



Course Outline

Instruction Team

- Dr. (Ranjan) R. Sri Ranjan, P.Eng. (he/him)

Professor
E1-346 EITC
(204) 474-9344
sri.ranjan@umanitoba.ca

Student Hours

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

Teaching Assistant

- Komlan Koudahe
koudahek@myumanitoba.ca

Location

- **527 Buller Bldg**
Lecture MWF 1:30 - 2:20 PM
- **E2-160 EITC Bldg**
Lab W 2:30 – 4:30 PM

Contact Hours

- 4 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours
- Lab Time:
2 hours x 12 weeks = 24 hours

Prerequisite:

- BIOE 4060 or CIVL 3730

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 4600 Design of Water Management Systems Fall 2025

Course Description

(Formerly 034.460) To introduce the basic theoretical principles in the design of irrigation and drainage systems. Topics covered include the determination of irrigation depth and interval, evapotranspiration, measurement and analysis of precipitation, design of sprinkler and drip irrigation systems, selection of pumps, surface and subsurface drainage design, water quality issues, salinity management, and the environmental impact of water management practices.

Course Delivery

Lectures and Studio Time will proceed as listed in the left and this time will be used to deliver course content, provide time for design work, testing and presentations.

Considering the ongoing pandemic please note:

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.

Recommended Reading

Course hand-outs will be available through UMLearn.

Supplementary material

- Eisenhauer, D. E., Martin, D. L., Heeren, D. M. & Hoffman, G. J. (2021). Irrigation Systems Management, ASABE. doi:10.13031/ISM.2021, CC BY-NC-ND 4.0, <https://creativecommons.org/licenses/by-nc-nd/4.0/>
- Huffman, R. L., D.D. Fanmeier, W.J. Eliot, S.R. Workman, and G.O. Schwab. 2013. Soil and water conservation engineering. 7th Edition. ASABE, St. Joseph, MI
<https://elibrary.asabe.org/textbook.asp?confid=swce2012>
- Food and Agriculture Organization of the United Nations. 2002. Crop evapotranspiration: guidelines for computing crop water requirements. Eds. R. G. Allen et al. FAO, Rome.
- Nijiland, H.J., F.W. Croon and H.P. Ritzema. 2005. Subsurface Drainage Practices. Wageningen, Alterra, ILRI Publication No. 60, pp. 608
- Ritzma, H.P. (Editor-in-Chief). 2006. Drainage Principles and Applications. Wageningen, Alterra, ILRI Publication No. 16, pp. 1125.
- 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)

Additional Materials

The following journals provide recent research information on the topics covered in this course:

- Canadian Biosystems Engineering Journal
- Transactions of the ASABE
- Applied Engineering in Agriculture
- Biosystems Engineering
- Agricultural Water Management
- Journal of Soil and Water Conservation

Useful Websites

www.bioeng.ca; www.asabe.org; www.asce.org; www.fao.org

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 0%
- Engineering Design: 100%

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
1	Explain the principles associated with the design of irrigation and drainage systems.
2	Analyze an existing field scenario to determine the most appropriate irrigation/drainage strategy.
3	Use models to predict requirements of an irrigation system
4	Design and evaluate irrigation and drainage systems for specified scenarios
5	Summarize and present the results of the design process in an oral presentation and formal report
6	Apply what was learned in the classroom to novel situations in the workplace.

Graduate Attribute Competency Levels Developed

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	5											
2		6		4								
3					3							5
4		6		4								
5				5	5	5	5	6				6
6									6			6

CEAB Graduate Attributes Assessed

- KB.5 – Recalls and defines, and/or comprehends and applies information, principles, and concepts in engineering design.
 PA.6 – Analyzes and solves complex engineering problems.
 DE.5 – Designs a component based on real-life scenario.
 CS.5 – Designs, produces, and delivers effective technical presentations for specific audiences.

Important Dates

- **Early Withdrawal Deadline**
September 16, 2025
- **Thanksgiving**
Mon. Oct. 13, 2025
No classes or examinations
- **Mid-term Tests**
• October 17, 2025
• November 21, 2025
- **Fall Term Break**
Nov. 10-14, 2025
No classes or examinations
- **Remembrance Day (observed)**
Mon. Nov. 11, 2025
- **Voluntary Withdrawal Deadline**
November 18, 2025
- **Design Presentation/Report**
November 26, 2025
- **Last Day of Classes**
Mon. Dec. 8, 2025

Grading Scale

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure year-to-year grading consistency.

Letter	Mark
A+	92–100
A	85–91
B+	78–84
B	72–77
C+	66–71
C	60–65
D	51–59
F	< 50

Evaluation

Late assignments will be assessed a penalty of 10% per day or part thereof (including weekends).

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Tutorial/Lab	20	TA	S	2, 3	I
Two Mid-term Tests	20	RSR	S	1, 2	I
Project Presentation	5	RSR, TA	S	3, 4, 5	I/T
Project Report	5	RSR, TA		3, 4, 5, 6	T
Final Examination	50	RSR		1, 2, 6	I

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

** I/T: I – Individual effort, T – A team effort

Weekly tutorials assigned on Wednesdays are due at 4:30 pm on the following Monday.

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 – 4:30 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](#)

Deferred Final Examinations

Students who miss the regularly scheduled writing of a final examination for valid medical or compassionate reasons will only be allowed to write a deferred exam if the Associate Dean (Undergraduate) approves the request. All requests for a deferred examination *must* be made within 48 hours of the missed exam and follow the procedure described on the Faculty [website](#) without exception. Course Instructors *do not have the discretion* to grant deferred final examinations.

 [Deferred Exam Policy \(student experience website\)](#)

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 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 copyrighted and delivered under the fair dealing provision of the Canadian Copyright Act. You may not redistribute this material in any manner without the express written permission of the relevant copyright holder(s).

 [Copyright Office](#)