbidden. Yanelis Acebo and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission. Course materials (both paper and digital) are for the participant's private study and research.

Students with disabilities are directed to Student Accessibility Services to facilitate the implementation of accommodations. Course instructors are willing to meet with Students to discuss the accommodations recommended by Student Accessibility Services.

Academic dishonesty guidelines are stated in your calendar regarding University policy with respect to academic dishonesty (particularly plagiarism and cheating) and behaviour and absence from final exams. All work is to be completed independently unless otherwise specified. Please remember that group projects are subject to the rules of academic dishonesty and every group member must ensure that a group project adheres to the principles of academic integrity.

The Faculty of Science web page has detailed information (<http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html>) Please read and follow these guidelines, and ask if you have any questions.