Course Details

Course Title & Number: BIOE 2590 Biology for Engineers
CRN: 18593
Class Times & Days of Week Lectures: MWF 10:30 - 11:20 am
Location: Education 326
Tutorials: Thursdays 2:30 - 3:45
Location: E2-350 EITC

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

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.

Instructor Information
Instructor(s) Name: Dr. David Levin, Professor
Office Location: E1-354 EITC
Office Hours or Availability: By appointment: Send me an e-mail message any time (24/7). I will respond within 24 hours with a day and I that I can meet with you.
Office Phone No. 204-474-7429
Email: david.levin@umanitoba.ca

Textbook, Readings, Materials
Required Text Book and Additional Material
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: $166.95
2) Purchase the eBook plus Mastering Biology: $115.00
3) Purchase Mastering Biology Code only: $ 60.50
Note: If you have the 1st Canadian Edition of Campbell, Reese, & Mitchell, *Biology*, you can purchase the Mastering Biology Code only.

**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). In this course, some dissemination of information will occur using the traditional lecture format. However, a substantial portion of the 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 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 2nd 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**

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KB</td>
</tr>
<tr>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>2</td>
<td>I</td>
</tr>
</tbody>
</table>

*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:

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

- 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.

<table>
<thead>
<tr>
<th>Assessment Element</th>
<th>Value</th>
<th>Attributes Covered</th>
<th>Indicators being assessed</th>
<th>Level*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Module Tests</td>
<td>45%</td>
<td>Knowledge base for engineering</td>
<td>KB.2 Recalls and defines and/or comprehends and applies information concepts in the natural sciences.</td>
<td>I</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15%</td>
<td>Knowledge base for engineering</td>
<td>KB.2 Recalls and defines and/or comprehends and applies information concepts in the natural sciences.</td>
<td>I</td>
</tr>
<tr>
<td>On-line Assignments</td>
<td>40%</td>
<td>Knowledge base for engineering</td>
<td>KB.2 Recalls and defines and/or comprehends and applies information concepts in the natural sciences.</td>
<td>I</td>
</tr>
</tbody>
</table>

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

Important Dates

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last day to drop fall/winter term courses without penalty</td>
<td>Tuesday, September 17th</td>
</tr>
<tr>
<td>Voluntary withdrawal date</td>
<td>Monday, September 18th</td>
</tr>
<tr>
<td>1st In-class Test: Module 1 - Thermodynamics &amp; Chemistry</td>
<td>Friday, September 20th</td>
</tr>
<tr>
<td>2nd In-class Test: Module 2 - Cell Biology</td>
<td>Friday, October 18th</td>
</tr>
<tr>
<td>3rd In-class Test: Module 3 - Genetics &amp; Molecular Biology</td>
<td>Friday, November 8th</td>
</tr>
<tr>
<td>4th In-class Test: Module 4: Animal Diversity &amp; Evolution</td>
<td>Friday, December 6th</td>
</tr>
</tbody>
</table>
Class Tutorials & Module Reviews

Class tutorials/Module Reviews

On specified Monday 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:

<table>
<thead>
<tr>
<th>Tutorial Date</th>
<th>Module Review</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, September 19th</td>
<td>1</td>
<td>Review of Lectures 1 - 5</td>
</tr>
<tr>
<td>Wednesday, October 16th</td>
<td>2</td>
<td>Review of Lectures 6 - 14</td>
</tr>
<tr>
<td>Thursday, November 7th</td>
<td>3</td>
<td>Review of Lectures 15 - 22</td>
</tr>
<tr>
<td>Thursday, December 5th</td>
<td>4</td>
<td>Review of Lectures 23 - 30</td>
</tr>
</tbody>
</table>

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 Winter 2019, using the following code: levin67134.

On-line Assignment Due Dates:

<table>
<thead>
<tr>
<th>On-Line Assignment #</th>
<th>Accessible on</th>
<th>Due on</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Friday, September 13th</td>
<td>Friday, September 27th</td>
</tr>
<tr>
<td>2</td>
<td>Friday, October 4th</td>
<td>Friday, October 18th</td>
</tr>
<tr>
<td>3</td>
<td>Friday, October 25th</td>
<td>Friday, November 8th</td>
</tr>
<tr>
<td>4</td>
<td>Friday, November 22nd</td>
<td>Friday, December 6th</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Guest Lecture</th>
<th>Lecture Date</th>
<th>Presenter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>September 26th</td>
<td>Chris Dartiaill</td>
<td>Production and properties of PHA polymers</td>
</tr>
<tr>
<td>2</td>
<td>October 3rd</td>
<td>Nisha Mohanan</td>
<td>Biodegradation of PHA polymers</td>
</tr>
<tr>
<td>3</td>
<td>October 24th</td>
<td>Ryan Sestric</td>
<td>Microbial production of carotenoids</td>
</tr>
<tr>
<td>4</td>
<td>October 31st</td>
<td>Irene Fakankun</td>
<td>Microbial metabolism and carotenoid synthesis</td>
</tr>
<tr>
<td>5</td>
<td>November 21st</td>
<td>Pardis Karimi</td>
<td>Microbial degradation of hydrocarbons</td>
</tr>
<tr>
<td>6</td>
<td>November 28th</td>
<td>Madeline Stanley</td>
<td>Research on hydrocarbon degradation at the ELA</td>
</tr>
</tbody>
</table>
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

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). 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