

DEPT OF GEOGRAPHY & ENVIRONMENTAL STUDIES
CARLETON UNIVERSITY

Course Outline

GEOG 3103A: Watershed Hydrology
September – December 2020

Instructor: Dr. Jennifer Totten

Virtual Office Hours: Fridays from 10 – 11 am, or by appointment

E-mail: jennifer.totten@carleton.ca (typically the best way to get in touch with me – I do not answer emails on weekends)

Lectures: Pre-recorded lectures, posted on cuLearn

Labs: format still to be determined

Pre-Requisite: GEOG 2013A

Course Objectives/ Learning outcomes:

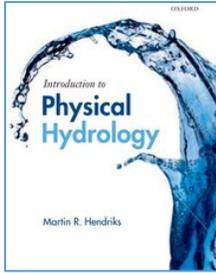
Hydrology is the study of the hydrologic cycle: the continuous movement of water from the atmosphere to the surface of the earth, on and into the surface, through the subsurface, and back to the atmosphere. During this course, students will develop a sound understanding of the various components of the hydrological cycle. Students will be able to identify these components, describe how they work, and identify how we measure them. Student will be able to discuss the importance of measuring and monitoring these components for water resource assessment. Students will be able to analyze various hydrological data sets to interpret specific hydrological regimes and extreme hydrological events.

General areas of study:

1. Hydrological cycle & world water balance
2. Precipitation
3. Interception
4. Evaporation and Evapotranspiration
5. Infiltration
6. Soil moisture and groundwater hydrology
7. Surface runoff
8. Snow hydrology
9. Urban hydrology
10. Drylands hydrology
11. Wetlands hydrology
12. Extreme hydrological events: floods & droughts
13. Water quality and pollution

Reading material:

There is a textbook which covers the first half of the course material. Lessons on other topics will have supplementary readings which will be provided on cuLearn web site. It is the responsibility



of each student to familiarize themselves with this material. Material contained in the course readings will be included on the final exam. Additional material may be assigned during the term.

Textbook: *Introduction to Physical Hydrology* by M.R. Hendriks. Oxford University Press, 2010. 331 pgs.

Course teaching and learning activities, including outlines, lectures, PowerPoint presentations, discussions, posted notes, labs etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).”

Course assessment:

The assessment for the course will be based on several components:

1. There will be 5 assignments on various aspects of the hydrological cycle. These will comprise 50% of the total grade.
2. There will be short quizzes / activities associated with each lesson. Some of these will be on the cuLearn platform, some may involve off-line work that needs to be submitted through cuLearn. These will be worth a total of 15%, equally distributed throughout the term.
3. A final examination worth 35% of the total grade will be given, which will be made up of both long and short answer questions. **You MUST pass the exam to pass the course.**
4. All elements of the course will be marked both for content (e.g. ideas, structure of arguments, research, citations etc.) and presentation (e.g. quality of writing, grammar, spelling, and graphical presentation). All assignments are to be submitted through cuLearn.

Exercise topics:

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| 1. Precipitation data analysis | 10% |
| 2. Hydrological data analysis & Recurrence intervals | 10% |
| 3. Field Exercise (to be completed from home) | 10% |
| 4. Hydrograph event analysis | 10% |
| 5. Water use journal | 10% |

Attendance and submission policy for course

All 5 Labs contribute to your grade. Completion of all labs and the final exam are required for successful completion of the course. Submission dates are important. Lab reports are due via cuLearn by 11:55 pm on the date specified (see attached schedule). Assignments will only be accepted for 2 days beyond the due date with a penalty of 5% (of the lab itself) per day, unless prior arrangements have been made. The only exception is for reasons of illness or equivalent circumstances (e.g. bereavement). These types of situations must be fully documented in writing

(medical certificates, accident reports etc.) **within one week** of the assignment due date. If in doubt, please send me an email or discuss this with me during my Virtual Office Hours.

Unless otherwise specified, group work is not acceptable. Assignments will be returned via cuLearn, and general feedback will be provided in the lab period following. If you have any questions about the grading, please discuss this with your TA, or with me via email or during Virtual Office Hours.

Standing in this course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

Academic Integrity & various offences

Instructional offences include among other activities cheating, contravening examination regulations, plagiarism, submitting similar work in 2 or more courses without prior permission, and disrupting classes. Conduct offenses apply in areas of discrimination and sexual harassment. Further information about University regulations which define and regulate these offences is found at: <http://www2.carleton.ca/studentaffairs/academic-integrity>

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."

Plagiarism is a serious offence which cannot be resolved directly with the course instructor. A rigorous investigation is conducted by the Office of the Faculty Dean, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of “F” for the course.

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly. For an accommodation request, the processes are as follows.

Pregnancy obligation: write to me with any requests for academic accommodation during the 1st two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Student Guide.

Religious obligation: write to me with any requests for academic accommodation during the 1st two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Student Guide.

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), Psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairment in mobility, hearing and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term. After requesting accommodation from PMC, email me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally scheduled exam.

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: <https://carleton.ca/equity/sexual-assault-support-services>.

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

Schedule for this term: (Lecture Order and Required Readings):

Lesson 1	Introduction & the hydrological cycle	Hendricks, M.R. (2010) Introduction to Physical Hydrology. Chapter 1 – pg 1 – 13
Lesson 2	Precipitation	Raghunath, H.M. (2006) <i>Hydrology: principles, analysis & design (2nd Ed)</i> . Chapter 2 Precipitation Pg. 17 – 59 Knutson, T.R. <i>et al</i> , Tropical cyclones and climate change. Nature Geoscience, 2010;
Lesson 3	Interception	Ward, R.C. & Robinson, M (2000). <i>Principles of Hydrology</i> . Chapter 3 Interception Pg. 63 – 89
Lesson 4	Evaporation & evapotranspiration	Maidment, D.R. (ed) (1992) <i>Handbook of Hydrology</i> , Chapter 4 Evaporation. Pg. 4.1 – 447
Lesson 5	Infiltration	Manning, J.C. (1997). <i>Applied Principles of Hydrology</i> . Chapter 4 Infiltration and soil water Pg. 75 - 104.
Lesson 6	Groundwater hydrology	Ward, R.C. (1975) <i>Principles of Hydrology</i> . Chapter 7 Subsurface water – Groundwater Pg. 183 – 231

Lesson 7	Surface hydrology	Dingman, S.L. (2002) <i>Physical Hydrology (2nd ed)</i> . <u>Chapter 9 Stream response to water-input events</u> – pg. 389 – 435
Lesson 8	Snow hydrology	Viessman,W. & Lewis, G. (1996). <i>Introduction to Hydrology</i> . <u>Chapter 14 Snow Hydrology</u> - pp. 265 – 271 & 284 - 288.
Lesson 9	Urban Hydrology	MacKenzie, F.B. (1987) <i>Urbanization and the Hydrological Regime</i> , in <u>Canadian Aquatic Resources</u> (Healey & Wallace, eds.) Dept. of Fisheries & Oceans. Pg. 277 – 292
Lesson 10	Drylands Hydrology	Thomas, D.S.G. (2011) <i>Arid zone Geomorphology</i> . <u>Chapter 11 Runoff generation, overland flow and erosion on hillslopes</u> . Pg. 237 – 259.
Lesson 11	Wetland Hydrology	Mitsch W.J. & Gosselink, J.G. (2007) <i>Wetlands</i> , <u>Chapter 4 Hydrology of Wetlands</u> . Pg.67-113.
Lesson 12	Floods & Droughts	Newson, M. (1994) <i>Hydrology and the River Environment</i> , <u>Chapter 4 Runoff Extremes</u> Pg. 64 – 89
Lesson 13	Water Quality	Davie, Tim (2002). <i>Fundamentals of Hydrology</i> . <u>Chapter 8 Water Quality</u> Pg. 106 – 129
	Course review	

Lab Assignment Schedule for Fall 2020 Term. <i>Assignment due dates are fixed.</i>
Week of Sep 21 to 25: Assignment 1 given & explained, due October 4/6th.
Week of Sept 28 to Oct 2 lab sessions: Lab working periods, T.A. will help during your lab period.
Assignment 1 DUE @ 11:55 pm the night before this week's lab
Week of October 5 to Oct 9: Assignment 2 given & explained, due Oct 18/20th.
Week of October 12 – 16th lab sessions: Lab working periods, T.A. will help during your lab period
Monday October 12: Thanksgiving Day – University closed (will be made up on Friday Dec 11th)
Assignment 2 DUE @ 11:55 pm the night before this week's lab
Week of October 19 to Oct 23rd: Assignment 3 given & explained, due Nov 1/3rd.
Oct 26 - 30: Reading Week, no classes or lab sessions
Assignment 3 DUE @ 11:55 pm the night before this week's lab
Week of November 2 to Nov 6th: Assignment 4 given & explained, due Nov 15/17th.
Week of Nov. 9 to Nov 13th lab sessions: Lab working periods, T.A. will help during your lab period
Assignment 4 DUE @ 11:55 pm the night before this week's lab
Week of Nov 16 to Nov 20th: Assignment 5 given & explained, due Nov 29/Dec 1.
Week of Nov 23 to Nov 27 lab sessions: Lab working periods, T.A. will help during your lab period
Assignment 5 DUE @ 11:55 pm the night before this week's lab
Week of Nov 30th to Dec 4th: no more lab sessions.