

# Hydrogeology Syllabus

## Department of Earth and Environmental Sciences

### ERTH 3401 Winter 2026

*Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.*

*We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.*

#### Course Instructor(s)

Name	Email	Office Hours
Christiane Zoghbi	christiane.zoghbi@dal.ca	T, R 9:00 to 11:00 a.m. LSC 3085 (Biology Wing)
Hadi Matin Rouhani	H.MatinRouhani@dal.ca	TBA

#### 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.

#### Student Resources

I will be available during my office hours to discuss any questions regarding the lecture content and/or lab assignments. Furthermore, the designated TA will assist with the lab assignments and answer any questions the students may have during their designated office hours.

## Course Structure

### *Course Delivery*

In-person. For extended absences, please contact the instructor and the Assistant Dean of Science.

### *Lectures*

T & R 11:35-12:55; Studley LSC-COMMON AREA C220

### *Laboratories*

R 13:05-14:25; Studley LSC-COMMON AREA C220

## Course Materials

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

The textbook is available for access/purchase at [Dal Bookstore](#). 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
- 20% Midterm
- 30% Final Exam
- 10% Participation & Attendance
- 15% Groundwater awareness project

### *Assignments or Problem Sets (5% each - 5 total)*

Assignments will be introduced and discussed during the Thursday lab sessions, in accordance with the Assignment Dates listed in the table below. Certain assignments will follow a lab-based format, requiring analysis of provided datasets or the use of specialized software. Students are responsible for completing all assigned exercises and submitting them by the specified deadlines.

	<i>Assignment Date (2026)</i>	<i>Due Date (2026)</i>
<i>Assignment 1</i>	<i>January 22</i>	<i>January 27</i>
<i>Assignment 2</i>	<i>January 29</i>	<i>February 10</i>
<i>Assignment 3</i>	<i>February 26</i>	<i>March 10</i>
<i>Assignment 4</i>	<i>March 12</i>	<i>March 24</i>
<i>Assignment 5</i>	<i>March 26</i>	<i>April 7</i>

*Midterm exam*

The course has a midterm exam (70 minutes) weighing 20% of the total grade. It will take place in class on **February 12**. It is a paper-based exam.

*Final exam*

The course has a final exam (120 minutes) weighing 30% of the total grade. It will take place during the **final exam period**. The final exam will be non-cumulative and will include the material covered after the midterm exam. It is a paper-based exam.

*Groundwater awareness project*

This project represents 15% of the total grade. Students will create an infographic on a significant groundwater issue (e.g., saltwater intrusion, arsenic contamination, groundwater depletion, drought and groundwater, climate change effects), presented on a **global scale** in the form of *“Groundwater Stories from Around the World.”* The project is **due before World Water Day (March 22)**. Students will also present their project to the class using the infographic or a short PowerPoint presentation.

Additional details and evaluation criteria will be provided during the term.

*Participation*

Participation represents 10% of the total grade and will be assessed based on your regular attendance and active engagement in class activities via Brightspace. The latter may include responding to multiple-choice questions, uploading solutions to assigned problems, or contributing to discussion forums.

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 assignments are granted for exceptional circumstances, using the Student Declaration of Absence Form. SDAs must be uploaded to Brightspace 24 hours before the assignment or exam due. The Student Declaration of Absence Form may be used two times this semester.
3. Missed assignments: if you do not complete an assignment and do not submit a Student Declaration of Absence form, your mark on the assignment is zero.
4. There will be no make-up midterm; if you miss your midterm due to illness, family emergency, or other acceptable reason, the final exam will have a higher value (50%).
5. A make-up date will be scheduled for the final exam. As per University regulations, you may only write the make-up exam under exceptional circumstances:  
"A student requesting an alternative time for a final examination will be granted that request only in exceptional circumstances. Such circumstances include illness (with a medical certificate) or other mitigating circumstances outside the student's control, including technology failure in the case of online examinations." For the full text, refer to the Undergraduate Academic Calendar 2025/2026: [Policy for the Scheduling of Courses/Examinations](#)

## 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 4-10	About the Course		
2	Jan 11-17	Groundwater: the big picture	Chapter 1	Assignment 1
3	Jan 18-24	Physical Properties	Chapter 2	
4	Jan 25-31	Principles of Flow	Chapter 3	Assignment 2
5	Feb 1-7	Principles of Flow	Chapter 3	
6	Feb 8-14	Hydrology and Geology	Chapter 5	<b>MIDTERM</b>
<b>STUDY BREAK</b>				
7	Feb 22-28	Modeling Steady Flow	Chapter 6	Assignment 3
8	Mar 1-7	Deformation and Storage/Modeling Transient Flow	Chapter 7/8	
9	Mar 8-14	Groundwater Chemistry	Chapter 10	Assignment 4
10	Mar 15-21	Groundwater Chemistry	Chapter 10	Project Presentations
11	Mar 22-28	Groundwater Chemistry	Chapter 10	Assignment 5
12	Mar 29 - Apr 4	Groundwater Contamination	Chapter 11	
13	Apr 5-11	Groundwater Contamination	Chapter 11	

## 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](mailto:elders@dal.ca). Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.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/mission-vision-values/global-relations.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](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](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/campus\\_life/ssc.html](https://www.dal.ca/campus_life/ssc.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: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.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/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf>

## **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/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf>

## **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.