Hydrogeology Syllabus

Department of Earth and Environmental Science

ERTH 3401 Winter 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Christiane Zoghbi	christiane.zoghbi@dal.ca	M, W 10:30 - 12:00 LSC, 3rd Floor, Room 3085

Course Description

Hydrogeology examines the space-time characteristics of groundwater quantity and quality. It includes physical processes occurring in natural groundwater systems and the governing relations for flow and transport; emphasizing Darcy's Law, steady-state and transient flow. It provides an overview of groundwater resource development, evaluation, contamination, and remediation.

Course Prerequisites

ERTH/ENVS 3701 or permission of instructor.

Course Structure

Course Delivery

In-person. Lectures will not be recorded. Students are expected to attend all classes in person. If unable to attend, use the student declaration of absence form. For extended absences, contact the instructor and the Assistant Dean of Science.

Lectures

M & W 08:35-09:55; Studley MCCAIN ARTS&SS 2118

Laboratories or Problem-Solving Sessions

F 08:35-09:55; Studley MCCAIN ARTS&SS 2118

Course Materials

Required Textbook: Fitts, S.L., 2023, Groundwater Science. Third Edition. ISBN: 9780128114551;

The course syllabus, discussions, lectures, laboratory instructions, presentations, announcements, assignments, out-of-text readings, and other pertinent information will be on the course Brightspace site. You are expected to check this site regularly.

Assessment

Semester grades are based on:

- 25% Assignments / Problem Sets
- 35% Quizzes
- 35% Final Exam
- 5% Attendance

Assignments or Problem Sets (5% each)

Assignments will be introduced and covered during the Lab sessions on Fridays, corresponding to the Assignment Dates listed in the table below. Some exercises will follow a lab format, where you will be given data to analyze. It will be your responsibility to complete the lab exercises and submit them by the designated due date.

	Assignment Date (2025)	*Due Date (2025)*
Assignment 1	*January 17th*	*January 24th*
Assignment 2	*January 31st*	*February 10th*
Assignment 3	*February 14th*	*February 28th*
Assignment 4	*March 7th*	*March 14th*
Assignment 5	*March 28th*	*April 8th*

Tests/quizzes (5% each; lowest grade will be dropped)

Quizzes will be held in class, on Brightspace, on the due date in the syllabus.

	Date (2025)
Quiz 1	*January 15th*
Quiz 2	*January 22nd*
Quiz 3	*January 29th*
Quiz 4	*February 12th*
Quiz 5	*March 5th*
Quiz 6	*March 12th*
Quiz 7	*March 19th*
Quiz 8	*March 26th*

Final exam

The course has a final exam weighing 35% of the total grade. It will take place during the final exam period.

Other course requirements

You are required to attend classes, complete all assignments, and participate in class in order to pass the course.

Conversion of numerical grades to final letter grades follows the
Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

1. Assignments submitted late and without an approved extension will be deducted 10% per day.
2. Extensions for quizzes and assignments are granted for exceptional circumstances, using the Student Declaration of Absence Form. Applications for extensions must be made in writing to Dr. Zoghbi 24 hours before the assignment or test is due. The Student Declaration of Absence Form may be used two times this semester.
3. Missed quizzes and assignments: if you do not complete a test or assignment and do not submit a Student Declaration of Absence form for that week, your mark on the test or assignment is zero.

Course Policies related to Academic Integrity

Feel free to use AI-driven tool to assist you in learning but remember that the objective is for you to acquire these competencies and outcomes in this course. You are responsible for all work that you produce, whether assisted by an AI-driven tool or not. You must acknowledge all tools used to assist you. If applicable, you must provide links to chat logs. If the work that you produce is suspected to misrepresent your own competencies, you may be asked to complete a supplemental assessment to evaluate your mastery of course outcomes.

Learning Objectives

Following active participation in this course you will be able to:

1. Explain and use the fundamental dimensions, units, and physical laws of hydrogeology.
2. Explain the role of groundwater in the hydrologic cycle and in water supply, contamination and construction issues.
3. Explain the physical principles of hydrogeology, including properties of subsurface materials, groundwater flow, groundwater geology, groundwater chemistry, and contamination.

Course Content

Week	Date	Lesson Topic(s)	Reading	Assessment
1	Jan 6-11	Groundwater: the big picture	Chapter 1	
2	Jan 12-18	Physical Properties	Chapter 2	Quiz 1 Lab 1
3	Jan 19-25	Principles of Flow	Chapter 3	Quiz 2
4	Jan 26-Feb 1	Field Exploration and Wells	Chapter 4	Quiz 3 Lab 2
5	Feb 2-8	Hydrology and Geology	Chapter 5	
6	Feb 9-15	Modeling Steady Flow	Chapter 6	Quiz 4 Lab 3
	Feb 16-22	Study Break		
7	Feb 23-Mar 1	Deformation and Storage	Chapter 7	Quiz 5
8	Mar 2-8	Modeling Transient Flow	Chapter 8	Quiz 6 Lab 4
9	Mar 9-15	Groundwater Chemistry	Chapter 10	Quiz 7
10	Mar 16-22	Groundwater Contamination	Chapter 11	
11	Mar 23-29	Groundwater Contamination	Chapter 11	Quiz 8 Lab 5
12	Mar 30-Apr 5	Subsurface Heat Flow and Geothermal Energy	Chapter 12	
13	Apr 6-7	Summary and Q&A		

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: http://www.dal.ca/cultureofrespect.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.