



**Faculty of Social Sciences
Department of Geography**

**University
of Victoria**

**Geography 491 A02
ADVANCED TOPICS IN SNOW AND ICE HYDROLOGY
SPRING 2015**

Instructor: Dr. Randall Scharien
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Course Description

Snow and ice dominate the Canadian landscape. There is virtually no area in Canada which escapes their influence. We skate on frozen ponds, ski down snow laden mountains, drive through snow blizzards and watch how ice jams in rivers cause rivers to swell and floods to occur. The extent of snow and ice increases rapidly northwards, and glaciers are found in mountainous areas and in large parts of the Arctic region. Given that snow and ice impact heavily on the Canadian way of life, this course seeks to understand the dynamics of snow and ice in a hydrological context. This course will examine snow properties, snowcover distribution, glacier hydrology, melt runoff, and ice in its many forms (lake ice, river ice, sea ice, and ground ice). This course will also examine the implications that the Global Change will impose on the cryosphere region in Canada.

Class Meetings

Tuesday, Wednesday, and Friday 11:30-12:20 MAC D109

Text and Readings

There is no required text for this course. Assigned readings will be posted on CourseSpaces (<http://CourseSpaces.uvic.ca>). If necessary, readings may be made available on the course reserve in the main library. If you come to class prepared it will be easier to remain committed to, and engaged with, the course materials throughout the term. This means you should have read and considered the relevant readings before each class meeting.

For project work and the critical review assignment you will be expected to make additional use of scientific and policy reports, journal articles, and book chapters in support of your work. Recommended sources will be provided by the course instructor.

CourseSpaces

You will be required to access the CourseSpaces site for required readings, important announcements, instructor notes, your grades, and additional information (e.g. discussion topics). Please take the time to familiarize yourself with CourseSpaces if you have not already done so.

Course Organization

CLASS MEETINGS

Each class meeting will typically comprise an overview lecture on a topic given by the instructor, followed by a discussion. Overview lectures and class discussions will build on assigned readings. Where appropriate, time will be allotted to student presentations.

There will be a minimum of two guest speakers (TBD) at different points throughout the term. They will provide unique and interesting perspectives on snow and ice hydrology research, with linkages to industry applications where applicable.

TAKE HOME ASSIGNMENTS

Two take home assignments will be given during the course. Further details, including evaluation criteria, will be provided in the class. Due dates are included in the course schedule below.

JOURNAL ARTICLE REVIEW

Each student is required to conduct a critical review of one peer-reviewed, published, journal article that addresses some aspect of snow and ice hydrology (e.g. techniques or applications). The review will comprise a written component, assessing the article within the context of the literature. It will also comprise a presentation component, where the critical review is presented to the class and followed by a discussion led by the reviewer. Students should consider choosing a journal article and related references which align with their chosen (or anticipated) term project topics or general areas of interest. Further details and evaluation criteria will be provided in class.

TERM PROJECT

A group term project (2-3 people) will address an interesting aspect of snow and ice hydrology. Groups are expected to develop a proposal in early January, and to design an experiment which spans the length of the term. Students will have to consider logistical restraints, available data, software and manpower in the design of the project.

The choice of topic for your project is up to you and your group, with a one page proposal due in class on January 30, 2015. The final two class meetings will be used for term project

presentations, to be given in a conference style format. The final term project report is due on the last day of classes for the term April 2, 2015.

Required format, evaluation criteria, and suggested topics will be provided in class.

Sample topics, from which focused projects may be derived.

Hydrologic cycle in the Arctic

Environmental factors influencing glacier runoff

Ice growth and decay

Role of climate on the distribution of permafrost

Role of permafrost in northern hydrology

Northern snow re-distribution and change

Role of snow in the northern water budgets

Role of snow in the terrestrial energy budget

Role of lake ice in the climate system

Role of sea ice in the climate system

Snow metamorphosis

Factors affecting the timing of snowmelt

Cryosphere evidence for climate change in northern environments

Factors driving the variability in sea ice extent

The influence of ice sheets and glaciers on sea level change

The relationship between sea ice and ocean current circulation

Ocean-ice interactions

The Freshwater budget of the Arctic

Thermal properties of snow covers

Snow water equivalent (SWE) patterns of snowcovers in British Columbia

Water chemistry of evolving snowpacks

Reflectivity of snow and ice with application to remote sensing

Remote sensing for hydrology applications

Glacier snowline detection

Ground based measurements

Modeling runoff

FINAL EXAM

There is no final exam in this course.

Grading Scheme

Assignments (2 at 10% each)	20%
Journal article critical review	20%
Project Proposal	5%
Project Presentation	10%
Project Report	35%
Participation	10%
TOTAL	100%

Course Topics

Topic 1 (T-1):	Material properties of water, ice, and snow
Topic 2 (T-2):	Energy exchanges
Topic 3 (T-3):	Snow and freshwater ice
Topic 4 (T-4):	Glaciers and Ice Sheets
Topic 5 (T-5):	Melt runoff and floods
Topic 6 (T-6):	Sea ice
Topic 7 (T-7):	Permafrost
Topic 8 (T-8):	Climate interactions and climate change

Tentative Course Schedule*

Week	Tue	Wed	Fri
1	Jan. 6 Course introduction	Jan. 7 T-1	Jan. 9 T-1
2	Jan. 13 T-2	Jan. 14 T-2	Jan. 16 T-2
3	Jan. 20 T-3	Jan. 21 T-3	Jan. 23 T-3
4	Jan. 27 T-3	Jan. 28 T-3	Jan. 30 T-3 Project Proposal (5%) due
5	Feb. 3 Assignment #1 (10%) due	Feb. 4 T-4	Feb. 6 T-4
6	Feb. 10 BREAK	Feb. 11 BREAK	Feb. 13 BREAK
7	Feb. 17 T-5	Feb. 18 T-5	Feb. 20 T-5
8	Feb. 24 T-5	Feb. 25 T-5	Feb. 27 T-5
9	Mar. 3 Assignment #2 (10%) due	Mar. 4 T-6	Mar. 6 T-6
10	Mar. 10 T-7	Mar. 11 T-7	Mar. 13 T-7
11	Mar. 17 T-8	Mar. 18 T-8	Mar. 20 T-8
12	Mar. 24 T-8	Mar. 25 T-8	Mar. 27 T-8
13	Mar. 31 and Apr. 1: Project Presentations (10%) in class. Apr. 2: Project Final Report (35%) due.		

*Schedule subject to change in order to accommodate guest lectures and/or student presentations.

Grade Scale

A+	A	A-	B+	B	B-	C+	C	D	F
90-100%	85-89%	80-84%	77-79%	73-76%	70-72%	65-69%	60-64%	50-59%	0-49%

Late Assignment Policy

Late assignments and presentations are not permitted except for circumstances involving medical or compassionate reasons. Written verification as proof may be requested at the discretion of the instructor.

Course Experience Survey (CES)

Your feedback on this course is valued. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous course experience survey (CES) regarding your learning experience. The CES is vital to providing feedback to the instructor regarding course content and teaching, as well as to help the department improve the overall program for future students. The survey is accessed via MyPage and can be completed using your laptop, tablet, or mobile device. You will be reminded and provided detailed information nearer to the completion of this course but please be thinking about this important activity throughout its duration.

Academic Integrity

Academic integrity requires commitment to the values of honesty, trust, fairness, respect and responsibility. It is expected that students, faculty members and staff at the University of Victoria, as members of an intellectual community, will adhere to these ethical values in all activities related to learning, teaching, research and service. Any action that contravenes this standard, including misrepresentation, falsification or deception, undermines the intention and worth of scholarly work and violates the fundamental academic rights of members of our community. Students are advised to consult the university's Policy on Academic Integrity in the University Calendar. The instructor reserves the right to use plagiarism detection software programs to detect plagiarism in term papers.

The University of Victoria is committed to promoting, providing and protecting a positive and safe learning and working environment for all its members.