

## Course Outline

### Instruction Team

Dr. David B. Levin (he/him)  
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Dr. Warren Blunt (he/him)  
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### Student Hours

Instructors will be available by appointment. Please reach out by e-mail any time (24/7). They will respond within 24 hours with a day and time that he can meet with you.

### Teaching Assistant

Md. Shamim Reza

### Location

**110 Architecture II Bldg**  
Tue. Thur. 1:00 - 2:15 PM

### Contact Hours

3 credit hours  
Lectures: 2.5 hours x 12 weeks = 36 hours

### Course Website

<http://umanitoba.ca/umlearn>

## Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

## BIOE 7180 Bioprocessing (CRN 14616) Fall 2023

### Course Objectives

This course allows students with a background in either biological sciences or engineering to gain an understanding of biochemical engineering processes used to enable important microbial/biochemical conversions by biological systems. Topics include bioprocessing unit operations, production of biofuels, biopolymers, and biopharmaceutical drugs and vaccines, fermentation and bioreactor systems, and downstream processing for product recovery.

### Course Content

Lectures will cover the following topics: Bioprocessing Unit Operations, Bioethanol production, Biodiesel production, Biopolymer production, Fermentation processes Bioreactor systems

### Course Delivery

Lectures will proceed as listed in the left and this time will be used to deliver course content, provide time for design work, testing and presentations.

Lecture #	Date	Lecture Topic/Title	Lecturer
0	September 7	Hand-out course Syllabus	DL & WB
1	September 11	Non-Newtonian Fluids	WB
2	September 14	Drying Processes	WB
3	September 19	Fluidized Beds	WB
4	September 21	Mixing Operations	WB
5	September 26	Filtration	WB
6	September 28	Membrane Separation	WB
7	October 3	Evaporation	WB
8	October 5	Clarification	WB
9	October 10	Fluid Extraction Methods	WB
10	October 12	Product Extraction: Phenolics	WB
11	October 17	1 <sup>st</sup> Generation Bioethanol	DBL
12	October 19	Cenovus Bioethanol Production	DBL
13	October 24	Cellulosic Bioethanol	DBL
14	October 26	Biodiesel	DBL
15	October 31	Energetics of Microbial Growth	DBL
16	November 2	Bioreactor Systems for Microbes	WB
17	November 7	Biopolymers	WB
18	November 9	Fermentation for PHA Production	WB
19	November 14	No Class: Reading Week	---
20	November 16	No Class: Reading Week	---
21	November 21	Bioreactor Systems for Eukaryotes	DBL
22	November 23	Microalgae Production	DBL
23	November 28	Carotenoid Production by Yeast	DBL
24	November 30	The Immune System	DBL
25	December 7	Vaccine Production	DBL

### Recommended Reading

The textbook for the course is "Bioprocessing", written by Drs. Stefan Cenkowski and David B. Levin. This book was prepared and edited by Dr. Cenkowski and Dr. Levin in collaboration with several of their graduate students in 2016. A PDF of the book will be provided to each student registered in the course through UMLearn ([www.umlearn.com](http://www.umlearn.com)).

## Grading Scale

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure year-to-year grading consistency.

Letter	Mark	GPA
A+	92–100	4.15-4.50
A	85–91	3.83-4.14
B+	78–84	3.52-3.82
B	72–77	3.25-3.51
C+	66–71	2.98-3.24
C	60–65	2.71-2.97
D	51-59	2.25-2.70
F	< 50	<2.25

## Learning Outcomes

At the conclusion of the course, the student should be able to understand and explain the basic principles of bioprocessing unit operations and their applications, specifically:

No.	Learning Outcome
1	Understand the basic theory of heat transfer, mass transfer, and fluid flow and how this theory governs unit operations
2	Understand how these unit operations are relevant in bioprocessing applications
3	Understand and explain the basics of microbial growth and growth systems for eukaryotic or prokaryotic organisms
4	Understand and explain different processes for production of biofuels, biopolymers, and drug/vaccine development.

## Evaluation

Course marks will thus consist of three “take-home” open book assignments and are due in class at the dates shown to the left. Assignment 1 is worth 40% of the final mark. Assignments 1 and 2 test theory and are worth 30% of the final mark, whereas Assignment tests bioprocessing applications and is worth 40% of the final mark. All the information required to answer the questions in assignments are in the lecture material or the relevant chapters of the Bioprocessing textbook. Each question directs you to the chapter you must read and understand to answer the questions. Late assignments will be assessed a penalty of 10% per day or part thereof (including weekends). Exceptions may be granted in unforeseen circumstances prevent submission. See UM’s Self-Declaration for Brief and Temporary Student Absences to submit late due to illness. Non-medical extensions may be granted if students communicate in advance with their Instructor and provide supporting documentation to warrant an extension.

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Assignment #1	30		S	1,2	I
Assignment #2	30		S	1,2	I
Assignment #3	40		S	3,4	I

\* Method of Feedback: **F** - Formative (written comments / oral discussion), **S** - summative (numerical grade)

\*\* I/T: **I** – Individual effort, **T** – A team effort

## Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the *General Academic Regulations on Academic Integrity*, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty. The guidelines stated in your University of Manitoba Graduate Calendar regarding University policy with respect to academic dishonesty (including plagiarism and cheating) and behaviour and absence from final exams will be followed. Students are advised to read sections in [7 Academic Integrity](#), [4.2 Examinations: Personations](#) and [5.1 General: Academic Dishonesty](#) the Graduate Calendar.

## Important Dates

**First day of class – course syllabus**  
Thurs. Sept 7, 2023

**Early Withdrawal Deadline**  
September 19, 2023

**Assignment #1 Distributed**  
Sept 23, 2023

**National Day for Truth and Reconciliation**  
Mon. Oct. 2, 2023  
No classes or examinations

**Assignment #1 Due**  
Oct. 5, 2023 (due in class)

**Thanksgiving**  
Mon. Oct. 9, 2023  
No classes or examinations

**Assignment #2 Distributed**  
Thurs. Oct 26, 2023

**Assignment #2 Due**  
Thurs. Nov. 9, 2023 (due in class)

**Fall Term Break**  
Nov. 13-17, 2023  
No classes or examinations

**Remembrance Day (observed)**  
Mon. Nov. 13, 2023  
No classes or examinations

**Voluntary Withdrawal Deadline**  
November 21, 2023

**Assignment #3 Distributed**  
Thurs. Nov 23, 2023

**Assignment #3 Due**  
Thurs. Dec 7, 2023 (due in class)  
(last class)

**Last Day of Class**  
Mon. Dec 11, 2023

## Requirements/Regulations

- Please copy the Instruction Team in all emails (Instructors and Teaching Assistants). All email communication must conform to the Communicating with Students university policy.  
[Communicating with Students](#)
- As the Instruction Team, we will do our best to respond to all emails **within 48 hours during working hours** (8:30 AM – 5:30 PM Monday thru Friday). Ex. A Friday night email may not be responded to until the following Tuesday.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences ( $\leq 72$  hours) for extenuating circumstances. This form cannot be used for planned absences like vacations. It is also not to be used for longer-term absences, or ongoing circumstances (e.g., Authorized Withdrawals, Leaves of Absence, or other accommodations), which will still require additional documentation.  
[Self-Declaration Form for Brief or Temporary Absence](#)  
[Self-Declaration Policy for Brief or Temporary Absences](#)
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should familiarize themselves with the University's *General Academic Regulations*.  
[General Academic Regulations \(Graduate\)](#)
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g., Academic Integrity, Respectful Behaviour, Examinations, and related matters.  
[Supplemental Resources](#)

## Deferred Final Examinations

Students who miss the regularly scheduled writing of a final examination for valid medical or compassionate reasons will only be allowed to write a deferred exam if the Associate Dean (Academic and Graduate) approves the request. All requests for a deferred examination *must* be made within 48 hours of the missed exam of assignment and follow the procedure described on the Faculty [website](#) without exception. Course Instructors *do not have the discretion* to grant deferred final examinations.

[Deferred Exam Policy \(student experience website\)](#)

## Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the Instructor and the Department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University's *Intellectual Property Policy* and the protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba)*. Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

## Copyright Notice

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[Copyright Office](#)

