



Course Outline

Instruction Team

- Derek Inglis
A204 AEB
(204) 474-7964
cell: (204) 470-5290
Derek.Inglis@umanitoba.ca

Student Hours

- Thursdays 3:00 – 5:00 PM
- Individual assistance is always available by appointment – stop by!

Location

- **E2-360**
MWF 9:30-10:20 AM
Mon 2:30-5:15 PM (lab)

Contact Hours

- 4 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours
- Labs:
1.5 hours x 12 weeks = 18 hours

Prerequisites:

- BIOE 2110

Course Website:

<http://umanitoba.ca/umlearn>

Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

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 4420 Crop Preservation

Fall 2022

Course Objectives

Students are expected to gain an understanding of the physical (grain physical properties, temperature, moisture, and gas), chemical (chemical materials and chemical reaction such as grain respiration), biological (insects, mites, and microorganisms), and economic variables affecting the preservation and storage of cereal grains, oilseeds, and other agricultural products such as biomass and vegetables. The principles are applied to the design and operating criteria of storage systems. After the completion of the lectures, students should have the knowledge of industrial grain storage practices to maintain quality of grain and their products.

Course Content

Interaction of biological and physical factors related to methods of preserving, storing, and handling cereals, oilseeds, and other agricultural crops.

The following topics will be covered:

- Introduction and overview of the postharvest grain industry in Canada. Grain storage in the world. Why storage is needed?
- Grain physical properties: moisture contents, relative humidity, ERH-EMC curves, specific heat, thermal conductivity, thermal diffusivity, densities, angles of repose, distribution of dockage, and mass and funnel flow. Psychrometric chart. Grain depth and air flow resistance, vertical vs horizontal air flow resistance.
- Ecosystem components: respiration of biological materials, pre- and post-harvest fungi, insects, and mites. Mycotoxin in stored grain and oil seeds. Characteristics of grain storage ecosystems. Example of hot spot and storage life.
- Grain temperature: Initial temperatures, temperatures in stored grain bins. Effect of bin diameter and height, initial grain temperature, bin wall material, solar radiation, and geological location.
- Grain moisture contents: change in moisture content. Moisture migration.
- Controlled atmosphere storage.
- Grain drying: Principles of drying.
- Design of non-ventilated storages. Design of aerated storages.
- Design of near-ambient drying systems.
- Design of heated-air drying systems.
- Advanced grain storage practice. Safety and health hazards.

Textbook

Dr. W. E. Muir. 1999. Grain Preservation Biosystems.

Accreditation Details

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 25%
- Engineering Science: 0%
- Engineering Design: 75%

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

- 1 - Knowledge (Able to recall information)
- 2 - Comprehension (Ability to rephrase information)
- 3 - Application (Ability to apply knowledge in a new situation)
- 4 - Analysis (Able to break problem into its components and establish relationships.)
- 5 - Synthesis (Able to combine separate elements into a whole)
- 6 - Evaluation (Able to judge the worth of something)

Learning Outcomes

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

No.	Learning Outcome	Transferable Skill
1	Understand the fundamental concepts of grain and biomass storage and handling: explain the physical, chemical, biological and economic variables affecting the preservation and storage of cereal grains, oilseeds and other agricultural products such as biomass and vegetables, explain how to control stored product insects, mites and mould, identify safety concerns during grain and biomass storage and handling	Knowledge Base, investigation, lifelong learning
2	Use the principles and theories delivered in the course to solve problems; evaluate existing storage scenarios to identify conditions likely to cause storage losses, design storage systems to preserve the quality of grain, oilseeds, and other agricultural products such as biomass and vegetables.	Use of engineering tools, problem analysis, individual work

Expected Competency Levels

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	5	5	5				5			5		
2	5	5	5				5			5		

CEAB Graduate Attributes Assessed

- KB.4 Recalls and defines, and/or comprehends and applies, first principles and concepts in specialized engineering science
- PA.3 Analyzes and solves complex engineering problems
- PA.4 Evaluates a solution to a complex engineering problem,
- CS.2 Designs and produces appropriate engineering documents
- IN.1 Gathers information and analyzes data
- IN.2 Devises and implements an appropriate plan/methodology for gathering information required to solve an engineering problem
- IN.3 Designs and produces appropriate engineering documents
- ET.1 Uses tools to complete engineering activities
- ET.2 Evaluates and selects appropriate tools for a given scenario
- EE.3 Demonstrates individual accountability

Important Dates

- **Early Withdrawal Deadline**
September 20, 2022

- **National Day for Truth and Reconciliation**
September 30, 2022
No classes or examinations

- **Thanksgiving**
October 10, 2022
No classes or examinations

- **Fall Term Break**
November 7-10, 2022
No classes or examinations

- **Remembrance Day**
November 11, 2022
No classes or examinations

- **Voluntary Withdrawal Deadline**
November 22, 2022

- **Last Day of Classes**
December 12, 2022

Evaluation

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Midterm examination	30	DI	F, S	1,2	I
Term work and assignments	30	DI	F, S	1, 2	I
Final exam	40	DI	F, S	1, 2	I

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

** I/T: I – Individual effort, T – 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 serious academic penalty.

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.

 Copyright Office

The Department of Biosystems Engineering has devised a plan so that there is minimal impact on the delivery and content of the course, should the instructor fall sick and is unable to continue lectures in-person. Please be assured that the alternative plan outlining any deviation from the normal mode of instruction will be communicated to you as quickly as possible if/when the need arises.