EARTH AND SPACE SCIENCES **Autumn 2019**
431 *PRINCIPLES OF GLACIOLOGY* 4 Credits, SLN 14993
505 *THE CRYOSPHERE* 4 Credits, SLN 15015

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

Week 1 –

W, 09/25 Unit 1	**Natural Occurrences of Ice:** Distribution and environmental factors of seasonal snow, sea ice, glaciers and permafrost	Christianson
F, 09/27	*Lab/Discussion – No Class*	

Week 2 –

M, 09/30 Unit 1	**Measuring Occurrences of Ice:** Observational techniques that help us understand the extent of the cryosphere	Christianson
W, 10/02 Unit 2	**Physical Properties of Ice:** Phase relationships, crystallography, basic properties	Christianson
F, 10/04	*Lab/Discussion*	Christianson/Hoffman

Week 3 –

M, 10/07 Unit 2	**Snow:** Formation in the atmosphere	Christianson
W, 10/09 Unit 2	**Accumulation:** Snow deposition, wind transport, metamorphism, physical properties	Christianson
F, 10/11	*Lab/Discussion*	Christianson/Hoffman

Week 4 –

M, 10/14 Unit 3	**Ablation:** Mass and energy budgets in the cryosphere	Christianson
W, 10/16 Unit 3	**Glacier Dynamics I:** Ice deformation	Huth
F, 10/18	*Lab/Discussion*	Huth/Waddington

Week 5 –

M, 10/21 Unit 3	**Glacier Dynamics II:** Sliding of glaciers and glacier basal processes	Hoffman
W, 10/23 Unit 3	**Glacier Dynamics III:** Temperature and heat flow in ice masses	Christianson
F, 10/25	*Lab/Discussion*	Christianson/Hoffman

Field Trip, Saturday, 10/26 – Mt. Baker

Week 6 –

M, 10/28 Unit 4	**Glacier Variations:** Response of glaciers to climate changes	Christianson
W, 10/30 Unit 4	**Ice Sheets, Ice Streams, Ice Shelves:** Ice-sheet structure and characteristics, ice-stream flow, ice shelves, and ice–ocean interactions	Christianson
F, 11/01	*Lab/Discussion*	Christianson/Hoffman

Week 7 –

M, 11/04 Unit 4	**Glacier Instabilities:** Surging glaciers, tidewater glacier cycles, marine ice-sheet and ice-cliff instabilities	Christianson
W, 11/06 Unit 4	**Recent Changes in Ice Sheets:** Elevation changes, retreat of ice shelves, speedup of outlet glaciers, sea-level change	Christianson
F, 11/08	**MIDTERM EXAM**	Christianson

Week 8 –

M, 11/11	**VETERANS DAY**	
W, 11/13	**Paleoclimate and Ice Ages I:** Ice cores and past climate	Steig
F, 11/15	**Midterm Review** *& Lab/Discussion*	Huth

Week 9 –

M, 11/18	**Paleoclimate and Ice Ages II:** Theories of ice-age cycles	Steig
W, 11/20	**Paleoclimate and Ice Ages III:** Reconstruction of former glaciers	Spector
F, 11/22	*Lab/Discussion*	Huth/Spector

Week 10 –

M, 11/25	**Sea Ice I:** Formation, structure, and relation to the climate	Light
W, 11/27	**Sea Ice II:** Dynamics and thermodynamics	Light
F, 11/29	**THANKSGIVING**	

Week 11 –

M, 12/02	**Glacial Erosion:** Abrasion, quarrying, subglacial fluvial processes, and chemical denudation	Hallet
W, 12/04	**Permafrost:** Distribution, relationship to climate, physical processes and structure/engineering problems	Hallet
F, 12/06	*Graduate Student Presentations*	Waddington/Huth

FINAL EXAM
Monday, December 9th 2:30-4:20