

# ICE SHEETS AND GLACIERS WINTER 2020

## GEOG 420

### CLASS SCHEDULE

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Section	Location	Time	Instructor(s)
GEOG 420 001	HH 2107	Mondays & Wednesdays 4 p.m. - 5:20 p.m.	Wesley Van Wychen wvanwych@uwaterloo.ca

### INSTRUCTOR / TA INFORMATION

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Instructor: Wesley Van Wychen

Office: EV1-230

Email: wvanwychen@uwaterloo.ca

Office hours: Wednesdays 2-4 pm, or by appointment

In terms of email correspondence, please note that all course correspondence should be completed using a "@uwaterloo" email address. Please do not use personal email addresses as these messages can be flagged as spam and be unseen by the instructor. Further, I try to respond to all email messages in a reasonable timeframe (within 24 hours excluding weekends), however students should not have the expectation that messages will be responded to instantly.

## COURSE DESCRIPTION

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### *Calendar Description for GEOG 420*

This course will introduce the basics of glaciology, with a focus on climate change and physical processes. Key areas covered by the course include glacial mass change in a warming climate, ice dynamics, various spatial and temporal scales of glaciation, and geomorphological features caused by glaciation.

Prereq: GEOG 201 or GEOG 209; Level at least 3A. Antireq: GEOG 474 001 W17

The world's glaciers and ice sheets are changing as a result of human-driven climate change. We begin this course by learning about what glaciers are (glaciers, ice caps, ice sheets) and how they are created. Next, we will turn our attention to glacier mass balance, before focussing on glacier hydrology and motion. Finally, we will look at the connection between glaciers and climate, and look at the wider implications of glacier mass loss.

## LEARNING OUTCOMES

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### **By the end of this course students should be able to:**

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| 1. Describe the core concepts of glacier mass balance and glacier dynamics  |
| 2. Explain the importance of glacier hydrology (surface hydrology, englacial hydrology, basal hydrology)                        |
| 3. Describe glacier motion and discuss the links between glacier mass balance and glacier hydrology on ice motion               |
| 4. Critically analyze the implications of glacier processes and glacier loss in a warming climate                               |
| 5. Demonstrate critical thinking and knowledge synthesis through the preparation and presentation of a formal research project. |

## TENTATIVE COURSE SCHEDULE

The instructor reserves the right to change the course schedule and lecture order as appropriate.

Week	Date	Topic	Assessment	Reading
1	Jan 6	Introduction to glaciology		Ch. 1
	Jan 8	Global distribution of glaciers		
2	Jan 13	How to make a glacier		Ch. 2
	Jan 15	Glacier mass balance		
3	Jan 20	Glacier hydrology		Ch. 4
	Jan 22	Class Seminar	Class Seminar 1	
4	Jan 27	Ice flow processes	Proposal/Annotated Bibliography Due <b>(15% of final grade)</b>	Ch. 5.
	Jan 29	Glacier dynamics		
5	Feb 3	Glacier dynamics (con't)	Class Seminar 2	Ch. 6
	Feb 5	Class Seminar		

6	Feb 10 Feb 12	Glacial geomorphology (erosion) Glacial geomorphology (deposition)		Ch. 10 (pp. 371-386; 436-440) Ch. 11 (pp/ 442-492; 510-535)
	Feb 17 Feb 20	READING WEEK READING WEEK		
7	Feb 24 Feb 26	Paleo-glaciology Class Seminar	Class Seminar 3	Ch. 12 (p. 644-671; 707-712) Ch. 7
8	Mar 2 Mar 4	Ice sheets Ice sheets and climate	Term Paper Draft 1 Due ( <b>10% of final grade</b> )	Ch. 9
9	Mar 9 Mar 11	Glaciers/Ice sheets and Sea level rise Class Seminar	Class Seminar 4	
10	Mar 16 Mar 18	Observing glaciers (field methods) Observing glaciers (remote sensing)		

11	Mar 23 Mar 25	Class Seminar  Final project presentation	Class Seminar 5	
12	Mar 30 Apr 1	Final project presentations  Course recap	Term Paper Final Draft Due ( <b>25% of final grade</b> )	

## TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
Benn, D. and Evans, D. 2010. Glaciers and Glaciation 2nd Edition.	Copies of this textbook are available at the UW Bookstore. This course text has been used in the past and used copies may be available from past students.	Yes

## STUDENT ASSESSMENT

Component	Value
Participation in Class Seminars	10% (5 worth 2% each)
Research Proposal & Annotated Bibliography	15%
Term Paper (First Draft)	10%
Term Paper (Final Draft)	25%
Presentation of Final Project	10%
Final Exam	30%

## **Assessments**

### ***Class Seminars:***

Throughout the course there will be time set aside for class seminars (times and dates noted in the course outline). Readings will be assigned prior to the topic of that week on LEARN. In total there are 5 class seminars, each seminar discussion is worth 10% of the final grade. Students that are not present for a class seminar (without a valid reason) will be given a 0% for that discussion.

### ***Major research project:***

Students will work on a major research assignment throughout this course which is comprised of the following elements:

1. Research Proposal and Annotated Bibliography
2. Term Paper (first draft)
3. Term Paper (final draft)
4. Presentation of Final Project

A late penalty of 10% per day (including weekends) will be applied to all elements of the major research project (1-4 above) of this course without a valid reason for lateness (e.g. a doctor's note or bereavement or at the discretion of the instructor).

Students will choose a glaciated region of the world and will write a major research paper which outlines the ongoing changes to glaciers and their implications for that region. More details will be provided during the first week of the course.

### ***Final Exam:***

There will be a final exam scheduled during the exam period. The final exam will cover all course content, including lectures and class seminars.

## **ASSIGNMENT SCREENING**

No assignment screening will be used in this course.

# ADMINISTRATIVE POLICY

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## University of Waterloo LEARN Environment

This course uses the LEARN course environment for course material dissemination and information exchange. LEARN is a web-based course management system that enables instructors to manage course materials (posting of lecture notes etc.), interact with their students, and provide feedback. YOU NEED TO ENSURE THAT YOU CAN ACCESS LEARN. Note that lecture slides are posted on LEARN prior to each lecture. Assignment materials are also distributed through LEARN.  
*Logging Into LEARN*

Since LEARN is a web-based system, you will need a browser.  
Once you have started up your browser, you can access LEARN via: <http://learn.uwaterloo.ca>

### *Checking Your Userid and Password*

Your password can be checked and reset (if needed) by going to:

<https://watiam.uwaterloo.ca/idm/user/login.jsp>

If you still cannot get on LEARN after checking and resetting your password, please confirm with your instructor that you are on the class roster.

### *Getting Help*

Documentation for LEARN is available at:

[http://av.uwaterloo.ca/uwace/training\\_documentation/index.html](http://av.uwaterloo.ca/uwace/training_documentation/index.html)

## Intellectual Property

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual

property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository). Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights. Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

**Academic integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (https://uwaterloo.ca/academic-integrity/) for more information.]

**Grievance:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat-general-counsel/node/100) (https://uwaterloo.ca/secretariat-general-counsel/node/100) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

**Discipline:** A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (https://uwaterloo.ca/academic-integrity/) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat-general-counsel/node/97) (https://uwaterloo.ca/secretariat-general-counsel/node/97) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat-general-counsel/node/131) (https://uwaterloo.ca/secretariat-general-counsel/node/131) .

**Appeals:** A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat-general-counsel/node/100) (https://uwaterloo.ca/secretariat-general-counsel/node/100) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat-general-counsel/node/97) (https://uwaterloo.ca/secretariat-general-counsel/node/97) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](https://uwaterloo.ca/secretariat-general-counsel/node/99) (https://uwaterloo.ca/secretariat-general-counsel/node/99) .

**Note for students with disabilities:** [AccessAbility Services](https://uwaterloo.ca/disability-services/) (https://uwaterloo.ca/disability-services/) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.



**Turnitin.com:** Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.