



**Course Outline**

**Instructor**

Dr. David B. Levin (he/him)  
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**Student Hours**

By appointment: Send me an e-mail message any time (24/7).

I will respond within 24 hours with a day and time that we can meet on-line.

**Teaching Assistant**

Quin Litke?

**Times**

**Lectures:** Mondays, Wednesdays, and Fridays: 10:30 to 11:20 am

**Tutorials:** Tuesdays, 2:30 to 3:45 pm

**Location (both lectures & Tutorials)**

Human Ecology Rm 207

**Contact Hours**

3 Credit hours

Lectures: 3 hours/week x 12 weeks = 36 hours

**Course Website**

<http://umanitoba.ca/umlearn>

**BIOE 2590 Biology for Engineers (CRN 18593) Fall 2023**

**Course Objectives**

This course will introduce students to the 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 provide students with an opportunity develop critical thinking skills.

*Why this course is useful:* This course is the “Bio” in Biosystems Engineering. As biosystems engineers, you will need a basic understanding of the structure, function, and energy transformations of biological systems at the cellular and organismal levels, and how these processes are affected by both internal and external environmental parameters.

*Who should take this course?:* This is a required course in the Biosystems Engineering program.

*How this course fits into the curriculum:* It is intended that students take this course during the first year after being accepted into the Department of Biosystems Engineering. As mentioned above, this course introduces students to the basic principles of biology.

*Pre-Requisites:* CHEM 1300 or University 1 Chemistry (Chem 1310)

**Course Content**

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.

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

**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.

|                      |                  |                             |
|----------------------|------------------|-----------------------------|
| <b>No Class</b>      | November 13-17   | Reading Week                |
| <b>Review</b>        | November 20      | Review to Lectures 15 to 22 |
| <b>In-class Test</b> | November 22      | Module 3 Test               |
| <b>23</b>            | November 24      | Intro to Animal Diversity   |
| <b>24</b>            | November 27      | Invertebrate Evolution I    |
| <b>25</b>            | November 29      | Invertebrate Evolution II   |
| <b>26</b>            | December 1       | Invertebrate Evolution III  |
| <b>27</b>            | December 4       | Vertebrate Evolution I      |
| <b>28</b>            | December 6       | Vertebrate Evolution II     |
| <b>29</b>            | December 8       | Vertebrate Evolution III    |
| <b>Review</b>        | December 11      | Review to Lectures 23 to 30 |
| <b>In-class Test</b> | To be Determined | Module 4 Test               |

### Learning Outcomes

The Accreditation Detail for this course is 100% Natural Science

The Graduate Attribute for this is KB: A knowledge base for engineering

At the conclusion of the course, the student should be able to:

| No. | Learning Outcome  | Transferable Skill   |
|-----|---|----------------------|
| 1   | Understand the basic principles of biological systems   | Scientific knowledge |
| 2   | Describe the basic structures of cells and the differences between prokaryotic and eukaryotic cells               | Scientific knowledge |
| 3   | Explain the differences between aerobic and anaerobic metabolism  | Scientific knowledge |
| 4   | Explain the basic structures and functions of viruses and bacteria  | Scientific knowledge |
| 5   | Explain the basic structures, functions, and evolution of animals   | Scientific knowledge |
| 6   | Distinguish correct statements from incorrect statements through critical assessment of the information presented | Scientific knowledge |

### 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          |    |    |    |    |    |    |    |    |    |    |    |

**\*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

Expected Level of Development:

- I – Introductory
- D – Developed
- A – Advanced

**\*\* KB-2: Recalls, defines, comprehends and applies information and concepts in natural sciences**

All courses in the Biosystems Engineering program are expected to contribute, in some way, to the development of one or more of the 12 graduate attributes that have been identified by the Canadian Engineering Accreditation Board. The table below shows the graduate attributes covered in BIOE 2590 in relation to the assessment element that contributes to your overall grade in the course. The final column indicates the approximate level of development in graduate attributes that is anticipated in this course.

| <b>Assessment Element</b>  | <b>Value</b> | <b>Attributes Covered</b>      | <b>Indicators being assessed</b>   | <b>Level*</b> |
|----------------------------|--------------|--------------------------------|--|---------------|
| <b>Class Module Tests</b>  | 60%          | Knowledge base for engineering | KB.2 Recalls and defines and/or comprehends and applies information and concepts in the natural sciences | I             |
| <b>On-line Assignments</b> | 40%          | Knowledge base for engineering | KB.2 Recalls and defines and/or comprehends and applies information and concepts in the natural sciences | I             |

\*Level of Development Grade Attributes (I – Introductory; D = Intermediate; A = Advanced)

## 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     |

## Important Dates

### First day of class: Course Syllabus

Wednesday, September 6, 2023

### Early Withdrawal Deadline

Tuesday, September 19, 2023

### National Day for Truth and Reconciliation

Mon. October 2, 2023

No classes or examinations

### Thanksgiving

Monday, October 9, 2023

No classes or examinations

### Fall Term Break

November 13-17, 2023

No classes or examinations

### Remembrance Day (observed)

Monday, November 13, 2023

No classes or examinations

### Voluntary Withdrawal Deadline

Tuesday, November 21, 2023

### Last Day of Class

Monday, December 11, 2023

## 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% |                |

## 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 test.

### Module Review Dates:

| Date                                  | Module Review | Topic                      |
|---------------------------------------|---------------|----------------------------|
| Wednesday, September 20 <sup>th</sup> | 1             | Review of Lectures 1 - 5   |
| Friday, October 20 <sup>th</sup>      | 2             | Review of Lectures 6 - 14  |
| Monday, November 20 <sup>th</sup>     | 3             | Review of Lectures 15 - 22 |
| Monday, December 11 <sup>th</sup>     | 4             | Review of Lectures 23 - 29 |

## 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 2023, using the following code: **levin62211**. 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 15 <sup>th</sup> | Friday, September 29 <sup>th</sup> |
| 2                    | Friday, October 6 <sup>th</sup>    | Friday, October 20 <sup>th</sup>   |
| 3                    | Friday, October 27 <sup>th</sup>   | Friday, November 10 <sup>th</sup>  |
| 4                    | Friday, November 24 <sup>th</sup>  | Monday, December 11 <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. Attendance of these lectures is obligatory, and there will be questions on the Module tests on the lectures. The dates, presenter names, and topics are as follows:

| Guest Lecture | Lecture Date                    | Presenter            | Topic   |
|---------------|---------------------------------|----------------------|---|
| 1             | Tuesday, Sept. 12 <sup>th</sup> | Joe Ackerman         | The Problem with Recycling                          |
| 2             | Tuesday, Sept 26 <sup>th</sup>  | Quintin Litke        | Biodegradable Food Packaging Materials              |
| 3             | Tuesday, Oct. 10 <sup>th</sup>  | Bruna Fernandez      | Microbial remediation of oil pollution              |
| 4             | Tuesday, Oct. 24 <sup>th</sup>  | Katherine Romero     | Cloning and expression of polymer degrading enzymes |
| 5             | Tuesday, Oct. 31 <sup>st</sup>  | Daniel Flores Orozco | Anaerobic Digestion of Manure                       |
| 6             | Tuesday, Nov. 21 <sup>st</sup>  | Rumana Islam         | Biodegradable polymers                              |
| 7             | Tuesday, Dec. 5 <sup>th</sup>   | Madeline Stanley     | Engineered Floating Wetlands and bioremediation     |

### 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.

### 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 or Assignments**

Students who miss the regularly scheduled writing of a final **examination** or assignment for valid medical or compassionate reasons will only be allowed to write a **deferred exam or assignment** if the Associate Dean (Undergraduate) approves the request. All requests for a **deferred examination** or assignment *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 **exam**inations or assignments.

[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.

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[Copyright Office](#)

