



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

Course Details

Course Title & Number:	BIOE 2480 Impact of Engineering on the Environment
Number of Credit Hours:	3
Class Times & Days of Week:	MWF 12:30-1:20
Location for classes/labs/tutorials:	E3-330 EITC
Pre-Requisites:	None

Course Description:

Students will gain an understanding of overall sustainability of industrial activities, life-cycle 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.

Instructor Information

Instructor(s) Name:	Dr. Nazim Cicek, P.Eng. (Professor)
Office Location:	259 Agriculture Building
Office Hours or Availability:	Please make an appointment if you wish to meet with me outside of class meetings
Office Phone No.	204-474-6082
Email:	Nazim_Cicek@umanitoba.ca
Contact:	You can contact me by email. Emails sent after business hours will not likely be answered until the next day
Teaching Assistant:	None, Marker/Grader will be used for assignments only

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 most cases) 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 does this course fit 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 a successful EIAs
- enable students to evaluate the quality and completeness of existing EIAs
- 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.
 - 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.
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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
 - 3.3 Define sustainable engineering design principles

Textbook, Readings, 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 Assessment. A Guide to Principles and Practice. 3rd edition. Oxford University Press, Don Mills, Ontario. ISBN: 978-0-19-900634-2

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 must not be distributed in any format without permission.

Recording Class Lectures

Dr. Nazim Cicek and 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, openly or surreptitiously, in whole or in part without permission from Dr. Cicek. Course materials (both paper and digital) are for the participant's private study.

Course Technology

Please remember to switch your cell phone to vibrate mode to avoid interruptions during class meetings. Please mute yourself during on-line meetings if you are not speaking. Course notes, reading materials, audio and video recordings will be available through UM Learn.

Class Communication

The University requires all students to activate an official University email account. 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).

Expectations: You Can Expect Me To

Create an environment that facilitates student engagement and learning. In this course, most dissemination of information will occur using audio-curved PowerPoint presentations. However, some reading materials or video clips will be distributed which will be followed by classroom discussions. It is expected that an active learning environment is created.

Expectations: We Expect You To

Be in attendance, and on time, for all scheduled lectures. To benefit the most from this class, you must be willing to participate in class discussions. Deadlines are a reality in the world of engineering; we expect assignments to be completed on time.

Academic Integrity:

Plagiarism or any other form of cheating 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.

Students 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, e-mail: Student_accessibility@umanitoba.ca

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.

General Lecture Content:

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

Important Dates:

Voluntary withdrawal date	March 22, 2023
Term Test-1	February 01, 2023
Term Test-2	March 01, 2023
Term Test-3	March 22, 2023
Term Test-4	April 12, 2023

Course Evaluation Methods

The grade for this course will be based on 4 assignments, and 4 Term Tests as shown below:

1. Assignments (4, at 5% each)	20%
2. Term Test-1	20%
3. Term Test-2	20%
4. Term Test-3	20%
5. Term Test-4	<u>20%</u>
	100%

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 “make-up” 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.

Supplemental Course Information for BIOE 2480

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 substantiated 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 simple 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 attribute being emphasized in this course is: *Impact of Engineering on Society and the Environment*.

Mapping of Course Evaluation to Graduate Attributes & Indicators

To maintain the accreditation of our Biosystems Engineering program, it is a requirement that student competency with respect to the 12 graduate attributes be assessed. To enable such assessment to occur in a meaningful manner, the Faculty of Engineering and representatives from industry developed a comprehensive list of indicators for each of the 12 graduate attributes. The indicators being formally assessed in BIOE 2480 are shown in the table below.

The ultimate goal of mapping the course evaluation in specific courses to graduate attributes and indicators is the identification of potential deficiencies in the Biosystems Engineering program so that continuous improvement can occur. Data generated from this course will be compiled with data collected from other sources (i.e., other courses, SEEQ surveys, exit surveys, co-op surveys) to facilitate on-going review and improvement of the Biosystems Engineering curriculum.

Grade Component	Specific Evaluation Point	Graduate Attribute	Indicators Being Assessed
Assignments (20%)	All Assignments	Impact of Engineering on Society and the Environment	9.2 Considers Impact: Ability to consider the impact of engineering interventions (decisions and technology) on society and environment (historical and/or contemporary).
Term Test-1 (20%)		Impact of Engineering on Society and the Environment	9.2 Considers Impact: Ability to consider the impact of engineering interventions (decisions and technology) on society and environment (historical and/or contemporary). 9.3 Solutions for Societal and Environmental Challenges: Ability to identify solutions to challenges in society and the environment.
Term Test-2 (20%)		Impact of Engineering on Society and the Environment	9.2 Considers Impact: Ability to consider the impact of engineering interventions (decisions and technology) on society and environment (historical and/or contemporary). 9.3 Solutions for Societal and Environmental Challenges: Ability to identify solutions to challenges in society and the environment.
Term Test-3 (20%)		Impact of Engineering on Society and the Environment	9.3 Solutions for Societal and Environmental Challenges: Ability to identify solutions to challenges in society and the environment. 9.4 Personal and Collective Responsibility: Ability to recognize the individual and collective responsibility of engineering and its interventions on society and the environment.
Term Test-4 (20%)		Impact of Engineering on Society and the Environment	9.3 Solutions for Societal and Environmental Challenges: Ability to identify solutions to challenges in society and the environment. 9.4 Personal and Collective Responsibility: Ability to recognize the individual and collective responsibility of engineering and its interventions on society and the environment.