

**DEPT OF GEOGRAPHY & ENVIRONMENTAL STUDIES
CARLETON UNIVERSITY**

Course Outline

**GEOG 4013: COLD REGIONS HYDROLOGY
January – April 2019**

Instructor: Dr. Jennifer Totten

Office: Loeb A209

Lecture: Fridays 11:35 a.m. – 14:25, Mackenzie Hall, rm 3190

Office Hours: Fridays 10:00 – 11:00 a.m.

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

Pre-Requisite: GEOG 3103

Course Objectives:

The objective of this course is to develop a working knowledge of the processes particular to the hydrological cycle in cold regions. Snow and ice play a pivotal role in the year-round water cycle in cold regions, the Arctic and Antarctic. Their various contributions must be examined in order to understand how the cold regions hydrological cycles differ from more temperate areas. Since Canada is, in essence, a cold region, we will place considerable emphasis on Canada's physical environments and issues arising from the cold part of our yearly hydrological cycle.

General areas of study:

1. Introduction
2. Snow processes: accumulation, distribution, snowmelt processes, energy balance, residual snow banks, hydrology
3. Lakes: heat balance, thermal regimes & stratification
4. Rivers: stream types, hydrograph patterns, thermal regimes
5. Ice formation: crystallographic processes, primary and secondary ice formation
6. Freezing processes and patterns: lakes & reservoirs, rivers,
7. Ice effects: hydraulics, behavior & bearing capacity, impact of hydroelectric development, hanging dams and ice jams, erosive effects on shorelines, thermal expansion formations, anthropogenic influences and effects.
8. Ice decay: crystallographic processes, patterns for melt & break-up, variations with ice types
9. Glacier hydrology
10. Permafrost hydrology: surface & groundwater movement, icings & frost blisters, pingos
11. Polar Oceans: basins, processes, thermal regimes, salinity, water movement, polynyas, ice formation; sea ice, ice shelves, ice bergs

Reading material:

There is no official text, but there will be considerable reading required for this course. Students will be supplied with related readings from textbooks, web reports or scientific journals which *must be read for discussion at the start of each week's lecture*. It is the responsibility of each student to familiarize themselves with this material. The readings will be made available on cuLearn for ease of access. Participation in the discussion of the readings goes towards the class participation grade, thus attendance will be tracked.

Classroom 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).

Attendance and submission policy for course

Absence from more than 3 sessions without a medical certificate or prior approval will be penalized at 2.5% of the final grade per session missed. Attendance is tracked.

Submission dates are important. Assignments will only be accepted for 2 days beyond the due date with a penalty of 5% per day, unless prior arrangements have been made. The only exception is for reasons of illness or equivalent circumstances (e.g. bereavement). These type 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 come and see me.

Unless otherwise specified, group work is not acceptable.

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. 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 first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Religious obligation: 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. For more details see <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Accommodation for Student Activities: 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. For more details see <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

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 is 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/sexual-violence-support/wp-content/uploads/Sexual-Violence-Policy-December-1-2016.pdf>

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 impairments 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 the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally scheduled exam.

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodations at <http://www2.carleton.ca/equity/>

Course assessment:

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

1. There will be 4 assignments. These will comprise 55% of the total grade.
2. A final examination worth 35% of the total grade will be given.
3. Participation in weekly class discussions is mandatory (10%). Attendance will be tracked.
4. All written course work must be typed. Spelling, grammar, and sentence structure will be taken into consideration for the marking of all submitted term work.

Standing in a 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.

Exercise topics:

Cold regions hydrological issues: data analysis assignment (15%); given Jan 18th, due Feb 8th

Field assignment: ice analysis (10%), given Feb 8th, due Mar 1

Research project – analysis of scientific papers (25%), given Jan 25th, due April 5th

Presentation of research project (5%), given Jan 25th, due April 5th

Important dates for this term:

Note: the dates on which individual lectures are presented may not be exactly as shown. Assignment due dates and field work dates are fixed. Weekly readings will be provided on the cuLearn website.

For January 11 th , please read:		
1. Climate Impact Assessment: Impacts of a Warming Climate: Read Findings 1 – 3 & 6-7. (can be downloaded from: http://www.acia.uaf.edu/ , but are available on the course website on cuLearn)		
1	January 11	Introduction to the Course
2	January 18	Snow Hydrology Assignment 1 handed out
3	January 25	Rivers & Lakes Term project handed out
4	February 1	Growth of Ice
5	February 8	River & Lake Ice processes (for 1.5 hrs), then Field work morning – come prepared to go outside, bring notebook & pencil, camera if possible Assignment 1 due today
6	February 15	River & Lake Ice processes (continued) River and lake ice break-up
7	February 22	READING WEEK - NO CLASSES
8	March 1	Rideau River case study & Ice Roads Assignment 2 due today, project topic & outline due today

9	March 8	Permafrost Hydrology
10	March 15	Glacier Hydrology
11	March 22	Polar Oceans
12	March 29	Sea Ice, Icebergs, Ice shelves
13	April 5	Course review and Exam format Presentation of poster; papers due