



## Course Outline

### Instructor

David B. Levin

### Student Hours

Individual assistance is always available by appointment. Please e-mail Dr. Levin to arrange a day and time to meet.

### Lecture Days, Time, & Location

MWF 10:30-11:20 am  
Agriculture Building, Rm 130

### Tutorial/Lab

Tuesdays, 2:30-3:45 pm  
E2-320 EITC

### Contact Hours

Lectures:  
3 hrs x 12 weeks = 36 hrs

Tutorial/Lab:  
3 hrs x 10 weeks = 30 hrs

### Prerequisites

CHEM 1300  
University 1 Chemistry.

### Course Website:

<http://umanitoba.ca/umlearn>

## BIOE 2590 Biology for Engineers A01 Fall 2024 (CRN 18593)

Credit Hours: 4

### Calendar Description

BIOE 2590 provides theories and principles of Biology to engineering students and presents applications of biological principles to engineering problems. Fundamental theories involved in cell structure and function, metabolism, genetics and heredity, the roles of DNA, RNA, and Proteins in cells, as well as animal structure, function, and evolution are covered. Tutorial sessions and term assignments focus on the engineering applications of these basic theories and principles to provide a good understanding of the role of Biology in Engineering.

### Course Objectives

The intent of this course is to:

1. Introduce students to basic biological principles of cell structure and function, metabolism, genetics and heredity, bacteria and virus structure and function, and animal structure, function, and evolution; and
2. Provide students with an opportunity to collaborate in the learning process and develop critical thinking skills

### Texts, Readings, Materials

#### Textbook:

Campbell Biology, Fourth Canadian Edition. by Urry, L.C., Wasserman, M., Minorsky, S., Orr, P., Hull, R., Rawle, L., Durnford, F., Moyes, D., and Kevin, CS.  
Publisher, Benjamin Cummings Science. ISBN: 9780138091774  
\$119.95 before tax.

### Course Delivery

The lectures are divided into four modules: Module 1, Thermodynamics & Chemistry; Module 2, Cell Biology; Module 3, Genetics & Molecular Biology; and Module 4: Animal Diversity & Evolution.

### Evaluation Method

The grading system for this course is based on a combination of four In-class Module Tests and four On-line assignments.

#### Evaluation Summary:

1) In Class Module Tests:	60% (4 x 15% each)
2) On-line assignments:	40% (4 x 10% each)
Total:	100%

## Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of Anishinaabeg, Ininiwak, Anisininewuk, Dakota Oyate and Dene, and on the National Homeland of the Red River Métis.

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.

## Lecture schedule

### Important Dates

**First day of class: Course Syllabus**

Wednesday, September 4, 2024

**Early Withdrawal Deadline**

Tuesday, September 17, 2024

**National Day for Truth and Reconciliation**

Monday, September 30, 2024

No classes or examinations

**Thanksgiving**

Monday, October 14, 2024

No classes or examinations

**Remembrance Day (observed)**

Monday, November 11, 2024

No classes or examinations

**Fall Term Break**

November 12-15, 2025

No classes or examinations

**Voluntary Withdrawal Deadline**

Tuesday, November 19, 2024

**Last Day of Class**

Monday, December 09, 2025

Lecture #	Date	Lecture Topic/Title
0	September 4	Hand-out course Syllabus
1	September 6	Matter, Elements, Atoms, & Water
2	September 9	Carbon & the Molecular Diversity of life
3	September 11	Macromolecules
4	September 13	Metabolism & Energy
5	September 16	Enzymes & Metabolism
Review	September 18	Review to Lectures 1 to 5
In-class Test	September 20	Module 1 Test
6	September 23	The Cell
7	September 25	Membrane Structure & Function
8	September 27	Cellular Respiration I
No Class	September 30	National Truth & Reconciliation Day
9	October 2	Cellular Respiration II
10	October 4	Photosynthesis I
11	October 7	Photosynthesis II
12	October 9	Cell Communication
13	October 11	The Cell Cycle: Mitosis
No Class	October 14	Thanksgiving
14	October 16	Meiosis
Review	October 18	Review to Lectures 6 to 14
In-class Test	October 21	Module 2 Test
15	October 23	Mendelian Genetics I
16	October 25	Mendelian Genetics II
17	October 28	Chromosomes
18	October 30	The Molecular Basis of Inheritance
19	November 1	From Gene To Protein I
20	November 4	From Gene To Protein II
Review	November 6	Review to Lectures 15 to 20
In-class Test	November 8	Module 3 Test
No Class	November 11	Remembrance Day
No Class	November 12-15	Reading Week
21	November 18	Intro to Animal Diversity
22	November 20	Invertebrate Evolution I
23	November 22	Invertebrate Evolution II
24	November 25	Invertebrate Evolution III
25	November 27	Invertebrate Evolution IV
26	November 29	Vertebrate Evolution I
27	December 2	Vertebrate Evolution II
28	December 4	Vertebrate Evolution III
Review	December 6	Review to Lectures 21 to 27
In-class Test	December 9	Module 4 Test

## 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

## Class tutorials/Module Reviews

On specified Tuesday afternoons, from 2:30 to 4:20 pm, we will have class tutorials in which we will review the course material leading up to the Module

### Module Review Dates:

Date	Module Review	Topic
Wednesday, September 18 <sup>th</sup>	1	Review of Lectures 1 - 5
Friday, October 18 <sup>th</sup>	2	Review of Lectures 6 - 14
Wednesday, November 6 <sup>th</sup>	3	Review of Lectures 15 - 20
Friday, December 6 <sup>th</sup>	4	Review of Lectures 21 - 28

### In-class Test Dates:

Date	Module Test	Topic
Wednesday, September 20 <sup>th</sup>	1	Lectures 1 - 5
Monday, October 21 <sup>th</sup>	2	Lectures 6 - 14
Friday, November 8 <sup>th</sup>	3	Review of Lectures 15 - 20
Monday, December 9 <sup>th</sup>	4	Review of Lectures 21 - 28

## On-line Assignments

You will have access to the on-line Mastering Biology website that supports the Campbell text Book. Throughout the semester, for each Module, you will be given an on-line assignment that you must complete, and submit on-line for grading. The assignments will be available to you at mid-night Thursday evening before the Friday class on the dates indicated in the On-line Assignment Due Dates table, above. Access to the assignments closes at noon on the day of the in-class Module Test (see the Important Dates table, above). There are four on-line assignments, worth 40% of your final grade.

To access the on-line Assignments, you must purchase the Mastering Biology Code. This can be purchase with the hardcopy of the Campbell Biology textbook, or the Campbell Biology eBook, or you can purchase just the Mastering Biology Code. Prices for these are listed above, on page 1 of this syllabus.

To access the on-line Assignments, you have to register at the BIOE 2590 Mastering Biology site, BIOE 2590 Fall 2024, using the following code: **levin21141**. Instructions on how to register for Mastering Biology have been uploaded to the BIOE 2590 website on UM Learn.

### On-line Assignment Due Dates:

On-Line Assignment #	Accessible on	Due on
1	Friday, September 13 <sup>th</sup>	Friday, September 27 <sup>th</sup>
2	Friday, October 4 <sup>th</sup>	Friday, October 18 <sup>th</sup>
3	Friday, October 25 <sup>th</sup>	Friday, November 8 <sup>th</sup>
4	Friday, November 22 <sup>cd</sup>	Friday, December 6 <sup>th</sup>

**Late Assignments:** Assignments submitted after the due date will be docked 10% per school day. Missed Assignments will receive a zero grade.

### Tutorial Guest Lectures

There will be a series of guest lectures on various aspects of biology and biosystems engineering. These lectures will be presented by graduate students and will highlight the interface between microbiology, biotechnology, and genome sciences with biosystems and bioprocess engineering. Questions about the Guest Lectures will be included in the In-Class Module Tests. The dates, presenter names, and topics are as follows:

Guest Lecture	Lecture Date	Presenter	Topic
1	Tuesday, Sept. 10 <sup>th</sup>	Joe Ackerman	The Problem with Recycling
2	Tuesday, Sept. 17 <sup>th</sup>	Quintin Litke	Biodegradable Food Packaging Materials
3	Tuesday, Sept. 24 <sup>th</sup>	Sarita Shrestha	Microbial & Enzymatic Degradation of PLA
4	Tuesday, Oct. 1 <sup>st</sup>	Trinh Nguyen	Microbial & Enzymatic Degradation of LDPE
5	Tuesday, Oct. 8 <sup>th</sup>	Katherine Romero	Cloning and expression of polymer degrading enzymes
6	Tuesday, Nov. 19 <sup>th</sup>	Madeline Stanley	Engineered Floating Wetlands
7	Tuesday, Nov. 26 <sup>th</sup>	Daniel Flores Orozco	Antibiotic Resistance Genes in Anerobic Digestors

### Learning Outcomes

By the end of this course, you will be able to:

Learning Outcomes	
1	Understand the basic principles of biological systems;
2	Describe the basic structures of cells and the differences between prokaryotic and eukaryotic cells;
3	Explain the differences between aerobic and anaerobic metabolism;
4	Explain the basic structures, functions, and evolution of animals;
5	Distinguish correct statements from incorrect statements through critical assessment of the information presented.

### Evaluation

Evaluation Method	Value (%)	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Module 1 Test	15	S	1 to 8	I
Module 1 On-line assignment	10	S		
Module 2 Test	15	S		
Module 2 On-line assignment	10	S		
Module 3 Test	15	S		
Module 3 On-line assignment	10	S		
Module 4 Test	15	S		
Module 4 On-line assignment	10	S	4 to 8	I

\* Method of Feedback: **F** - Formative (written comments and/or oral discussion), **S** - Summative (numerical grade) \*\* I/T: **I** – Individual effort, **T** – Team effort

## Accreditation Details

### Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 25%
- Engineering Science: 0%
- Engineering Design: 75%

### Graduate Attributes

KB: A knowledge base for engineering

PA: Problem analysis

IN: Investigation

DE: Design

ET: Use of engineering tools

IT: Individual and team-work

CS: Communication skills

PR: Professionalism

IE: Impact of engineering on society/environment

EE: Ethics and equity

EP: Economics and project management

LL: Life-long learning

### Competency Levels

I - Introduced

D – Intermediate (Developing)

A - Advanced

## CEAB Graduate Attributes Assessed

This course will assess the following CEAB graduate attribute indicators shown below:

Indicator (Level)	Indicator Description	Assessment Point
DE.2 (I)	Uses an appropriate design process that considers all relevant factors (i.e., health and safety risks, standards, economic, environmental, cultural and societal considerations)	Midterm exams
DE.3 (D)	Develops possible solutions to an open-ended design problem, leading to an appropriate recommendation	Written design report
IT.1 (D)	Participates equitably in group activities and decision-making in leadership and followership (support) roles	Reflective letter #2 & Self evaluation
IT.2 (D)	Exhibits appropriate interpersonal skills when interacting with team members, including giving and receiving constructive feedback	Self-evaluation
CS.1 (I)	Designs and produces effective written and graphical engineering documents for specific audiences (e.g., research reports, engineering reports, design documents)	Design report (draft & final)
CS.2 (D)	Delivers, produces, and delivers effective technical presentations for specific audiences	Final project presentation
PR.1 (I)	Understands the role of the engineering profession in society and the responsibility of the Professional Engineer in protection of the public	Safety quizzes
EE.1 (I)	Appreciates and articulates ethical considerations, and resolves ethical issues, related to engineering activities	Case study
LL.1 (D)	Recognizes limitations of their knowledge and engages in actions to address them	Information gathering report
LL.2 (I)	Critically reflects on successes, challenges and mistakes to guide ongoing learning	Self-evaluation
LL.3 (D)	Demonstrates research and information literacy skills	Information gathering report & design reports

## Expected Competency Levels

Learning Outcome	Attribute*											
	KB-2**	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	I											
2	I											
3	I											
4	I											
5	I											
6	I											

## 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, use of Artificial Intelligence (AI), 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.

## 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](#)

 [Engineering Academic Regulations](#)

- 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 (Undergraduate) approves the request. All requests for a deferred examination *must* be made within 48 hours of the missed exam 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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