EARTH AND SPACE SCIENCES **Autumn 2018**
431A *PRINCIPLES OF GLACIOLOGY* 4 Credits, SLN 14855
505A *THE CRYOSPHERE* 4 Credits, SLN 14871

M-W-F, 1:30 - 2:50 pm. ***Room:*** JHN 127
Mon.-Wed.: Lectures, Fri: Lab/Discussion

Class web page: http://courses.washington.edu/ess431/

Instructor:
Knut Christianson
218 ATG Building
knut at uw.edu

T.A.:
Brita Horlings
208B ATG Building
brita2 at uw.edu

Additional Instructors: Warren, Conway, Hallet, Light, Roe, Waddington

Office Hours: Tu, Th 10-11 am, Drop in / By Appointment (Knut)

Required Text: *The Cryosphere* by S.J. Marshall

Optional books: *Glacial Geologic Processes* by D.J. Drewry
Physics of Glaciers by K. Cuffey and W.S.B. Paterson
Glaciers of North America by S. Ferguson
Avalanche Handbook by D. McClung & P. Schaerer

Grade Breakdown - ESS 431:
[25%] – Problem Sets (out of class)
[30%] – Mid-term Exam
[30%] – Final Exam
[15%] – Participation (reading questions)

Grade Breakdown - ESS 505:
[25%] – Problem Sets (out of class)
[25%] – Midterm Exam
[25%] – Final Exam
[10%] – Term paper/project
[15%] – Participation (reading questions)

Late Work Policy:
Work for this class will typically be assigned with the following schedule:

1) Reading questions, due each day at the beginning of lecture
2) Lab assignments, completed in class each Friday
3) Problem sets, posted each Wednesday, due 1 week later

Reading questions can be submitted either in person or by email (in the event that you cannot be in class), but will not be accepted late. Reading assignments and labs will be graded as C/NC.

Problem sets will be graded based on the accuracy of your responses. They are due at the beginning of class, 1 week after assigned. If you feel you will not be able to complete the assignment on time, contact Knut or Brita more than 24 hours before the due date and we will accommodate you. Otherwise, late homework turned in within one week of the due date will be penalized by 10%, with additional penalties for further delay. You are encouraged to work together on solving the problems, but you are expected to write and turn in your own answers.

Missing Exam Policy:
Exams can only be made up under extraordinary circumstances, and only in the event that the instructor is notified more than 24 hours in advance of the exam.

Course Content:
This course is taught by a group of UW faculty and senior grad students who all have active research interests in ***Glaciology***, defined in a broad sense as ***ice in the environment***. The course covers the molecular structure of water and ice, ice in clouds, glaciers and polar ice sheets, glacial geology, frozen ground and permafrost, seasonal snow, sea ice, and ice ages. Instructors relate the various forms of ice to other processes such as polar oceanography, atmospheric circulation, and climate change. The course achieves the advanced standards expected of a 400-level course by challenging students to critically understand concepts such as conservation laws and how to deduce behaviors of macroscopic systems from knowledge of microscopic properties, rather than by introducing advanced mathematical or physical complexity.

Course Structure:

Principles of Glaciology:
Unit 1 – Overview of the Cryosphere: what it is and how we observe it
Unit 2 – Ice formation and molecular structure/behavior
Unit 3 – Ice Dynamics
Unit 4 – Alpine and continental glacier systems

----- Midterm 1 ----- [Friday, November 9th 1:30-2:50 pm]

Special Topics in Glaciology:
Avalanches, Paleoclimate, Glacial Geology and Erosion, Sea Ice, Modern Change

----- Final Exam ----- [Monday, December 10th 2:30-4:20 pm]

Field Trip:
We plan a field trip to Easton Glacier on Mt. Baker on Saturday, October 13th. There will be a writing assignment associated with the field trip. If you are unable to go on the trip, it will be possible to do an alternative assignment; however, if you can possibly go on the field trip, this should be your preferred option.

Additional Comments:
The 431 course is designed for seniors with some math and science background, such as Physics 121/122. It should be well-suited for ESS Majors who have fulfilled their physics requirements, and for Atmospheric Sciences students pursuing the Climate track. Other undergraduates can do well in the class if they are comfortable with basic physics ideas such as heat conduction, vapor pressure, and forces. Please talk with me if you do not have the PHYS 121/122 prerequisites.

Graduate students take ESS505 because of an interest in ice in their research, or to fulfill the breadth requirement in the ESS graduate program. For all students, this course is a way to discover the range of UW faculty research interests in Glaciology.

Access and Accommodations:

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at:

011 Mary Gates Hall
uwdrs@uw.edu
206-543-8924 (Voice & Relay)
206-616-8379 (Fax)
disability.uw.edu.

DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

Plagiarism and academic misconduct:

At the University level, passing anyone else's scholarly work (which can include written material, exam answers, graphics or other images, and even ideas) as your own, without proper attribution, is considered academic misconduct. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect that you will know and follow the UW's policies on cheating and plagiarism. Any suspected cases of academic misconduct will be handled according to UW regulations. For more information, see the College of the Environment Academic Misconduct Policy and the UW Community Standards and Student Conduct website:

http://coenv.washington.edu/intranet/academics/academic-policies/academic-misconduct/.

Following a report of suspected misconduct, the instructor and/or T.A. will refer the matter to the College of the Environment's Dean's Office for review. A grade will not be assigned for the assignment or course until the investigation is concluded. If the student is found responsible for academic misconduct, a zero / no credit will be given for any assignments involving academic misconduct. All other course assignments will be evaluated and graded according to the expectations and grading method stated in the course syllabus. If the Dean's Office exonerates the student, the course instructor will reinstate the grade that the student would have received had the misconduct charge not been reported.

Other courses about ice and glaciers:
If you feel that you are not ready to take ESS 431, but you have an interest in glaciers and ice, you can also consider two other courses:

ESS 203, Glaciers and Global Change
Instructor: Nick Holschuh & Peter Neff, Earth and Space Sciences.
This course is designed for students without a science background who are interested in glaciers, how glaciers flow, how they advance and retreat as climate changes, and how information about past climates is recorded within the layers of polar glaciers and ice sheets.
ESS203 qualifies as a *Natural World* (NW) course, and as an *Individuals and Society* (I&S) course, with optional *Writing credit* (W).

ESS 302, Great Ice Age
Instructor: Terry Swanson, Earth and Space Sciences
This course is designed for students with at least one basic geology class in their background. It focuses on geological changes and the continental-scale ice sheets associated with the Pleistocene Ice Ages of the past two million years. ESS302 is also a *Natural World* (NW) course.