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

COURSE DETAILS

Course Title & Number: BIOE 4900 Biosystems Engineering Design 3

Number of Credit Hours: 4

Lecture/Lab Times: T/TH 8:30-11:20 am

Classroom Location: 300 Human Ecology Building (HEB)

Lab Location: 300 HEB & Biosystems Fabrication Shop

Pre-Requisites: BIOE 3900 Biosystems Design 2

Undergraduate Calendar Description
An opportunity for the Biosystems Engineering student to practice fundamental engineering competencies (project management, technical communication) in the preparation of preliminary design for the client. Students will be expected to demonstrate professionalism as a part of a design team. May not be held with BIOE 3580. Prerequisite: BIOE 3900.

How does this course fit into the curriculum?
This is a required course in the Biosystems Engineering program; the prerequisite for BIOE 4900 is BIOE 3900. 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 4900 is the third of these four 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 4900 builds on the principles of engineering design with a specific project that will be taken from concept to a set of design documents in BIOE 4900, and then on to prototyping or proof of concept in BIOE 4950 the following term.

Why is this course useful?
Design is one of the core graduate attributes identified by the Canadian Engineering Accreditation Board. Although engineers must have sufficient skills to analyze complex problems, they must also be able to communicate effectively and work in teams or individually to solve challenging, open-ended problems within real time constraints. In this course, engineering communication topics are integrated alongside design concepts with an overall emphasis on project management. Design teams prepare a preliminary design in response to a design assignment submitted by industry. Instructors of this course will facilitate the engineering student to continue their development of the CEAB graduate attributes needed for a career as a professional engineer, including design, problem analysis, engineering communication skills, working in a team to manage a project, professionalism, impact of engineering on society and the environment, economics and project management, and lifelong learning.
## Instructor Contact Information

<table>
<thead>
<tr>
<th>Instructor(s) Name</th>
<th>Office Location</th>
<th>Office Hours or Availability</th>
<th>Office Phone No.</th>
<th>Email</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Danny Mann, P.Eng., Professor &amp; Head</td>
<td>E2-376 EITC</td>
<td>By appointment outside of class or laboratory hours.</td>
<td>204-474-7149</td>
<td><a href="mailto:Danny.Mann@umanitoba.ca">Danny.Mann@umanitoba.ca</a></td>
<td>You may contact me with questions related to the course in person, by phone, or by email.</td>
</tr>
<tr>
<td>Dr. Jillian Seniuk Cicek, Ph.D.</td>
<td>333 Stanley Pauley Engineering Building</td>
<td>By appointment</td>
<td>204-474-9698</td>
<td><a href="mailto:Jillian.SeniukCicek@umanitoba.ca">Jillian.SeniukCicek@umanitoba.ca</a></td>
<td>You may contact me with questions related to the course in person or by email.</td>
</tr>
<tr>
<td>Mr. James White, P.Eng. (Engineer-in-Residence)</td>
<td>E1-268 EITC</td>
<td>By appointment</td>
<td></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


Students are required to use steel-toe shoes and safety glasses when working in the fabrication shop or wood shop.
Course Goals

The objectives of this course are as follows:

Engineering Objectives:
Provide students with the opportunity to gain knowledge and skills in several engineering fundamentals. Through a problem-solving approach with an emphasis on clear communication, design teams will produce a set of deliverables for a prototype or proof of concept that will be manufactured in BIOE 4950 during the following winter term. These deliverables will include:

- Design calculations
- Drawings
- Specifications
- Material costs/budget

Communication Objectives:
Provide students with the opportunity to converse in various engineering communication scenarios and demonstrate competence in:

- Resume preparation and interview skills
- Keeping an engineering journal
- Revising and editing their own and their peers’ documents
- Negotiating a variety of interpersonal styles and learning to work effectively, ethically, equitably and professionally in a team environment
- Demonstrating effective and engaging presentation skills

Intended Learning Outcomes

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

1. Use appropriate communication strategies to manage and document an engineering design project
2. Critique in written form a design proposal prepared by another student team
3. Write an engineering proposal for an external client
4. Use project management tools and fundamentals to manage an engineering design project
5. Use appropriate information (i.e., research literature, engineering codes, standards, etc.) to generate and/or support design information
6. Present and accept critique from a wider audience on how design components fit within the overall team design project

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<tr>
<th>Learning Outcome</th>
<th>Attributes*</th>
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</table>
**CEAB 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  Lifelong learning

**Expected Level of Development:**
- I - Introductory
- D – Developing
- A - Advanced

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### 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, blackberrys) 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](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](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 two 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, and sourcing product information.

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).

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

The following schedule provides an overview of course content.

**Week 1**

**September 5**

Course outline & introductions (DM, JSC & JW); Listing of projects will be distributed to students, students required to complete proposal forms by end of class on September 5.

“The Why & How of Keeping an Engineering Journal/Log” – Engineering logbooks/journals will be introduced (30 mins.). Design teams will be assigned on September 10.

**Week 2**

**September 10**

Approximately 1 h is devoted to team development activity. Lecture: Design Process and Project Definition (30 mins.)

Approximately 1.5 h of class time is devoted to “problem definition”. Students expected to work independently to produce a written document i) outlining the current understanding of the design problem and ii) listing questions that need to be answered during the initial meeting with client. Then, working as a team, students are expected to review their individual submissions and generate a team document. The team’s understanding of the design problem should be e-mailed to the industry sponsor before the end of class.

**September 12**

**Unstructured design time.** It is anticipated that design teams will use this time to meet with project sponsors to clarify understanding of the design problem.

**Week 3**

**September 17**

Lecture: Course Instructors – Professor Jill Seniuk Cicek - “Collaborative Projects” (1.5 h), followed by **structured design time** (teams will discuss their approaches to collaborative projects and writing their team charter).

*Project Update Memo due:* Students expected to submit a memo to the course instructors indicating how their understanding of the design problem changed as a result of meeting with the industry sponsor.

**September 19**

Class brainstorming activity. **Unstructured design time** (Design teams expected to use brainstorming or other idea generation techniques to generate potential design solutions. Preliminary team discussion used to assess potential solutions that warrant further investigation. Teams to decide what additional information is required in order to select a single conceptual solution.)

*Project Update Memo due:* Students expected to submit a memo to the course instructors indicating i) potential design solutions generated through brainstorming that warrant further investigation and ii) the information that the student has agreed to research.

**Week 4**

**September 24**

Guest Lecture: Dawn Nedohin-Macenyk – “Running Effective Meetings” (1.5 h) followed by **structured design time** (teams will reflect on their team processes, team charter, and meetings thus far and make plans going forward).

**September 26**

**Unstructured design time:** (Design teams should use this time to gather information).

**Week 5**
October 1  
Guest Lecture: Kathryn Atamanchuk – Project Management (1 h) followed by **structured design time** (teams will develop a WBS for their design projects).

October 3  
**Unstructured design time** (Design teams should use this time to gather information).

**Week 6**

October 8  
Lecture & Discussion: Professor Danny Mann - “Leading Others” (with reference to Chapter 4 in Fundamental Competencies for the 21st-Century Engineer) (1.5 h) followed by **unstructured design time** (Design teams to review information and finalize which potential solution will be proposed to the industry sponsor. Design teams are expected to send communication to their industry sponsor by the end of the class.).

*Project Update Memo due:* Students expected to submit a memo to the course instructors summarizing the background information that was discovered and its relevance to the design problem.

October 10  
**Unstructured design time.**

**Week 7**

October 15  
Guest Lecture: Lori Mac – “Communication & Conflict: Skills to build positive relationships and improve your interactions with others” (2 h) followed by **unstructured design time.**

October 17  
**Unstructured design time.**

**Week 8**

October 22  
Lecture: TBD – “Using Graphics in Communication” (1 h) followed by **unstructured design time.**

October 24  
**Unstructured design time.**

**Week 9**

October 29  
Guest Lecture: Lynda Peto – “Marketing Yourself for Career Success: Create Effective and Professional Resumes & Cover Letters” (1.5 h) followed by students working on their resumes and cover letters. Required viewing prior to class: **Resume Webshop and Cover letter Webshop** found on the Career Services site at www.umanitoba.ca/student/careerservices under the Webshop Icon.

October 31  
**Unstructured design time.**

**Week 10**

November 5  
Guest Lecture: Lynda Peto – “Marketing Yourself for Career Success: Strategies and Tips to Prepare for the Job Interview Process” (1.5 h). **Students must bring job postings, resumes and cover letters to class.** * Required viewing prior to class: 2 Interview Webshops found on the Career Services site at www.umanitoba.ca/student/careerservices under the Webshop Icon.

November 7  
**Unstructured design time.**

**Week 11**

November 12  
Fall term break – no class

November 14  
Fall term break – no class

**Week 12**
November 19  Lecture: Professor Jill Seniuk Cicek – “Peer Editing” (30 mins.) followed by time for students to complete the peer-editing workshop.

Draft of Design Proposals due.

November 21  *Unstructured design time.* (Design teams expected to use this time to make final preparations for the design review.)

**Week 13**

November 26  Design Review: Course instructors, technicians, and project sponsor will be present for a formal design review. Each design review will be allocated 30 min. Teams will be expected to orally present the conceptual solution being proposed, the rationale for choosing this solution, and the method by which proof of concept will be evaluated. Members of the panel will be given opportunity to ask questions and/or make suggestions for the design team to consider going forward. Design teams are expected to take notes during the design review so that useful information arising from the review is not lost.

November 28  Design Review: Course instructors, technicians, and project sponsor will be present for a formal design review. Each design review will be allocated 30 min. Teams will be expected to orally present the conceptual solution being proposed, the rationale for choosing this solution, and the method by which proof of concept will be evaluated. Members of the panel will be given opportunity to ask questions and/or make suggestions for the design team to consider going forward. Design teams are expected to take notes during the design review so that useful information arising from the review is not lost.

**Week 14**

December 3  Instructions for Peer Evaluations discussed – students expected to complete peer evaluations outside of class & submit to course instructor on December 5th.

Students expected to bring their engineering logbooks/journals during class on December 3rd. Each student is expected to meet individually with the course instructors to explain their logbooks/journals methodology and reflect on the effectiveness of their methodology in creating their logbooks/journals as a record of the details and decisions associated with the design project.

Approximately 3 h of class time available for design teams to finalize Design Proposal based on feedback received during the design review.

December 5  Peer Evaluations due; Course evaluations to be completed.

**Design Proposal due:** The Design Proposal is intended to be a concise report prepared for the industry client. Written document to include: i) engineering problem to be solved, ii) background information consulted and ideas considered, iii) conceptual solution being proposed, iv) method by which proof of concept will be evaluated, v) projected timeline for completion of the project (including proof of concept evaluation), and vi) anticipated project expenses.

**Design Package due:** The design package represents that bulk of the design work that students will do this term, and should include the following elements: design calculations, specifications, construction drawings, project milestones, and economic analysis (budget).

**Important Dates:**
November 12-15: No classes – Fall Break
November 18: Last date for Voluntary Withdrawal for fall term courses.
November 26 & 28: Design Reviews
December 5: Design Proposals & Design Packages due

Course Evaluation Methods

The final grade for this course will be based on the assessments of engineering communication assignments, written reports, drawing package and the oral design review. The grade distribution will be as follows:

Engineering Design Project (50% of course grade)
- Design Proposal (20%)
- Design Package (20%)
- Oral Design Review (5%)
- Client Evaluation (5%)

Term Assignments (20% of course grade)
- Shop Safety Training & Orientation
- Engineering Logbook/Journal
- Project Update Memos
- Cover Letter / Resume Assignment
- Peer Editing

Mid-Term Exam (Take home) (15% of course grade)
- Topics include: ethics, leadership, project management

Professionalism (15% of course grade)
- Attendance (5% of course grade)
- Confidential Performance Evaluations (10%)

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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<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 (50% of course grade)

**Design Proposal (20%):** Design teams are required to submit a written document that includes: i) a description of the engineering problem to be solved, ii) background information that has been consulted and ideas considered, iii) the conceptual solution being proposed, iv) the method by which proof of concept will be evaluated, v) the projected timeline for completion of the project (including proof of concept evaluation), and vi) anticipated project expenses. Proposals will be due at the end of the term. An assessment rubric will be provided to students when the design proposal is introduced in class.

**Design Package (20%):** The design package represents the bulk of the design work that students will do this term, and includes the following elements: Design calculations, Specifications, Construction drawings, Project milestones, and Economic analysis – budget. Students will be guided through these processes throughout the term. Specifications and/or rubrics will be provided in class.

**Design Review (5%):** At the end of the term, each student is expected to participate in a Design Review. Design teams are expected to describe the conceptual solution being proposed, the rationale for choosing this solution, and the method by which proof of concept will be evaluated. A panel consisting of the course instructors, department technicians, and the industry client will ask questions as a means of critiquing the proposed design. The grade will be based on the team’s presentation and responses to questions during the design review.

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

Term Assignments (20% of course grade)

**Shop Safety Training & Orientation:** In preparation for prototype fabrication in BIOE 4950, students are required to complete shop safety training and orientation during BIOE 4900. Students are expected to review safe work procedures that have been developed for the major tools present in the department’s fabrication shop and wood shop, to attend an orientation session hosted by one of the department’s shop technicians, and complete a quiz to demonstrate understanding of the safety protocols in place for the department’s shop facilities.

**Engineering Logbook/Journal:** Students are expected to keep an engineering logbook/journal for their design project. At the end of the semester, students will meet with the course instructors in person to defend the adequacy of their journal as a permanent record of the details and decisions associated with the design project.

**Project Update Memos:** Students are expected to provide regular progress updates to the course instructors using the format of written memos. The memos will be evaluated and feedback provided to enable students to develop this important communication skill.

**Cover letter / Resume Assignment:** The ability to effectively market yourself is important. Students will get practice preparing a resume and cover letter for a relevant engineering position.

**Peer Editing:** Drafts of proposals will be exchanged between student teams prior to the design reviews to provide feedback and gain experience critically reviewing documents.
Mid-Term Exam (Take home) (15% of course grade)

There will be a take-home midterm examination covering topics such as ethics, leadership and project management.

Professionalism (15% of course grade)

Attendance (5%): Attendance will be taken for each class. Students who have more than 3 unexcused absences will forfeit the 5% Attendance grade.

Confidential Performance Evaluations (10%): The ability to provide an appropriate performance evaluation is an important skill associated with leading a team in a work environment. Students will be expected to complete written performance evaluations for their team members using a format provided by the course instructors. For the purposes of this course, the written performance evaluations will be submitted to the course instructors and will NOT be shared with your peers.

EVALUATION CRITERIA – All marking rubrics and assessment criteria will be provided to students in class and on UM Learn when the assignments are introduced in class.

Assignment Grading Times

The last date for Voluntary Withdrawal (VW) from the course is November 18, 2019. Students can expect to receive marks for several items prior to the VW date. Marks for the Design Proposals and the Design Package will not be available to students until the end of the term.

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. All assignments must be submitted and workshops, seminars, and speed interviews must be attended to pass the course.