

**Faculty of Science Course Syllabus**  
**Department of Earth and Environmental Sciences**  
**ERTH/ENVS 3701.03 – Fundamentals of Hydrogeology**  
**Winter, 2022**

*Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.*

### **A. Course Information**

**Instructor:** Dr. Shannon Sterling    Shannon.Sterling@dal.ca    3056 LSC (Biology Wing)

**TA:** TBA

**Due to public health concerns associated with the pandemic, courses will be delivered online initially for the Winter 2022 term. Subsequent changes in delivery methods may require modified elements in course syllabi.**

**Online Structure:** The assigned lecture slides, readings, quizzes and problem sets are posted to Brightspace and TopHat. Each week, students are required to read the textbook chapter and to complete the online quiz. Synchronous class will be on Tuesday and Thursday from 8:35-9:25 am when we will go over the lectures and complete activities to deepen your learning. Alternating Fridays we will work through problem sets together.

**Lectures:** T, Th 8:35-9:25 am

**Laboratories:** F 14:35-15:25

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### **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**

ENVS/ERTH 3701 or permission of instructor

### **Course Objectives/Learning Outcomes**

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.

4. Be able to solve real-world problems related to hydrogeology.

### **Course Materials**

- Required Textbook: Fitts, S.L., 2013, Groundwater Science. Second Edition. ISBN: 9780123847065; <https://doi.org/10.1016/C2009-0-62950-0>
- The course syllabus, discussions, lectures, laboratory instructions, presentations, announcements, assignments, out-of-text readings, and other pertinent information will be on the course BLS site. You are expected to check this site regularly.

### **Top Hat**

We will be using Top Hat ([www.tophat.com](http://www.tophat.com)) for quizzes. You can visit the Top Hat Overview (<https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide>) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system. You can register by visiting our course website on Brightspace and clicking on TopHat Registration in the Content section. Top Hat may require a paid subscription, and a full breakdown of all subscription options available can be found here: [www.tophat.com/pricing](http://www.tophat.com/pricing). Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email ([support@tophat.com](mailto:support@tophat.com)), the in app support button, or by calling 1-888-663-5491.

### **Materials required and information for flipped course delivery:**

- online platform to be used: Brightspace
- access to a computer that can access Brightspace and be able to watch videos on Brightspace
- course instructor and TAs are available answer questions/emails during in-person class, after class (in person), and outside class time (in person with appointment or by email).
- students are given a week to complete TopHat quizzes. If power outage occurs during that week, the students are to contact TopHat technical service to ensure they are not negatively affected by the power outage. Documentation of power outages from NS Power is required for any re-writes of quizzes.

### **Public Health**

All students are required to comply with health and safety requirements on campus and should be considerate of others' health concerns. Non-compliance may be reported under the Code of Student Conduct. At a minimum, students must follow provincial recommendations and requirements regarding Covid (<https://novascotia.ca/coronavirus/working-during-covid-19/> )

### **Course Assessment**

Semester grades are based on:

- 20% Laboratory assignments / Problem Sets
- 35% Quizzes
- 40% Final Exam, synchronous, online

***Asynchronous TopHat Tests/quizzes (20 min long, worth 3.9% of final grade each)***

	<b><i>Assignment Date</i></b>	<b><i>Due Date (2022)</i></b>
Quiz 1	Jan 11 <sup>th</sup>	Jan 18 <sup>th</sup> , 5 pm
Quiz 2	Jan 18 <sup>th</sup>	Jan 25 <sup>th</sup> , 5 pm
Quiz 3	Jan 25 <sup>th</sup>	Feb 1 <sup>st</sup> , 5 pm
Quiz 4	Feb 1 <sup>st</sup>	Feb 8 <sup>th</sup> , 5 pm
Quiz 5	Feb 8 <sup>th</sup>	Feb 15 <sup>th</sup> , 5 pm
Quiz 6	Feb 15 <sup>th</sup>	March 1 <sup>st</sup> , 5 pm
Quiz 7	March 1 <sup>st</sup>	March 8 <sup>th</sup> , 5 pm
Quiz 8	March 8 <sup>th</sup>	March 15 <sup>th</sup> , 5 pm
Quiz 9	March 15 <sup>th</sup>	March 22 <sup>nd</sup> , 5 pm

***Labs (worth 4% of final grade each)***

	<b><i>Assignment Date (2022)</i></b>	<b><i>Due Date (2022)</i></b>
Lab 1	January 14 <sup>th</sup>	January 21 <sup>st</sup>
Lab 2	January 27 <sup>th</sup>	February 7 <sup>th</sup>
Lab 3	February 18 <sup>th</sup>	March 4 <sup>th</sup>
Lab 4	March 11 <sup>th</sup>	March 18 <sup>th</sup>
Lab 5	March 25 <sup>th</sup>	April 1 <sup>st</sup>

***Final Exam***    **40%**    ***online, synchronous during Final Exam period***

**Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale**

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

### Course Content and Schedule<sup>1</sup>

Location of lectures (indoor or outdoor) will be posted in announcements on Brightspace. Check reading guides on Brightspace for detailed content of quizzes.

Week	Topic	Text Reading	Evaluation
1 Jan 6-11	Groundwater: the big picture	Chapter 1	
2 Jan 13-18	Physical Properties	Chapter 2	Quiz 1 Lab 1
3 Jan 20-25	Principles of Flow	Chapter 3	Quiz 2
4 Jan 27-Feb 1	Field Exploration and Wells	Chapter 4	Quiz 3  Lab 2
5 Feb 3-8	Hydrology and Geology	Chapter 5	Quiz 4
6 Feb 10-15	Deformation, Storage, and General Flow Equations	Chapter 6	Quiz 5
7 Feb 17-March 1	Modelling	Chapter 7, 8	Lab 3  Quiz 6
8 Mar 3-8	Groundwater Chemistry	Chapter 10	Quiz 7
9 Mar 10-15	Groundwater Chemistry	Chapter 10	Quiz 8 Lab 4
10 Mar 17-22	Groundwater Contamination	Chapter 11	Quiz 9
11 Mar 24-29	Groundwater Contamination	Chapter 11	Lab 5  Quiz 10
12 March 31-Apr 6	Subsurface Heat Flow and Geothermal Energy	Chapter 12	

### Course Policies

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. Sterling 24 hours before the lab or test is due. The Student Declaration of Absence

<sup>1</sup> Subject to change

Form may be used two times this semester. Make-up quizzes and make-up labs will be offered if the student misses the requirement for an excused absence.

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.
4. Collaboration is permitted on laboratories in groups, but each student must submit their own laboratory and must identify with whom they worked on the assignment, and identify what contributions they made to the assignment.
5. Questions regarding the course must be posted to the discussion board in Brightspace so that information is shared with all students.
6. All assignments must be submitted through Brightspace. E-mailed submissions will not be accepted.
7. Attendance at lectures is required for the class. Material will be covered in lectures that will not be posted in slides or in Brightspace.

## **B. University Policies and Statements**

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

### **Academic Integrity**

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of 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.

**Information:** [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### **Accessibility**

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

**Information:** [https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.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.

**Code:** [https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

### **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

**Statement:** <http://www.dal.ca/cultureofrespect.html>

### **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 (1321 Edward St) ([elders@dal.ca](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

**Important Dates** in the Academic Year (including add/drop dates)

[https://www.dal.ca/academics/important\\_dates.html](https://www.dal.ca/academics/important_dates.html)

**University Grading Practices**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

## C. Student Resources and Support

### Advising

General Advising [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

Black Students Advising Centre: [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)

International Centre: [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)

### *Academic supports*

Library: <https://libraries.dal.ca/>

Writing Centre: [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)

Studying for Success: [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

*Other supports and services* Student Health & Wellness Centre: [https://www.dal.ca/campus\\_life/health-and-wellness/services-support/student-health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html)

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)

Safety Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Dalhousie COVID-19 information and updates: <https://www.dal.ca/covid-19-information-and-updates.html>