

Fundamentals of Hydrology Syllabus

Department of Earth and Environmental Sciences

ERTH/ENVS 3701.03 Fall 2023

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
Dr. Shannon Sterling (Course coordinator)	Shannon.Sterling@dal.ca	-
Dr. Christiane Zoghbi (Course Instructor)	christiane.zoghbi@dal.ca	TBA

Course Description

This course is an introduction to physical hydrology – the science of the processes governing water availability, droughts, and floods. In this course we cover both the theoretical and applied approaches to Hydrology. Fundamental theoretical hydrology covered in this course focuses on processes and mechanisms of water storage and flow in the atmosphere, at the land/atmosphere interface, in soils, and in routing water through the landscape. Applied hydrology concepts in this class applies theoretical concepts as a basis for making informed decisions concerning water resource development and the impact of land cover change on water resources.

Course Prerequisites

MATH 1000.03 or MATH 1215.03 and one of ENVS 1000.06, SUST 1001.06, ERTH 1080.03, or ERTH1090.03, or one of SCIE 1502XY.21/SCIE 1504.27/ SCIE 1510XY.33, and completion of 2 years of an undergraduate degree. PHYC 1280.03 and 1290.03 (or PHYC 1300X/Y.06) and MATH 1010.03 are recommended.

Course Structure

Course Delivery

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

Lectures

W, F 10:05-11:25 am Studley LSC-BIOL&EARTH B2055

Laboratories

Four per term F 8:35-9:55 am Outdoor locations and/or Studley LSC-BIOL&EARTH B2055

Course Materials

- Required Textbook: Dingman, S.L., 2014, Physical Hydrology. Third Edition. Waveland Press, Inc. ISBN-13: 978-1478611189.
- The course syllabus, discussions, slides, laboratory instructions, 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.

Assessment

Semester grades are based on:

- 35% Laboratory assignments
- 25% Quizzes
- 10% Participation in Class Discussions
- 30% Final Exam

Tests/quizzes

	Weight (% of final grade)	Due Date
Quiz 1	2.78	September 15th, 2023
Quiz 2	2.78	September 22nd, 2023
Quiz 3	2.78	September 29th, 2023
Quiz 4	2.78	October 13th, 2023
Quiz 5	2.78	October 20th, 2023

Quiz 6	2.78	October 27th, 2023
Quiz 7	2.78	November 3rd, 2023
Quiz 8	2.78	November 17th, 2023
Quiz 9	2.78	December 1st , 2023

Labs	Assignment Date	Due Date
Lab 1	September 15, 2023	October 6, 2023
Lab 2	October 6, 2023	October 27, 2023
Lab 3	October 27, 2023	November 24, 2023
Lab 4	November 24, 2023	December 6, 2023

Final exam

The course has a final exam weighing 30% of the total grade. It will take place during the final exam period.

Other course requirements

You are required to attend classes, complete all labs 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. Quizzes will be held in class, on the due date in the syllabus.
2. Assignments submitted late and without an approved extension will be deducted 10% per day.
3. 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 Form may be used two times this semester. Make-up labs will be offered if the student misses the requirement for an excused absence.
4. 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.

5. Late penalties for assignments: 10 % per day.
6. 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 declare in writing that the work was distributed equally among the lab authors.
7. All assignments must be submitted through Brightspace. E-mailed submissions will not be accepted.
8. In the case of a missed quiz due to Covid-19 or a labor disruption, the quiz in question will not be counted towards your final grade, and the other quizzes will have a higher weighting.

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 the definition of hydrology.
2. Explain and use the fundamental dimensions, units, and physical laws of hydrology.
3. Explain what a watershed is, how to delineate it, and why it is the basic unit of hydrology.
4. Explain the components of the hydrological cycle and calculate the water balance and mean residence time using steady state box models.
5. Describe the mechanisms controlling how water moves through the land phase of the water cycle, both numerically and theoretically, in particular, the processes driving
 - a. Precipitation,
 - b. Evapotranspiration,
 - c. Infiltration,
 - d. Groundwater, and
 - e. Runoff and Streamflow,
6. Manipulate and analyze hydrologic time series data.
7. Make basic hydrologic field measurements and discuss the quality of common hydrologic measurements.

Course Content

Any changes to location of lectures will be posted in announcements on Brightspace before class. Check reading guides on Brightspace for detailed content of quizzes.

Week	Date	Lesson Topic(s)	Reading	Assessment
1	Sep 6-8	Introduction to Hydrology: basic concepts and challenges and the watershed and water balances	Chapter 1	
2	Sep 13-15	The Global Context: climate, hydrology, and the critical zone Lab 1: Mapping watershed boundaries, the water balance	Chapter 2	Quiz 1
3	Sep 20-22	Surface-Atmosphere Water and Energy Exchange	Chapter 3	Quiz 2
4	Sep 27-29	Precipitation Meteorology	Chapter 4	Quiz 3
5	Oct 4-6	Precipitation Cont. Snow/Snowmelt Lab 2: River monitoring and measurement (Little Sackville River)	Chapter 4 Chapter 5	Lab 1 due
6	Oct 11-13	Snow/Snowmelt Evapotranspiration	Chapter 5 Chapter 6	Quiz 4
7	Oct 18-20	Evapotranspiration	Chapter 6	Quiz 5
8	Oct 25-27	Principles of subsurface flow Lab 3 Soil measurement (in Long Lake Park)	Chapter 7	Quiz 6 Lab 2 due
9	Nov 1-3	Infiltration and water movement in soils	Chapter 8	Quiz 7
10	Nov 8-10	Groundwater-surface-water interactions and wetlands	Chapter 9	Quiz 8
11	Nov 22-24	Runoff Generation and Streamflow Lab 4 Flood trends in Nova Scotia	Chapter 10	Lab 3 due
12	Nov 29-Dec 1	Runoff Generation and Streamflow Droughts Review Session	Chapter 10	Quiz 9
13	Dec 6	No Classes - End of Term		Lab 4 Due

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/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.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.