



## University of Manitoba Department of Biosystems Engineering

### Course Details

---

<b>Course Title &amp; Number:</b>	BIOE 2590 Biology for Engineers
<b>CRN:</b>	18593
<b>Days of Week &amp; Class times</b> Location: Webex link:	<b>Lectures: MWF 10:30 - 11:20 am</b> On-line via Webex Available within BIOE 2590 UM Learn website
<b>Tutorials:</b> Location: Webex link:	<b>Tuesdays 2:30 - 3:45 pm</b> On-line via Webex Available within BIOE 2590 UM Learn website

### Course 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 structure and function of bacteria and viruses, 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.

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

---

### Instructor Information

---

<b>Instructor(s) Name:</b>	Dr. David Levin, Professor
<b>Office Location:</b>	E1-354 EITC
<b>Availability:</b>	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.
<b>Office Phone No.</b>	204-474-7429
<b>Email:</b>	<a href="mailto:david.levin@umanitoba.ca">david.levin@umanitoba.ca</a>

---

### Textbook, Readings, Materials

---

#### Required Text Book and Additional Material

Campbell, N.A., J.B. Reece and L.G. Mitchell. 2020. *Biology*, 3<sup>rd</sup> Canadian Edition. New York, NY: Benjamin Cummings Science.

Mastering Biology: On-line resources provided by the textbook publisher, Benjamin Cummings Science.

---

There are three options:

- |  |          |
|--|----------|
| 1) Purchase a new copy of Campbell Biology, with Mastering Biology Code: | \$149.99 |
| 2) Purchase the eBook plus Mastering Biology:                            | \$115.50 |
| 3) Purchase Mastering Biology Code only:                                 | \$ 50.50 |

Note: If you have the 1<sup>st</sup> or 2<sup>nd</sup> Canadian Edition of Campbell, Reese, & Mitchell, *Biology*, you can purchase the Mastering Biology Code only.

### ***How to Purchase the Campbell Biology eBook and/or Mastering Biology on-line***

The Campbell Biology eBook and Mastering Biology code digital products can be purchased by directly from The University of Manitoba bookstore online store: <http://www.umanitoba.ca/bookstore/>

Once there, you can click the [students](#) link under Textbooks & Course Materials (located on the upper left side of the UofM Bookstore page. On the following page they will see another link:

Click [HERE](#) to order your textbooks ONLINE!

This will bring up....another page:

<http://bookstore.umanitoba.ca/SelectTermDept>

From this page, students can select BIOE 2590 from the drop down menu to obtain a list of course materials for this course.

A simpler method involves students clicking this link:

[https://www.campusebookstore.com/integration/AccessCodes/default.aspx?bookseller\\_id=33&Course=BIOL+1020%2f1030+%2f+BIOE+2590&frame=YES&t=permalink](https://www.campusebookstore.com/integration/AccessCodes/default.aspx?bookseller_id=33&Course=BIOL+1020%2f1030+%2f+BIOE+2590&frame=YES&t=permalink)

This link is basically a shortcut as it takes the student directly to a shopping cart page that contains the two digital options. Please note although the two options will be listed one can be easily removed by clicking the [Remove item](#) link below the product.

One would then complete the transaction to get the access code for the eText and Modified Mastering (or the Modified Mastering by itself).

### ***How to Purchase Hardcopies of the Campbell Biology and Mastering Biology***

The hardcopy/physical product (loose-leaf text with Modified Mastering access code) can be purchased from the UofM Bookstore three different ways:

- 1) Visit the store in person. The Bookstore is open from 11am to 7pm Monday to Thursday and 11am to 4pm Fridays from August 31<sup>st</sup> to September 17<sup>th</sup>;
  - 2) Ordering by phone or email and getting the product delivered to them (please note there is a delivery charge associated with this option);
-

3) Ordering by phone or email and arranging to pick up the product from our pickup window at the UofM Bookstore.

UofM Bookstore phone: 204-474-7961

UofM Bookstore email: [bookstore\\_webmaster@umanitoba.ca](mailto:bookstore_webmaster@umanitoba.ca)

## **General Course Information**

---

### **Instructional Methods**

Learning is most effective when both the teacher and the student are engaged in the subject material. The role of the teacher, therefore, is to create an environment that facilitates student engagement (and therefore learning). Due to the COVID-19 pandemic, this course will be presented entirely on-line. All of the lectures will be presented on-line in the scheduled class times (MWF 10:30 to 11:20 am) via Webex. The lectures presented on-line will be recorded and then posted to the BIOE 2590 website on UM Learn. The tutorial classes (on Tuesdays from 2:30 to 3:45) will also be presented on-line and will be used for clarification of specific topics, special guest lectures, and reviews of lecture materials in advance of class tests.

A complete set of the lectures is already posted to the UM Learn website, but these do not have voice-over recordings. The lectures recorded during scheduled class periods via the Webex will be uploaded to the UM Learn website after each class. The files with the voice-over recording are very large (60 to 100 Mb), and not all students have the computer capacity to download files of this size. The files without the voice-over recording are smaller (3 to 5 Mb).

A substantial portion of the course content is contained within the assigned textbook and supplementary materials accessible on-line through the Mastering Biology website, provided by the textbook publisher. Students are expected to prepare for class by reviewing the lecture PowerPoint files, reading the assigned materials in the textbook, and completing on-line assignments.

### **How does this course fit into the curriculum?**

This is a required course in the Biosystems Engineering program; the prerequisite for BIOE 2900 is ENG 1430. The Biosystems Engineering program has four design courses that build upon basics that were introduced in ENG 1430 (i.e., introduction to the engineering design process and the dynamics of working as a team to solve an engineering problem). BIOE 2900 is the first of these four courses and is to be taken during the 2<sup>nd</sup> year of the program.

### **Course Goals**

---

The intent of this course is to:

- 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.
- Provide students with an opportunity to collaborate in the learning process and 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.

**Intended Learning Outcomes**

---

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

- Understand the basic principles of biological systems
- Describe the basic structures of cells and the differences between prokaryotic and eukaryotic cells
- Explain the differences between aerobic and anaerobic metabolism
- Explain the basic structures and functions of viruses and bacteria
- Explain the basic structures, functions, and evolution of animals

2) Collaborate in the learning process and develop critical thinking skills

- Distinguish correct statements from incorrect statements through discussion with other students and critical assessment of the information presented

**Expected Level of Development in Course \*\***

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

## Course Evaluation Methods

---

The grading system for this course is based on a combination of on-line assignments, participation in class tutorials, a Mid-term exam, and a Final Exam.

Evaluation Summary:

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

## Grading

---

The grading scale used for this course is shown below:

Letter Grade	Percentage out of 100	Grade Point Range	Final Grade Point
A+	90 – 100	4.25-4.5	4.5
A	80 – 89.5*	3.75-4.24	4.0
B+	75 – 79.5*	3.25-3.74	3.5
B	70 -74.5*	2.75-3.24	3.0
C+	65 – 69.5*	2.25-2.74	2.5
C	60 – 64.5*	2.0-2.24	2.0
D	50 – 59.5*	Less than 2.0	1.0
F	< 50		0

- Scores between 0.6 and 0.9 of a grade percentage will be rounded up to the next whole number and the next Letter Grade as appropriate

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.

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

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

---

## Important Dates

---

Event	Date
Last day to drop fall/winter term courses without penalty	Tuesday, September 22 <sup>cd</sup>
Voluntary withdrawal date	Monday, November 23 <sup>rd</sup>
1 <sup>st</sup> In-class Test: Module 1 - Thermodynamics & Chemistry	Friday, September 25 <sup>th</sup>
2 <sup>cd</sup> In-class Test: Module 2 - Cell Biology	Wednesday, October 21 <sup>st</sup>
3 <sup>rd</sup> In-class Test: Module 3 - Genetics & Molecular Biology	Friday, November 20 <sup>th</sup>
4 <sup>th</sup> In-class Test: Module 4: Animal Diversity & Evolution	Friday, December 11 <sup>th</sup>

## Class Tutorials & Module Reviews

---

### 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 23 <sup>rd</sup>	1	Review of Lectures 1 - 5
Monday, October 19 <sup>th</sup>	2	Review of Lectures 6 - 14
Wednesday, November 18 <sup>th</sup>	3	Review of Lectures 15 - 22
Tuesday, December 8 <sup>th</sup>	4	Review of Lectures 23 - 30

## Assignment Descriptions

---

### 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 2020, using the following code: **levin33195**.

#### *On-line Assignment Due Dates:*

On-Line Assignment #	Accessible on	Due on
1	Friday, September 11 <sup>th</sup>	Friday, September 25 <sup>th</sup>
2	Friday, October 9 <sup>th</sup>	Friday, October 23 <sup>rd</sup>
3	Friday, October 30 <sup>th</sup>	Friday, November 20 <sup>th</sup>
4	Friday, November 27 <sup>th</sup>	Friday, 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.

## 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. 22 <sup>nd</sup>	Chris Dartailh	Production and properties of PHA polymers
2	Tuesday, Oct. 6 <sup>th</sup>	Nisha Mohanan	Biodegradation of PHA polymers
3	Tuesday, Oct. 22 <sup>nd</sup>	Ryan Sestric	Microbial production of carotenoids
4	Tuesday, Nov. 3 <sup>rd</sup>	Irene Fakankun	Microbial metabolism and carotenoid synthesis
5	Tuesday, Nov. 17 <sup>th</sup>	Pardis Karimi	Microbial degradation of hydrocarbons
6	Tuesday, Dec. 3 <sup>rd</sup>	Madeline Stanley	Research on hydrocarbon degradation at the ELA

## UNIVERSITY & COURSE POLICIES

### Using Copyrighted Material

---

Please respect copyright. We will use copyrighted content in this course. The content used is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by us, are made available for private study and research and must not be distributed in any format without permission.

### Recording Class Lectures

---

Dr. Levin and the University of Manitoba hold copyright over the course materials, presentations and lectures that 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 from Dr. Levin. Course materials (both paper and digital) are for the participant's private study and research.

### Course Technology

---

As a courtesy to both the instructors and your classmates, use of cell phones is not permitted during class time. Please remember to switch your cell phone to vibrate mode to avoid interruptions. Laptops may be used during lectures only for the purpose of taking notes. Some course materials will be available through UM Learn.

### Class Communication

---

The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit:

[http://umanitoba.ca/admin/governance/media/Electronic\\_Communication\\_with\\_Students\\_Policy\\_-\\_2014\\_06\\_05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

---

Please note that all communication between you as a student and your instructors/TAs must comply with the electronic communication with student policy ([http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

## **Academic Integrity**

---

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation and duplicate submission. Electronic detection tools may be used to screen assignments in cases of suspected plagiarism.

## **Expectations: You Can Expect Us To**

---

Learning is most effective when both the teacher and the student are engaged in the subject material. The role of the teacher, therefore, is to create an environment that facilitates student engagement and learning. In this course, some dissemination of information will occur using the traditional lecture format. However, a substantial portion of the content will be distributed as reading materials, which will be covered using classroom discussion or other learning activities. You can expect us to endeavour to create an active learning environment.

## **Expectations: We Expect You To**

---

We expect you to be in attendance, and on time, for all scheduled lectures and labs. If you must be absent, please show us the courtesy of sending an e-mail notifying us of your absence. To benefit the most from this class, you must be willing to participate in class discussions. Therefore, you will be expected to prepare for class by reading the assigned materials.

## **Student Accessibility Services**

---

### **Student Accessibility Services**

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

*Student Accessibility Services* <http://umanitoba.ca/student/saa/accessibility/>

520 University Centre

204 474 7423

[Student\\_accessibility@umanitoba.ca](mailto:Student_accessibility@umanitoba.ca)

---