

University of Manitoba
Department of Biosystems Engineering

Course Details

Course Title & Number:	BIOE 3900 Biosystems Engineering Design 2		
Class Times & Days of Week:	Lecture/Studio Time:	TR	11:30-14:15

Location for classes/labs/tutorials: Online
Cisco WebEx through UMLearn

Pre-Requisites: BIOE 2900 & ENG 2020

Course Description:

An introduction to the use of reverse engineering to deduce design features from previously-designed products or systems. Considerations such as design for sustainability and design for disassembly will be discussed. Focus on design for the intended user, location and tasks to be performed will be emphasised. Students will have the opportunity to use reverse engineering principles:

- i) to understand how components fit together to form functional systems,
- ii) to identify flaws and,
- iii) to propose design improvements.

Students will learn appropriate techniques for documenting the reverse engineering process. Theory of project management will also be taught and discussed.

Instruction Information

Instructor(s) Name:	Mr. Jean-Christophe Habeck, EIT, MSc. (PhD candidate, Biosystems Engineering)
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Office Location:	N/A
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Office Hours or Availability:	Available during lecture/studio periods as well as by phone for one on one meetings by appointment.
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Contact Phone No.	204-880-7146
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Email:	umhabeck@myumanitoba.ca
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Teaching Assistant:	Mr. Kenton McCorquodale-Bauer
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Office Location:	N/A
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Email:	mccorquk@myumanitoba.ca
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Textbook, Readings, Materials

Required textbook – No text is specifically required. However, chapters of important material, available electronically, will be highlighted on the UMLearn course page.

Supplementary Readings – Notes and material will be made available through the UMLearn site for this course.

General Course Information

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. This course introduces the use of reverse engineering to deduce design features from previously-designed products or systems. Considerations such as design for sustainability and design for disassembly will be discussed. Focus on design for the intended user, location and tasks to be performed will be emphasised. Students will have the opportunity to use reverse engineering principles: i) to understand how components fit together to form functional systems, ii) to identify flaws and iii) to propose design improvements. Students will learn appropriate techniques for documenting the reverse engineering process. Theory of project management will also be taught and discussed. The course will aid the engineering students to develop the CEAB graduate attributes needed for a career as a professional engineer: engineering communication skills, working in a team to manage a project, professionalism, and lifelong learning.

How does this course fit into the curriculum?

This is a required course in the Biosystems Engineering program; the prerequisites for BIOE 3900 is BIOE 2900 (or former BIOE 2580) and ENG 2020 (or former ENG 2020). 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 3900 is the second of these four courses and is to be taken during the 3rd year of the program.

Course Goals

- Introduce students to reverse engineering processes that are usable by engineers to form design processes.
- Provide students with the experience of using a reverse engineering process to:
 - Understand how components fit together to form a functional system;
 - Understand how design requirements are dependant on the design's intended user(s), location(s) and task(s) to be performed.
 - Identify design flaws with an existing product or systems; and
 - Identify design improvements
- Introduce students to techniques for documenting a reverse engineering process.
- Provide students with instruction in the theory of project management and the use of project management tools.

Intended Learning Outcomes

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

1. Explain how reverse engineering processes are used to deduce design features from previously-designed products or systems.
 2. Dissect and measure an existing product/system to reverse engineer its functional and dimensional specifications.
 3. Understand how a product's intended user(s), location(s), task(s) affect the final design of a product.
 4. Reverse engineering a product or systems to identify design flaws and potential improvements
 5. Document the reverse engineering process using appropriate techniques.
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6. Use project management principles and tools.

Expected Level of Development in Course **

Learning Outcome	Attribute*											
	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	D							D				D
2	D			D								
3								D		D		D
4	D			D								
5						D	D	D		D		D

***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 course develops or introduces several principles (e.g., Reverse Engineering, Project Management, Documentation Procedures) that should be considered throughout a design process. There will be three (3) group Brainstorming sessions (done via Webex through UMLearn or any other medium of your group's choosing) targeting different questions where results of each session will be submitted electronically by each group, one (1) submission per group. These combined results will be organized by each student individually and used for an individual summary assignment to be submitted at the end of the term. The bulk of individual work is comprised of two (2) design assignments. Additionally, one (1) reverse engineering project will be done in teams of two people. Finally, there will be four (4) individual assignments designed to help you conceptualize and prepare for your future career while also connecting you to career opportunities. *All Assignments and Projects must be submitted in order to pass the course.*

Note that participation in Brainstorming sessions is mandatory and should any person be unable to attend for a legitimate reason the grades will be redistributed to not yet completed work (individual work).

Brainstorming Days(group) + Summary Assignment (individual)	5 + 5%
Understanding an Existing Design Assignment	25%
Project Management Assignment	25%
Reverse Engineering Project (team)	30%
Professional Development Assignments (4)	10%

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 information on what is expected as an outcome will be summarized in the rubrics for each assignment/project.

Grading

The grading scale used for this course is shown below.

Letter Grade	Percentage out of 100
A+	92-100
A	85-91
B+	78-84
B	72-77
C+	66-71
C	60-65
D	50-59
F	Less than 50

Assignment & Project 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 docked by 10% per day. All assignments must be submitted to pass the course. Extension requests will be handled on a case by case basis and should be forwarded to the instructor (Mr. Jean-Christophe Habeck) in a timely manner and requires valid reason (appropriate documentation may be requested). If you have questions regarding a grade that has been issued to you, please contact the TA within at least **two weeks** after the assignment was returned to you. If after meeting with the TA your concerns are still not addressed you may then make an appointment with the instructor for further discussion.

Assignment & Project Descriptions

The course introduces several principles (i.e., safety engineering, human factors engineering, biomimicry) that should be considered during a design process. In addition, the course will provide opportunity for students to develop engineering communication skills. Student work will be assessed in each of these areas. Assignments/Reports should be typed in Times New Roman, font size 12, double spaced and submitted in PDF format. All assignments require a Title Page and should at minimum indicate the title of the assignment, the date submitted, and the name of the submitter(s). Reports should be free of typos (1 or 2 is fine...) and grammatically correct.

Important Timelines

Sept. 8 – Dec 11	Fall Term
Nov 9 – Nov 13	Fall Reading Week
Tuesday and Thursday 11:30-2:15	Class Lectures/Studio Time

Important Dates

Sept. 10	First Class
Sept. 16	Brainstorming Day 1 due

Sept. 17	Reverse Engineering Your Career Workshop with Rebecca Balakrishnan
Sept. 21	Brainstorming Day 2 due
Sept. 23	Brainstorming Day 3 due
Sept. 24	Reverse Engineering Your Career Assignment due
Sept. 24	LinkedIn Workshop with Rebecca Balakrishnan
Oct. 1	LinkedIn Assignment due
Oct. 1	ASE Career Fair Prep Workshop with Rebecca Balakrishnan
Oct. 7	ASE Career Fair (Wednesday)
Oct. 15	Career Fair Reflections Assignment due
Oct. 19	Understanding Design Report due
Nov. 2	Project Management Report due
Nov. 26	Reverse Engineering Team Report Due
Nov. 26	Skill Articulation Workshop with Rebecca Balakrishnan
Dec. 3	Skill Articulation Assignment Due
Dec. 10	Brainstorming Summary Due

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. Jason Morrison, Mr. Jean-Christophe Habeck 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 Mr. Jean-Christophe Habeck. 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 purpose of taking notes. Some course materials will be available through UMLearn.

Class Communication

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

https://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_wit_h_students_policy.html

Please note that all communication between you as a student and your instructors/Tas must comply with the electronic communication with student policy. 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.

Referencing Style

Students are expected to follow either CSBE reference style or a similar style when citing reference in course assignments.

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 narrated PowerPoint Lectures and 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 can 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

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Supplemental Course Information for BIOE 3900

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 12 graduate attributes have been defined below for your information.

Graduate Attributes

- 1. A Knowledge Base for Engineering:** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
- 2. Problem Analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantial conclusions.
- 3. Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.
- 4. Design:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
- 5. Use of Engineering Tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simply to complex, with an understanding of the associated limitations.
- 6. Individual and Team Work:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
- 7. Communication Skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
- 8. Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
- 9. Impact of Engineering on Society and the Environment:** An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
- 10. Ethics and Equity:** An ability to apply professional ethics, accountability, and equity.
- 11. Economics and Project Management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
- 12. Life-long Learning:** An ability to identify and address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

While there are likely some aspects of many of these attributes that can be found in this course, the attributes being emphasized in this course are: 1) *A Knowledge Base for Engineering*, 4) *Design*, 6) *Individual and Team Work*, 7) *Communication Skills*, 8) *Professionalism*, 10) *Ethics and Equity*, and 12) *Lifelong Learning*.
