University of Manitoba  
Faculty of Agricultural & Food Sciences  
Department of Biosystems Engineering

COURSE DETAILS

Course Title & Number: BIOE 4950 Biosystems Engineering Design 4  
Number of Credit Hours: 4  
Lecture/Lab Times: MWF 1:30-2:20 pm & WF 2:30-4:20 pm  
Classroom Location: Remote learning via Webex (until end of February)  
Lab Location: Remote learning via Webex (until end of February)  
Pre-Requisites: BIOE 4900 Biosystems Design 3

Undergraduate Calendar Description
BIOE 4950 focuses on the fabrication of a prototype. Engineering communication topics are integrated alongside design concepts. Design teams take the design developed in BIOE 4900 and fabricate a prototype. Prerequisite: BIOE 4900.

How does this course fit into the curriculum?
This is a required course in the Biosystems Engineering program; the prerequisite for BIOE 4950 is BIOE 4900. 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 4950 is the fourth of these courses and is to be taken during the 4th year of the program. This course will provide the student with the opportunity to use skills from other courses, build on fundamental engineering competencies, and develop engineering communication skills that are most important in industry. BIOE 4950 provides students with the opportunity to produce a prototype or proof-of-concept designed in the BIOE 4900 proposal phase.

Why is this course useful?
It is often said that design is what engineers do. Engineers use a wide variety of skills and knowledge to take an idea, formulate a concept and develop a design. To clearly articulate a design an engineer must be able to communicate effectively in written form, through design drawings and via oral presentations. This course will provide the student with the opportunity to develop these skills by means of a hands-on project.
## Instructor Contact Information

<table>
<thead>
<tr>
<th>Instructor(s) Name:</th>
<th>Dr. Don Petkau, P.Eng., Senior Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Location:</td>
<td>E2-358 EITC</td>
</tr>
<tr>
<td>Office Hours or Availability:</td>
<td>By appointment outside of class or laboratory hours.</td>
</tr>
<tr>
<td>Office Phone No.</td>
<td>204-474-7443</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:Don.Petkau@umanitoba.ca">Don.Petkau@umanitoba.ca</a></td>
</tr>
<tr>
<td>Contact:</td>
<td>You may contact me with questions related to the course in person, by phone, or by email.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instructor(s) Name:</th>
<th>Dr. Jillian Seniuk Cicek, Ph.D. (Dr. Seniuk Cicek will have limited participation in this course; she will only be present for Team Presentations &amp; involved in some assessment. Feel free to contact her if you need support with communication skills, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Location:</td>
<td>333 Stanley Pauley Engineering Building</td>
</tr>
<tr>
<td>Office Hours or Availability:</td>
<td>By appointment</td>
</tr>
<tr>
<td>Office Phone No.</td>
<td>204-474-9698</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:Jillian.SeniukCicek@umanitoba.ca">Jillian.SeniukCicek@umanitoba.ca</a></td>
</tr>
<tr>
<td>Contact:</td>
<td>You may contact me with questions related to the course in person or by email.</td>
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<tr>
<th>Instructor(s) Name:</th>
<th>Mr. James White, P.Eng. (Engineer-in-Residence)</th>
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<tbody>
<tr>
<td>Office Location:</td>
<td>E1-268 EITC</td>
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<td>Office Hours or Availability:</td>
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<td>Office Phone No.</td>
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<tr>
<td>Email:</td>
<td><a href="mailto:James.White@umanitoba.ca">James.White@umanitoba.ca</a></td>
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All email communication must conform to the [Communicating with Students](#) university policy. We will do our best to respond to your questions within 24 h.

## Textbook, Readings, Materials

# Course Goals

The intent of this course is to allow students to complete the design project initiated in BIOE 4900. Design teams will be required to evaluate their design using an appropriate strategy prior to making a final recommendation to their industry client in the form of both a written project report and a formal presentation.

# Intended Learning Outcomes

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

1. Use appropriate communication strategies to manage an engineering design project.
2. Use project management tools and fundamentals to manage an engineering design project.
3. Evaluate an engineering design using an appropriate strategy (i.e., prototype, proof-of-concept model, computer simulation, mathematical model).
4. Write an engineering project report for an external client.
5. Disseminate technical information in a formal presentation.
7. Exhibit professional behaviour expected of an engineering professional.

### Expected Competency Level **

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attributes*</th>
<th>KB</th>
<th>PA</th>
<th>IN</th>
<th>DE</th>
<th>ET</th>
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*CEAB Graduate Attributes:

<table>
<thead>
<tr>
<th>KB</th>
<th>A knowledge base for engineering</th>
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<tr>
<td>PA</td>
<td>Problem analysis</td>
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<td>IN</td>
<td>Investigation</td>
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<tr>
<td>DE</td>
<td>Design</td>
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<td>ET</td>
<td>Use of engineering tools</td>
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<td>IT</td>
<td>Individual and team work</td>
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<td>CS</td>
<td>Communication skills</td>
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<td>PR</td>
<td>Professionalism</td>
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<td>IE</td>
<td>Impact of engineering on society/environment</td>
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<td>EE</td>
<td>Ethics and equity</td>
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<td>EP</td>
<td>Economics and project management</td>
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<td>LL</td>
<td>Lifelong learning</td>
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</table>

**Expected Level of Development:**

- I - Introductory
- D – Developing
- A - Advanced

*CEAB Graduate Attributes:*

**Expected Level of Development:**
Using Copyrighted Material
Please respect copyright. We will use copyrighted content in this course. We have ensured that 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
The course instructors 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 the course instructors. Course materials are for the participant’s private study and research.

Course Technology
It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by instructor and/or the University of Manitoba Student Accessibility Services. While we recognize the importance of technology in our daily lives (laptops, cell phones, blackberries) we ask that you use them with discretion. For example, this includes turning off cell phones during class time and if working on a laptop, ensuring that the work is related exclusively to the lecture/course. Some course materials will be available through UM Learn.

Class Communication
In accordance with university policy all email communication for this course shall be conducted using your University of Manitoba email address only.
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 must comply with the electronic communication with student policy: (http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html).

Please ensure that you are also monitoring your UM Learn account for this course.

Expectations: You Can Expect Us To
Learning is most effective when both the instructors and the students are engaged in the subject material. The role of the instructors, therefore, is to create an environment that facilitates student engagement and learning. In this course, you can expect an active learning environment. Some dissemination of information will occur using the traditional lecture format. However, a substantial portion of the course will be used to facilitate teamwork and the development of teams’ design projects. The nature of design tends to be open-ended, iterative and relies on the self-discipline of the engineer to see a project through to completion. The schedule for this course provides for multiple blocks of time each week, in which a portion of the time will be used to present more traditional lecture material for certain aspects of the course. This will be done to
provide direction for assignments and other activities required for the course. The remainder of class time will be reserved to work on design projects. This time will be used for a variety of activities, including: consulting with the instructors, working on design drawings, meeting with industry members, sourcing product information, and evaluating the proposed design.

### Expectations: We Expect You To

Attendance and punctuality are expected, primarily as this is a team-based course, requiring students to maximize opportunities to work effectively with their teammates in class. If you must be absent, please notify your team members and us beforehand via email. When we are engaged in class discussion and interaction, your full attention is requested. While instruction time for this course is less structured than in a traditional analysis course, successful completion of the course requirements demands that this time be used wisely.

**Academic Integrity:**

All applicable rules and regulations in the University of Manitoba General Calendar, including those on plagiarism, cheating (Section 7.1) and examination impersonation (Section 4.2.8) are to be read and followed. Continued registration in this course implies that you accept, and will comply, with these conditions. Reproduction of another student’s work is not acceptable. Please refer to the “Academic Integrity” section of the University of Manitoba Undergraduate Academic Calendar. ([http://crscalprod.ad.umanitoba.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=341&chapterid=4295&loaduseredits=False](http://crscalprod.ad.umanitoba.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=341&chapterid=4295&loaduseredits=False)).

### Referencing Style

Students are expected to follow the CSBE reference style when citing references in course assignments. The *Biosystems Engineering Citation Guide – CSBE Style* is available through UM Learn. Please refer to this guide to ensure that you follow the correct referencing style.

### Students 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/](http://umanitoba.ca/student/saa/accessibility/)

520 University Centre
204 474 7423
Student_accessibility@umanitoba.ca
# Class & Lab Schedule

## Week 1
- **January 24**: Course overview
- **January 26**: Safety training, design time
- **January 28**: Safety training, design time

## Week 2
- **January 31**: Unstructured design time; **Project Update Memo #1 due**
- **February 2**: Engineering Practice Lecture; Consultation with Instructors
- **February 4**: Unstructured design time; Consultation with Instructors

## Week 3
- **February 7**: Unstructured design time
- **February 9**: Engineering Practice Lecture; James relationships between manufacturers and distributors
- **February 11**: Unstructured design time

## Week 4
- **February 14**: Lecture on Design Project Report contents
- **February 16**: Engineering Practice Lecture
- **February 18**: **Guest Lecture** – Rebecca Balakrishnan & Career Curriculum

## Week 5
- **February 28**: Consultation with Instructors; **Project Update Memo #2 due**
- **March 2**: Engineering Practice Lecture; Consultation with Instructors
- **March 4**: Unstructured design time, Consultation with Instructors

## Week 6
- **March 7**: Unstructured design time
- **March 9**: Engineering Practice Lecture
- **March 11**: Unstructured design time

## Week 7
- **March 14**: Lecture on giving effective presentations;
- **March 16**: Engineering Practice Lecture, Lecture on giving effective presentations;
- **March 18**: Unstructured design time

## Week 8
- **March 21**: Consultation with Instructors
- **March 23**: Engineering Practice Lecture; Unstructured design time
- **March 25**: Unstructured design time

## Week 9
- **March 28**: Unstructured design time, **Project Update Memo #3 due**
- **March 30**: Engineering Practice Lecture; Consultation with Instructors
- **April 1**: Unstructured design time, Consultation with Instructors

## Week 10
- **April 4**: Unstructured design time
- **April 6**: Engineering Practice Lecture; Unstructured design time
- **April 8**: Unstructured design time
Week 11
April 11  Design Project Presentations
April 13  Design Project Presentations
April 15  No class – University closed for Good Friday

Week 12
April 18  Instructions for Self & Peer Evaluations discussed
April 20  Review of Engineering Logbooks, Career Reflections Assignment due.
April 22  Unstructured design time, Lecture Summaries due.

Week 13
April 25  Course evaluations to be completed. Design Project Report due.

Self & Peer Evaluation due;

Important Dates:
February 22-24:  No classes – Louis Riel Day & Winter Break
April 25:  Last date for Voluntary Withdrawal for winter term courses.
April 11 & 13:  Design Project Presentations
April 25:  Design Project Reports due

Course Evaluation Methods

Engineering Design Project (75% of course grade)
- Design Project Report (50%)
- Design Project Presentation (10%)
- Client Evaluation (5%)
- Project Update Memos (3) (10%)

Lifelong Learning (15% of course grade)
- Lecture Summaries (5%)
- Career Reflections (5%)
- Engineering Logbook/Journal (5%)

Professionalism (10% of course grade)
- Attendance at lectures
- Self & Peer Evaluations (Instructors have the discretion to use the peer evaluations to inform the professionalism grade. Students with poor peer evaluations could lose their Professionalism mark (up to 10% of course grade, and could be assessed up to a 10% deduction to the Team deliverables (Engineering Design Project (70% of course grade))).
Grading

The grading scale used for this course is shown below.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage out of 100</th>
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<tbody>
<tr>
<td>A+</td>
<td>92-100</td>
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<tr>
<td>A</td>
<td>85-91</td>
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<tr>
<td>B+</td>
<td>78-84</td>
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<tr>
<td>B</td>
<td>72-77</td>
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<tr>
<td>C+</td>
<td>66-71</td>
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<tr>
<td>C</td>
<td>60-65</td>
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<tr>
<td>D</td>
<td>50-59</td>
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<tr>
<td>F</td>
<td>Less than 50</td>
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Assignment Descriptions

**Engineering Design Project (65% of course grade)**

**Design Project Report (50%)**: Design teams are required to submit a written project report that summarizes the project work over both semesters (BIOE 4900 & BIOE 4950), with emphasis on the evaluation of the design work completed during the current semester (i.e., process used to evaluate the design). This report will be shared with the industry client as a final record of the project that has been completed. The report will also be graded by the course instructors. An assessment rubric will be provided to students that will give an overview of the content expected to be contained in the Design Project Report.

**Design Project Presentation (10%)**: At the end of the term, each student is expected to participate in a Design Project Presentation. The industry client will be invited to these presentations.

**Client Evaluation (5%)**: The design team’s industry client will be asked to assess the final design and the team.

**Term Assignments (15% of course grade)**

**Engineering Logbook/Journal (5%)**: Students are expected to keep an engineering logbook/journal for their design project.

**Project Update Memos (10%)**: Design teams are expected to provide regular progress updates to the course instructors using the format of written memos.

**Lifelong Learning (10% of course grade)**

**Lecture Summaries (5%)**: We have arranged a series of lectures, some to be delivered by guests, covering topics that are relevant to the practicing engineer. You will be expected to take notes and write a short reflection on each lecture indicating how the topic resonates with your understanding of Biosystems engineering, and may or may not be relevant to the engineering career that you envision.

**Career Reflections (5%)**:
Professionalism (10% of course grade)

Attendance: Attendance will be taken for each class. Students who have unexcused absences will forfeit all or part of the 5% Attendance grade.

Self & Peer Evaluations (10%): Through confidential self and peer evaluations conducted at the end of term, each student will be given the opportunity to assess themselves and their teammates in terms of their team skills, collaboration, and design contributions throughout the project period.

Assignment Extension and Late Submission Policy

Deadlines are a reality in the world of engineering. We expect assignments to be completed on time. Assignments submitted after the due date will be deducted 10% per day. Missed assignments will receive a grade of zero. Contact the instructors before due dates if you need to negotiate a date.