

**Faculty of Science Course Syllabus
Department of Earth and Environmental Sciences
ERTH/ENVS 3701.03 – Fundamentals of Hydrology
Fall, 2019**

Instructor: Dr. Shannon Sterling Shannon.Sterling@dal.ca 3056 LSC (Biology Wing)
TA: Caitlin McCavour Caitlin.McCavour@Dal.Ca
Lectures: Wed/Fri 10h05-11h25 B2055
Laboratories: Fri 8h35-09h55 (Mandatory – see schedule) LSC-BIOL&EARTH2055

Course Description

This course is an introduction to hydrology, emphasizing surface processes and watershed responses. Hydrologic science has both basic and applied aspects. Basic or pure hydrology relates to questions about the role of water in natural processes, such as shaping the surface of the Earth. Applied hydrology relates to using scientific knowledge as the basis for making informed decisions concerning water allocation and protection of natural resources. In this course we learn about both the pure and applied uses of hydrology, with a special emphasis on the interfaces between hydrology and other environmental sciences. The course is quantitative, with an emphasis on calculating how perturbations from human activity affect the hydrologic cycle.

Structure: Each week there will be 4.5 hours of class time. Some weeks will have 3 hours of lecture and 1.5 hours of lab, while other weeks will have 3 hours of lab exercises and 1.5 hours of lecture.

Course Prerequisites

MATH 1000.03 or MATH 1215.03 and one of ENVS 1000.06, SUST 1001.06, ERTH 1080.03, or ERTH 1090.03, 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 Objectives/Learning Outcomes

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

1. Explain the components of the hydrological cycle and calculate the major fluxes,
2. Develop understanding of the conceptual basis of hydrology and of the quantitative relations used to answer scientific and water-resources-management questions,
3. Describe the way in which water moves through the land phase of the water cycle, both numerically and theoretically, in particularly the processes driving
 - a. Precipitation,
 - b. Infiltration,
 - c. Evapotranspiration,
 - d. Groundwater, and
 - e. Runoff and Streamflow,
4. Manipulate and analyze basic hydrologic time series data,

5. Make basic hydrologic field measurements such as precipitation and stream discharge and discuss the quality of common hydrologic measurements, and
6. Identify how to assess impacts and risk to water resources due to climate change and human activities and to natural risks, for:
 - a. Floods,
 - b. Droughts, and
 - c. Pollution.

Course Materials

- Required Textbook: Dingman, S.L., 2014, Physical Hydrology. Third Edition. Waveland Press, Inc. ISBN-13: 978-1478611189.
- The course syllabus, 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 the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.

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.

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), the in app support button, or by calling 1-888-663-5491.

Course Assessment

Semester grades are based on:

- 35% Laboratory assignments
- 15% Participation in Class (via TopHat)
- 20% Quizzes
- 30% Final exam

Component	Weight (% of final grade)	Date
Tests/quizzes		
Quiz 1	2	September 11 th , 2019
Quiz 2	2	September 18 th , 2019
Quiz 3	2	September 25 th , 2019
Quiz 4	2	October 2 nd , 2019
Quiz 5	2	October 19 th , 2019
Quiz 6	2	October 16 th , 2019
Quiz 7	2	October 23 th , 2019
Quiz 8	2	October 30 st , 2019
Quiz 9	2	November 6 th , 2019
Quiz 10	2	November 20 th , 2019

Final exam

(Scheduled by Registrar)

Assignments

Assignment Date

Due Date

<i>Lab 1</i>	<i>September 13, 2019</i>	<i>September 20, 2019</i>
<i>Lab 2</i>	<i>September 20, 2019</i>	<i>September 27, 2019</i>
<i>Lab 3</i>	<i>September 27, 2019</i>	<i>October 4, 2019</i>
<i>Lab 4</i>	<i>October 4, 2019</i>	<i>October 11, 2019</i>
<i>Lab 5</i>	<i>October 11, 2019</i>	<i>October 18, 2019</i>
<i>Lab 6</i>	<i>October 18, 2019</i>	<i>October 25, 2019</i>
<i>Lab 7</i>	<i>October 25, 2019</i>	<i>November 1, 2019</i>
<i>Lab 8</i>	<i>November 1, 2019</i>	<i>November 8, 2019</i>
<i>Lab 9</i>	<i>November 8, 2019</i>	<i>November 22, 2019</i>
<i>Lab 10</i>	<i>November 22, 2019</i>	<i>November 29, 2019</i>

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 Schedule¹

Class	Date	Topic	Text Reading	Evaluation
1	Sept 4	Introduction to hydrology	Chapter 1.1-1.5	
2	Sept 6	Basic concepts and challenges and the watershed and water balances	Chapter 1.6-1.11	
3	Sept 11	Global Climate, the energy balance	Chapter 2.1	Quiz 1
4	Sept 13	Lab 1 (8:35-9:55) Mapping watershed boundaries, the water balance Lecture (10:05-11:25) The global hydrologic cycle	Chapter 2.2	Lab 1
5	Sept 18	Surface-atmosphere water and energy exchange principles and processes	Chapter 3	Quiz 2
6	Sept 20	Lab 2 (8:35-9:55) Investigating air temperature with HydroClient and RStudio Lecture (10:05-11:25) Land-atm. exchange	Chapter 3	Lab 2
7	Sept 25	Lab 3 (8:35-9:55) Precipitation measurement	Chapter 4	Quiz 3
8	Sept 27	Lecture/lab (8:35-11:25) Precipitation and precipitation measurement	Chapter 4	Lab 3
9	Oct 2	Snow and snowmelt	Chapter 5	Quiz 4
10	Oct 4	Lab 4 (8:35-9:55) Downloading & interpretation of discharge and precipitation data Lecture (10:05-11:25) Snow and Snowmelt	Chapter 5	Lab 4
11	Oct 9	Evapotranspiration	Chapter 6	Quiz 5
12	Oct 11	Lab 5 (8:35-11:25) Field visit to Sackville River. Streamflow measurement, rating curves		Lab 5
13	Oct 16	Evapotranspiration	Chapter 6	Quiz 6
14	Oct 18	Lab 6 (8:35-11:25) Soils lab Long Lake Park		Lab 6
15	Oct 23	Principles of subsurface flow	Chapter 7	Quiz 7
16	Oct 25	Lab 7 (8:35-9:55) Soils analysis Lecture (10:05-11:25) Principles of subsurface flow	Chapter 7	Lab 7
17	Oct 30	Infiltration and water movement in soils	Chapter 8	Quiz 8
18	Nov 1	Lab 8 (8:35-9:55) Data analysis with R Lecture (10:05-11:25) Hydrology and the critical zone, principles and processes	Chapter 2.3, 8	Lab 8
19	Nov 6	Groundwater-surface-water interactions	Chapter 9	Quiz 9
20	Nov 8	Lab 9 (8:35-9:55) Flow trends in Nova Scotia Lecture (10:05-11:25) Groundwater in the hydrologic cycle	Chapter 9	Lab 9
21	Nov 20	Runoff generation and streamflow	Chapter 10	Quiz 10
22	Nov 22	Lab 10 (8:25-9:55) Flood and drought risk Lecture (10:05-11:25) Runoff generation and streamflow	Chapter 10	Lab 10
23	Nov 27	Floods and droughts		
24	Nov 29	Review for Final Exam (8:25-9:55) Lecture (10:05-11:25) Water Crises & the Future		

¹ Subject to change

Course Policies

1. Spend approximately three hours a week on your textbook chapter readings.
2. Attend all lectures and labs.
3. Labs are to be done in pairs. <http://www.economist.com/news/books-and-arts/21613167-why-greatest-feats-creativity-come-pairs-it-takes-two>
4. Assignments submitted late and without an approved extension will be deducted 10% per day. Extensions are granted for exceptional circumstances, with notification to Dr. Sterling before the lab is to take place.
5. Missed assignments. Make up exams will only be given in the case of documented medical or family emergencies. If you miss a test for any reason other than documented medical or family emergency grounds, your mark on the test or exam is zero.

ACCOMMODATION POLICY FOR STUDENTS

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The full text of Dalhousie's Student Accommodation Policy can be accessed here:

http://www.dal.ca/dept/university_secretariat/policies/academic/student-accommodation-policy-wef-sep--1--2014.html

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the **Advising and Access Services Centre (AASC)** prior to or at the outset of the regular academic year. More information and the **Request for Accommodation** form are available at www.dal.ca/access.

ACADEMIC INTEGRITY

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

The Academic Integrity website (<http://academicintegrity.dal.ca>) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie's **Policy on Intellectual Honesty** and **Faculty Discipline Procedures** is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

STUDENT CODE OF CONDUCT

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. In general:

"The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and non – academic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University's premises;
- the property of the University or its members.”

The full text of the code can be found here:

http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with <ul style="list-style-type: none"> - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties 	Killam Library Ground floor Rm G28 Bissett Centre for Academic Success	In person: Killam Library Rm G28 By appointment: <ul style="list-style-type: none"> - e-mail: advising@dal.ca - Phone: (902) 494-3077 - Book online through MyDal
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	Killam Library Ground floor Librarian offices	In person: Service Point (Ground floor) By appointment: Identify your subject librarian (URL below) and contact by email or phone to arrange a time: http://dal.beta.libguides.com/sb.php?subject_id=34328
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	Killam Library 3rd floor Coordinator Rm 3104 Study Coaches Rm 3103	To make an appointment: <ul style="list-style-type: none"> - Visit main office (Killam Library main floor, Rm G28) - Call (902) 494-3077 - email Coordinator at: sfs@dal.ca or - Simply drop in to see us during posted office hours All information can be found on our website: www.dal.ca/sfs
Writing Centre	Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster) <ul style="list-style-type: none"> - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field 	Killam Library Ground floor Learning Commons & Rm G25	To make an appointment: <ul style="list-style-type: none"> - Visit the Centre (Rm G25) and book an appointment - Call (902) 494-1963 - email writingcentre@dal.ca - Book online through MyDal We are open six days a week See our website: writingcentre.dal.ca