University of Manitoba | Price Faculty of Engineering
Department of Biosystems Engineering

Course Outline

BIOE 2480 Impact of Engineering on the Environment
Winter 2025

Instruction Team

- Dr. Warren Blunt P.Eng. (he/him)
  E1–310 EITC
  (204) 474–7144
  Warren.Blunt@umanitoba.ca

Student Hours
- Individual assistance is always available by appointment, please send Dr. Blunt an email to set up a meeting.

Teaching Assistant
- Kenton McCorquodale-Bauer, mccorquk@myumanitoba.ca

Location
- **527 Buller Bldg**
  Mon 12:30 - 1:20 pm
  Wed 12:30 – 1:20 pm
  Fri 12:30 – 1:20 pm

Contact Hours
- 3 credit hours
- Lectures: 37 hours

Prerequisites:
- Enrollment in Biosystems Engineering program

Course Website:
http://umanitoba.ca/umlearn

Course Description
Students will gain an understanding of overall sustainability of industrial activities, life-cycle and risk assessment techniques for sustainability, and design improvements to enhance environmental performance of engineered systems. This course will introduce basic methodologies for conducting environmental impact assessments, including physical, chemical, ecological, social and economic impacts.

General Course Information
Understanding the various impacts of engineering on the environment and related core concepts surrounding sustainable practices is essential to all engineers. Concepts around life-cycle assessment and associated tools for engineering applications are also important to engineers. Most development projects, whether they are small and local or large and national, require environmental impact assessments to ensure that environmental, economic and social effects of such projects are reviewed and potentially significant adverse impacts are mitigated. These assessments are important in the quest for sustainable development and allow for public participation in the process. This course will help you attain this critical environmental engineering competency and provide you with a valuable skill you can use in the workforce.

How this course fits into the curriculum
This is a required course in the Biosystems Engineering program. It is intended that students take this course during their second or third year in the program. As mentioned above, this course introduces the student to several sustainability, environmental stewardship, and environmental impact assessment concepts, which are not reliant upon any particular pre-requisites within the curriculum.

Course Goals
The intent of this course is to:
- introduce students to sustainability concepts around energy/materials use and environmental emissions,
- familiarize students with life-cycle assessment tools for engineering applications,
- introduce students to Environmental Impact Assessment (EIA) laws and regulations existing in Manitoba, Canada, and worldwide,
- provide students with a clear methodology to conduct successful EIAs,
- enable students to evaluate the quality and completeness of existing EIAs, and
- have students appreciate the importance of sustainable development and a healthy environment.

Intended Learning Outcomes
At the conclusion of the course, the student should be able to:
1. Understand the environmental impact assessment process.
   1.1. Define relevant terms.
   1.2. Describe the provincial (Manitoba) and federal EIA processes using a flowchart.
   1.3. Differentiate between an environmental impact assessment, an environmental site assessment, and an environmental management system.
2. Assist in preparing an environmental impact assessment report.
   2.1. Identify the relevant characteristics of a proposed action.
   2.2. Describe the baseline environmental conditions.

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 50%
- Engineering Science: 50%
- Engineering Design: 0%

Graduate Attributes

KB: A knowledge base for engineering
PA: Problem analysis
IN: Investigation
DE: Design
ET: Use of engineering tools
IT: Individual and teamwork
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 year-to-year grading consistency.

Letter	Mark
A+	95–100
A	86–94
B+	80–85
B	73–79
C+	65–72
C	60–64
D	50-59
F	< 50

2.3. Identify likely impacts on the environment.
2.4. Predict the impact on the environment.
2.5. Predict the cumulative effect in a given scenario.
2.6. Design an appropriate mitigation measure for a predicted impact.
2.7. Devise a plan to obtain public input in an EIA study.
2.8. Write a clear explanation of a predicted impact.
3. Appreciate the importance of protecting the environment.
3.1. Explain the importance of sustainable development and environmental stewardship.
3.2. Understand concepts associated with life-cycle assessment.

Textbook, readings, and materials

There is no required textbook for this course; below are recommended reading materials and book references.

- Allen and Shonnard. 2011. *Sustainable Engineering: Concepts, Design, and Case Studies*, Prentice Hall. New York, NY: Routledge. ISBN: 978-0-13-275654-9
- Morris and Therivel. 2009. *Methods of Environmental Impact Assessment*, 3rd edition. New York, NY: Routledge. ISBN: 978-0-415-44174-2
- Hanna, K.S. 2016. *Environmental Impact Assessment*, 3rd Edition, Oxford University Press, Don Mills, Ontario. ISBN: 978-0-19-900662-5
- Noble, B.F. 2015. *Introduction to Environmental Impact Assessmen*t. A Guide to Principles and Practice. 3rd edition. Oxford University Press, Don Mills, Ontario. ISBN: 978-0-19-900634-2

Learning Outcomes

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

No.	Learning Outcome	Transferable Skill
1	Understand the environmental impact assessment process.	Impact of engineering on society/environment
2	Assist in preparing an environmental impact assessment report.	Impact of engineering on society/environment
3	Appreciate the importance of protecting the environment.	Impact of engineering on society/environment

CEAB Graduate Attributes Assessed

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

Indicator (Level)	Indicator Description	Assessment Point
IE.2 (D)	Ability to consider the impact of engineering interventions (decisions and technology) on society and the environment (historical and/or contemporary).	Term Tests 1-4 Assignment 1-4
IE.3 (D)	Ability to identify solutions to challenges in society and the environment.	Term Test 1,3 Assignment 4
IE.4 (D)	Ability to recognize the individual and collective responsibility of engineering and its interventions on society and the environment.	Term Test 1-4 Assignments 1, 2
EP.2 (D)	Understands concepts of project management.	Term Tests 2-4 Assignments 3, 4

.

Important Dates

- **Assignment #1 due**
  January 24, 2025
- **Term Test-1**
  January 31, 2025
- **Assignment #2 due**
  February 14, 2025
- **Louis Riel Day**
  February 17, 2025
  No classes or examinations
- **Winter term break**
  Feb. 18 - 21, 2025
- **Term Test-2**
  February 28, 2025
- **Assignment #3 due**
  March 7, 2025
- **Voluntary Withdrawal (VW)**
  March 19, 2025
- **Term Test-3**
  March 21, 2025
- **Assignment #4 due**
  April 4, 2025
- **Term Test-4**
  April 9, 2025
- **Last Day of Classes**
  April 9, 2025
- **Good Friday**
  April 18, 2025
  No classes or examinations

Class Schedule

A preliminary schedule is provided below. The schedule is subject to change at the discretion of the instructors and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the ROASS Procedure.

Week 1: Industrial activity and the environment, energy usage, and resource depletion
Week 2: Environmental Emissions as it relates to air & water pollution, solid & hazardous wastes
Week 3: Life-cycle Assessment for Sustainability
Week 4: The Nature and Origins of Environmental Impact Assessment
Week 5: Federal and Manitoba EIA process
Week 6: Describing the existing environment, baseline conditions
Week 7: Methods for impact identification and prediction
Week 8: Significance of impacts, mitigation and monitoring
Week 9: Description of Social and Economic Impacts
Week 10: Description of Noise and Traffic Impacts
Week 11: Cultural & Heritage Impacts
Week 12: Follow up and post project monitoring
Week 13: Cumulative effects assessment and strategic environmental assessments

Evaluation

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Assignments (4 @ 5% ea.)	20	TA	S/F	1, 2 3	I
Term Test 1	20	WB	S	1, 2, 3	I
Term Test 2	20	WB	S	1, 2, 3	I
Term Test 3	20	WB	S	1, 2, 3	I
Term Test 4	20	WB	S	1, 2, 3	I

* Method of Feedback: **F** - Formative (written comments and/or oral discussion), **S** - summative (numerical grade)
** I/T: **I** – Individual effort, **T** – Team effort

Each Term Test will cover approx. 3 weeks of course materials and will take place in-person during lecture time. There will be no final exam.

Assignment Grading Times

Students can expect to receive grades for at least two of the assignments and two term tests prior to the voluntary withdrawal date. Grades for the remaining assignments and test will be available prior to the end of the term.

Assignment Extension and Late Submission Policy

Assignments submitted after the due date will be docked 10% per day. There will be no "makeup" term tests; students who miss a test with a reasonable and verifiable explanation will have the value of their remaining tests increased by the appropriate percentage.

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 serious academic penalty.

Traditional territories

The University of Manitoba campuses are located on original lands of the Anishinaabeg, Ininiwak, Anisininewuk, Dakota Oyate and Dene peoples, 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 a spirit of reconciliation and collaboration.

Requirements/Regulations

- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication, or data storage devices) are allowed in examinations unless approved by the course instructor.
- All email communication must conform to the Communicating with Students university policy.

Communicating with Students

- Attending lectures and laboratories is essential for the successful completion of this course.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences (≤72 hours) for extenuating circumstances. Students don't need to share personal information about their situation beyond declaring the nature of the extenuating circumstance on the self-declaration form.

Self-Declaration Form for Brief or Temporary Absence

- 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 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*, as well as Section 3 of the Faculty of Engineering *Academic Regulations* dealing with incomplete term work, deferred examinations, attendance, and withdrawal.

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 Behaviour, Examinations and related matters.

Supplemental Resources

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/or 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.

Copyright Notice

All materials provided in this course are copyright and are provided under the fair dealing provision of the Canadian Copyright Act. This material may not be redistributed in any manner without the express written permission of the relevant copyright holder