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

Course Details

Course Title & Number:	BIOE 7350 – Bioresource Engineering and Sustainability
Number of Credit Hours:	3
Class Times & Days of Week:	1:00 pm-2:15pm Tuesdays and Thursdays Winter Term 2026
Location for classes:	Room 399 E2 EITC
Pre-Requisites:	None

Course Description:
Students will gain an understanding of actual sustainability of industrial activities, energy usage, agriculture and natural resource depletion. They will be introduced to the effects of air and water pollution, climate change, and waste generation. The concepts of life-cycle assessment, appropriate design, and resource conservation will be explored through assignments. Management of industrial and natural systems for sustainability will be discussed.

Instructor Information

Instructor(s) Name:	Dr. Joe Ackerman Research Associate, Manager of SiAF
Office Location:	Sustainability in Action Facility (SiAF) or E1 355 Tel: 204-891-0115
Office Hours:	E1 348 Thursday mornings 9 to 10:30 (make appt!)
Email:	Joe.Ackerman@umanitoba.ca
Contact:	You may contact me by email. Emails sent after business hours will not likely be answered until the next day.

Course Goals

The intent of this course is to:

- introduce students to sustainability concepts around energy/materials use, environmental emissions with a focus on climate change
- provide students with an understanding of waste management and related impacts
- familiarize students with life-cycle assessment tools for engineering applications
- have students appreciate the importance of sustainable development and a healthy environment
- provide students with an understanding of social, economic effects of unintended consequences

Required Textbook

none

Reference Materials

Allen and Shonnard. 2012. Sustainable Engineering: concepts, design, and case studies. New Jersey, NJ: Prentice Hall. 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

Wendell Berry. 1993. Sex, economy, freedom & community. Pantheon Books. New York and San Francisco. ISBN 9781640091405

Huff, Darrell 1954. How to lie with statistics. W. W. Norton Company, New York. ISBN: 0-393-31072-8

Mark Schatzker. 2015. The Dorito Effect. Simon & Shuster. ISBN: 9781476724218

Daniel Quinn. 1992. Ishmael. Bantam Turner. ISBN 0-553-07875-5

Omar Al-Akkad. 2025. One day, Everyone will Always have been Against This. Penguin Random House. ISBN 9780593804148

Wayne Curtis 2006. And a Bottle of Rum. Penguin Random House, New York. ISBN978-0-525-57502-3

Using Copyrighted Material

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Course Technology

This course will be managed through UMLearn and student university email. Course materials (PowerPoint slides, reading materials, video clips, etc.) will be distributed through the UM Learn course site.

Expectations of Instructor

Create an environment that facilitates student engagement and learning. In this course, most dissemination of information will occur using the traditional lecture format, based on PowerPoint presentations. However, some reading and viewing materials will be distributed which will be followed by classroom discussions.

Expectations of Students

Be in attendance, and on time for all scheduled lectures. There will be at least one in-class quiz on previous lecture material and hopefully a field trip. To benefit the most from this class, you must be willing to participate in class discussions. Assignments are expected to be completed on time.

Academic Integrity:

Plagiarism or any other form of cheating on assignments or academic work is subject to serious academic penalty. Cheating includes copying from another student, unauthorized collaborative work, copying from internet sources, contract submission, or use of the omnipresent Artificial Intelligence. 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.

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.

Lecture Content:

Week 1: Course introduction and discussion on assignments.
Week 2: Green House Gases
Week 3**:** Refrigerants and halo carbons
Week 4: Carbon and Carbon Offsets
Week 5: It's not Waste unless it's Wasted; Landfill design and organic wastes
Week 6: Recycling: The Problem Child**;** Plastic recycling and PFAS contamination
Week 7: Life-cycle Assessment for Sustainability
Week 8: Waste/Feedstock integrated Industrial Parks; Cold Weather
Week 9: The Sustainable construction in cold climates; Nutrients
Week 10: Sustainable Agriculture; Forestry
Week 11: Good Work; Fishing and the Commons
Week 12: Student presentations
Week 13: Unfinished topics

Course Evaluation Methods

The assignments listed below are given here as samples. 2026 assignments and evaluation methods are currently under review to fortify them against AI assistance (i.e., cheating) and will be finalized before the course commences.

Likely Assignment Descriptions

Assignment #1 (30%): Students will be asked to compile a short review on an assigned greenhouse gas. This will include its GWP, atmospheric concentration, degradation rate, uses and any restrictions on production or use. Students must include analysis of relative impact from their compound and possible alternatives. A short oral presentation of the key findings will be made to the class and data will be combined with those of other GHGs to form a global atmospheric concentration of CO2 equivalents.

Assignment #2 (30%): Students will be asked to design an industrial park in which the industries utilize the wastes generated by adjacent compatible industries to create an integrated loop of circularity. This will be presented to the class via PowerPoint.

Assignment #3 (30%): The campus is analyzed within the concepts covered in the class and a scheme is chosen by each student to expand and perfect in terms of energy conservation/generation, waste management, inefficiency, transportation, food production. This will be presented to the class.

Assignment Rubrics and Late Submissions

Rubrics will be determined for each assignment and posted in the UMLearn site along with the Assignment. A penalty of 10% per day is imposed on late submissions.