



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

Course Details

Course Title & Number:	BIOE 3100 – Agricultural Engineering Fundamentals for Agronomists
Number of Credit Hours:	4
Class Times & Days of Week:	3 hours of lecture per week & 2 hours of lab/tutorial per week
Pre-Requisites:	PLNT 2500 Crop Production

Course Description:

The course will provide fundamental technical competencies from the discipline of agricultural engineering for agronomy students. Students will be introduced to i) concepts of smart farming, ii) functions of machinery for production agriculture, iii) water management for production agriculture, and iv) safe storage and handling of grains and oilseeds.

Instructor Information

Instructor(s) Name:	Instructor Derek Inglis
Office Location:	A206 Agricultural Engineering Building
Office Hours or Availability:	Please make an appointment if you wish to meet with me outside of class or laboratory hours.
Office Phone No.	204-474-7964
Email:	Derek.Inglis@umanitoba.ca
Instructor(s) Name:	Instructor Dr. Ramanathan Sri Ranjan
Office Location:	E1-346 Engineering Building
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Course Goals

The intent of this course is to provide technical competencies from the discipline of agricultural engineering for agriculture students in the agronomy program. More specifically, the course will:

- Introduce students to concepts of smart farming.
 - Introduce students to functions of machinery for production agriculture.
 - Introduce students to water management for production agriculture (i.e., irrigation & drainage).
 - Introduce students to safe storage and handling of grains and oilseeds.
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Reference Materials

- Muir, W.E. 1999. Grain Preservation Biosystems.
- Srivastava, A.K., C.E. Georing, R.P. Rohrbach and D.R. Buckmaster. 2006. Engineering Principles of Agricultural Machines, 2nd Edition. American Society of Agricultural & Biological Engineers.
- Hoffman, G.J., R.G. Evans, M.E. Jensen, D.L. Martin, and R.L. Elliott. 2007. Design and operation of farm irrigation systems. 2nd Edition. ASABE, St. Joseph, MI
- Smedema, L.K., W.F. Vlotman, and D.W. Rycroft, 2004. Modern Land Drainage – Planning, design and management of agricultural drainage systems
- Tanji, K.K. (Editor). 1990. Agricultural Salinity Assessment and Management. ASCE, New York. NY.[ISBN #0-87262-762-4]
- Hillel, D. 1998. Environmental Soil Physics. Academic Press (ISBN: 0-12-348525-8)

Class Schedule

The class will be taught as 4 distinct modules (i.e., Water Management Module, Smart Farming Module, Grain Storage Module, Machinery Module), each approximately 3 weeks in length. Relevant technologies for smart farming will be integrated into each module. There will be 3 hours of lecture time per week plus 2 hours of tutorial/lab time per week.

Lecture Content:

Water Management Module (9 lectures):

- Irrigation systems and their benefits
- Determining irrigation capacity and irrigation interval
- Sprinkler nozzle selection and lateral design
- Sprinkler layout and pressure losses
- Pumping power requirements
- Drainage systems and their benefits
- Surface drainage ditch design
- Subsurface drainage systems and controlled drainage
- Salinization effects and methods to alleviate

Smart Farming (9 lectures):

- Introduce smart farming concepts
- Describe the global positioning system and geographic information systems, and use in agriculture
- Explain the environmental benefits associated with smart farming practices

Machinery Module (9 lectures):

- Soil Tillage (functional performance of tillage implements, crop needs/tillage effects, draft force, wheel-track & tillage-induced compaction)
 - Crop Planting (fundamentals of seed metering, seed transport and seed placement)
 - Chemical Application (sprayer calibration, reducing spray drift)
 - Grain Harvesting (separating, threshing and cleaning systems in combine and the influence of improper harvesting procedures on crop losses and/or crop quality)
 - Machinery Selection
 - Machinery Safety
 - Machinery modifications to achieve precision farming (variable rate application; yield monitoring)
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Grain Storage Module (9 lectures):

- Introduction and overview of the postharvest grain industry in Canada
- Grain physical properties
- Respiration of biological materials, pre- and post-harvest fungi, hot-spots and storage life
- Insects and mites and their control
- Grain temperatures in stored grain bins
- Grain moisture contents: change in moisture content. Moisture migration in bins
- Introduction of grain drying and aeration
- Advanced grain storage practice. Safety and health hazards
- Use of smart technologies for monitoring grain storage

Course Evaluation Methods

Lab/Tutorial Assignments	60%
Final Examination	40%

There will be 3 lab/tutorial assignments associated with each of the 4 major modules in the course (12 in total). A final examination will cover material from all 4 modules.

Course Philosophy**Students' Learning Responsibilities**

Students are expected to study the material covered during the lecture and make additional notes. They are expected to review the material already covered before they come to the next class. The assignments are due on the designated dates. This course relies heavily on your knowledge of basic concepts in soil physics. You are encouraged to review soil physics from any textbook. i.e. Many books by Daniel Hillel are available in the library. Please respect both us as instructors and your classmates by turning off your cell phone during class time. Laptops/iPads may be used during lectures only if you are using it in connection with this course.

Why this course is useful?

The course covers topics in agricultural engineering. It provides information on different types of irrigation and drainage systems and methods to alleviate soil salinization to meet the water and aeration needs of the crops. It also includes topics in grain storage and farm machinery and implements and how technology is integrated into a modern farm. This course will equip you with the tools necessary for your career.

Who should take this course?

Students interested in the application of Agricultural Engineering concepts in production agriculture.

Course Policies**Description of Assignments**

Assignments are usually problem-solving type questions to provide practice for what was discussed in class. We will briefly review the assignments at the beginning of the class and get you started on problem solving. You are expected to complete the assignment and submit by the due date.

Assignment Due Dates

Deadlines are a reality in the working world; we expect assignments to be completed on time to the UMLearn portal. Assignments submitted after the due date will be docked 10% per day. All assignments must be submitted to pass the course. Assignments are given on Fridays. They are due to be uploaded to the UMLearn as .pdf file by 4:30 pm on the following Wednesday. Your papers can be scanned in the library.

Missed Assignments

Zero marks for missed assignments.

Missed Exams

In case of a missed final examination, a student will be assigned an F no paper grade for the course unless an acceptable medical certificate or a confirmable compassionate reason is provided in which case a supplementary examination will be allowed.

General Guidance Resources on Campus

Students are encouraged to familiarize themselves with the resources available to them by visiting the Student Affairs website at <http://umanitoba.ca/student/index.html>. The site contains helpful general information as well as links to webpages for the Aboriginal Student Centre, the International Centre for Students, the Academic Learning Centre, Student Advocacy & Accessibility, the Student Counselling & Career Centre, and University Health Service. Please make use of these resources to enhance your academic learning and life as a student.

Important Dates

February 15:	Louis Riel Day (University Closed)
February 16 - 19:	No class – Winter term break
March 18:	Last date for Voluntary Withdrawal for Winter term courses.
March 31:	Voluntary withdrawal deadline
April 2:	Good Friday (University Closed)
April 19 - May 1:	Winter term exam period
