

Course Outline

Instruction Team

- Dr. Jason Morrison, P.Eng.
E1-356 EITC
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Student Hours

- Individual assistance is available by appointment

Teaching Assistants

Ali Reza Mohammad
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Location

300 Human Ecology

TR 11:30am – 2:15pm

Contact Hours

- 4 credit hours

- Lectures:
24 hours
- Studio/Labs
48 hours

Prerequisites:

- ENG 2022
- BIOE 2900

Course Website:

<http://umanitoba.ca/umlearn>

Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of Anishinaabeg, Ininiwak, Anisiniwuk, Dakota Oyate and Dene, and on the National Homeland of the Red River Métis.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

BIOE 3900 Engineering Design 2

Fall 2025

Course Description

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. Students will use reverse engineering principles to:

1. Develop an understanding of how components fit together to form functional systems,
2. Identify flaws and strengths of a design, and
3. Propose design improvements.

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

Course Delivery

Lectures and Studio Time will proceed as listed on the left. This time will be used to deliver course content and provide time for design work, testing, and presentations.

Messages regarding the course will be given in person and through the course website at www.umanitoba.ca/umlearn.

Required Texts, Readings and Materials

The instructor will supply material and links to material through the course website www.umanitoba.ca/umlearn

Learning Outcomes

By the end of this course, you will be able to:

No.	Learning Outcome
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), and task(s) affect the final design of a product.
4	Reverse engineering a product or system to identify design flaws and potential improvements
5	Document the reverse engineering process using appropriate techniques.
6	Use project management principles and tools.

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 0%
- Engineering Design: 100%

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: Life-long learning

Competency Levels

I - Introduced

D – Intermediate (Developing)

A - Advanced

Grading Scale

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

Letter	Mark
A+	92–100
A	85–91
B+	78–84
B	72–77
C+	66–71
C	60–65
D	50–59
F	< 50

CEAB Graduate Attributes Assessed

This course will assess the following CEAB graduate attribute indicators shown below:

Indicator (Level)	Indicator Description	Matching Outcomes
KB.3 (D)	Recalls and defines, and/or comprehends and applies information, first principles and concepts in fundamental engineering science.	2, 3
PA.3 (D)	Analyzes and solves complex engineering problems	1, 2
CS.1 (D)	Designs and produces effective written and graphical engineering documents for specific audiences	1, 3, 5
DE.1 (D)	Understands the complexities of an open-ended engineering design problem and defines appropriate objectives and constraints	2, 3, 4, 5
DE.3 (D)	Develop possible solutions to an open-ended design problem, leading to an appropriate recommendation	1, 2, 3, 4, 5
EP.2 (D)	Understands and applies business practices including project, risk and change management	2, 6

Evaluation

Late assignments will be assessed a penalty of 10% per day or part thereof (including weekends). Work that is not submitted due to unavoidable and valid reasons will have grades redistributed based on individual or teamwork at the discretion of the Instructor.

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Brainstorming Days	7.5	AM	S	3, 5	T
Understanding a Design	20	AM	S	1	I
Project Management	20	AM	S	1, 2, 6	I
Brainstorming Summary	5	AM	S, F	1, 5	I
Systems Eng. Design	20	AM	S, F	2, 5	T
Reverse Eng.	30	AM	S, F	2, 4, 5	T

* Method of Feedback: F - Formative (written comments / oral discussion), S - summative (numerical grade)

** I/T: I – Individual effort, T – A team effort

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the *General Academic Regulations on Academic Integrity*, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to a serious academic penalty.

Important Dates

Brainstorming Day 1

Tues. Sept 9 (Due 4:00pm)

Brainstorming Day 2

Thurs. Sept 11 (Due 4:00 pm)

Brainstorming Day 3

Tues. Sept 16 (Due 4:00 pm)

National Day for Truth and Reconciliation

Tues. Sept.30, 2025

No classes or examinations

Understanding a Design

Due: Oct 2 (11:30am)

Thanksgiving

Mon. Oct 13, 2025

No classes or examinations

Project Management

Due: Oct 16 (11:30am)

Systems Eng. Design

Due: Nov 6 (11:30am)

Remembrance Day

Tue. Nov 11, 2025

No classes or examinations

Fall Term Break

Nov 10-14, 2025

No classes or examinations

Voluntary Withdrawal Deadline

November 18, 2025

Reverse Engineering

Due: Nov 27 (11:30am)

Brainstorming Summary

Due: Thurs. Dec 4 (4:00 pm)

Last Day of Classes

Mon. Dec. 8, 2025

Deferred Final Examinations

Students who miss the regularly scheduled writing of a final examination for valid medical or compassionate reasons will only be allowed to write a deferred exam if the Associate Dean (Undergraduate) approves the request. All requests for a deferred examination *must* be made within 48 hours of the missed exam and follow the procedure described on the Faculty [website](#) without exception. Course Instructors *do not have the discretion* to grant deferred final examinations.

 [Deferred Exam Policy \(student experience website\)](#)

Retention of Student Work

- Students are advised that copies of their work submitted in completing course requirements (i.e., assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the Instructor and the Department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University's *Intellectual Property Policy* and the protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba)*. Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

Requirements/Regulations

- Please copy the Instruction Team in all emails (Instructor and Teaching Assistant). All email communication must conform to the Communicating with Students university policy.

 [Communicating with Students](#)

- As the Instruction Team, we will do our best to respond to all emails **within 48 hours during working hours** (8:30 AM – 5:30 PM Monday thru Friday). Ex. A Friday night email may not be responded to until the following Tuesday.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences (≤ 72 hours) for extenuating circumstances. This form cannot be used for planned absences like vacations. It is also not to be used for longer-term absences, or ongoing circumstances (e.g., Authorized Withdrawals, Leaves of Absence, or other accommodations), which will still require additional documentation.

 [Self-Declaration Form for Brief or Temporary Absence](#)

 [Self-Declaration Policy for Brief or Temporary Absences](#)

- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should familiarize themselves with the University's *General Academic Regulations*.

 [General Academic Regulations](#)

 [Engineering Academic Regulations](#)

- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies, e.g., Academic Integrity, Respectful Behavior, Examinations, and related matters.

 [Supplemental Resources](#)

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 [Copyright Office](#)