



Course Outline

Winter 2024

Instruction Team

- Derek Inglis
A206 Agricultural Engineering Building
204-474-7964 or 204-470-5290
Derek.Inglis@umanitoba.ca
- Dr. (Ranjan) Sri Ranjan, P.Eng.
(he/him)
E1-346 EITC
(204) 474-9344
sri.ranjan@umanitoba.ca

Student Hours

- Individual assistance is always available by appointment: talk to us.

Teaching Assistant

- N/A

Location

- **300 Human Ecology**
MWF 9:30 - 10:20 AM
- **E2-350 EITC**
F 2:30 – 4:20 PM

Contact Hours

- 3 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours
- Labs/Tutorial:
2 hours x 12 weeks = 24 hours

Prerequisites:

PLNT 2500 Crop Production

Course Website:

<http://umanitoba.ca/umlearn>

BIOE 3100 – Agricultural Engineering Fundamentals for Agronomists

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.

Course Objectives

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

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

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)

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

Important Dates

- **Winter Term Break**
Feb 19 - 23, 2024
No classes or examinations.
- **Voluntary Withdrawal Deadline**
March 20, 2024
- **Last Day of Classes**
April 10, 2024

- 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

Smart Farming Module (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
- Final examination for this module is scheduled for April 10 (final day of classes) and is worth 10% of your final grade.

Textbook

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)

Evaluation

Lab/Tutorial Assignments 60% (15% per module)

Final Examinations for each module 40% (10% per module) (Scheduled during the term)

There will be 3 lab/tutorial assignments associated with each of the 4 major modules in the course (12 in total). Final examinations for each module will be scheduled during the term soon after the end of the module during the Lab time.

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

- Please copy the Instruction Team in all emails (Instructors and Teaching Assistants). All email communication must conform to the Communicating with Students university policy. [Communicating with Students](#)
- As the Instruction Team, we will do our best to respond to all emails **within 48 hours during working hours** (8:30 AM – 5:30 PM Monday thru Friday). Ex. A Friday night email may not be responded to until the following Tuesday.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences (≤ 72 hours) for extenuating circumstances. 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 Form for Brief or Temporary Absence](#)

[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*.

[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. 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.

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