

**EARTH & SPACE SCIENCES 211**  
**PHYSICAL PROCESSES OF THE EARTH**  
Autumn Quarter 2018

Welcome to ESS 211, the first in a series of three courses in the core of our undergraduate curriculum. As you can tell from the title, the aim of the course is to show how the earth's surface and outer crust are physically shaped and modified, concentrating on the processes at work. In this way, the course will serve as an introduction to the disciplines of *geomorphology*—the study of the evolution of landforms and the Earth's surface—and of *structural geology and tectonics*—the study of how rocks on all scales, from an outcrop to a mountain range, are deformed. We realize that for many of you, this class will be your first in university-level Earth science, so we will begin the course with a summary of the Earth's overall structure and composition.

ESS 211 serves students with diverse goals and interests. It is part of the core curriculum required for majors in Earth & Space Sciences, and as such it prepares majors for more advanced courses in geodynamics, geomorphology, and structure and tectonics. The course also constitutes one of the requirements for the ESS minor. Students from other majors can elect part or all of the core series—ESS 211, 212, 213—if they wish to learn the fundamentals of solid-earth science.

**INSTRUCTIONAL STAFF**

Two professors will jointly teach the lectures:

Prof. Kate Huntington  
Johnson 353    543-1750  
[kate1@uw.edu](mailto:kate1@uw.edu)

Prof. John Stone  
Johnson 345    221-6332  
[stn@uw.edu](mailto:stn@uw.edu)

Teaching assistants for labs:

Julia Kelson, JHN 362, [jrkelson@uw.edu](mailto:jrkelson@uw.edu)

Lindsey Davidge, JHN 323, [ldavidge@uw.edu](mailto:ldavidge@uw.edu)

**CLASS SCHEDULE**

Lecture	10:30 – 11:20	M W F	JHN 075
Lab AA	9:30-11:20	T Th	JHN 011
Lab AB	11:30-1:20	MW	JHN 011
Lab AC	1:30-3:20	MW	JHN 011
Lab AD	3:30-5:20	T Th	JHN 011

**COURSE ANNOUNCEMENTS VIA EMAIL** Important course announcements will be sent via email using the “Announcement” feature in Canvas. Check your Canvas settings to confirm you are receiving these Announcements.

**LAPTOP AND MOBILE COMMUNICATION DEVICE USE** Students are permitted to use computers during class for note-taking and other class-related work only. Students using laptops must sit in the front half of the lecture hall. Those using computers during class

for work/activities not related to ESS 211 must leave the classroom. The use of cell phones, smart phones, or other mobile communications devices is disruptive. Except in emergencies, those using such devices (including for texting) must leave the classroom.

**TEXTBOOK** Although there is no required text, we suggest you “rent” student access to *Processes in Structural Geology and Tectonics* by van der Pluijm and Marshak for \$10 (<http://psgt.earth.lsa.umich.edu/>). You may wish to consult any well-illustrated, introductory earth-sciences text, such as *Geology* by Chernicoff and Whitney, or *Earth: Portrait of a Planet*, by Marshak for reading that supports some, but not all, of the topics covered in lectures. If you think that you may continue with course work in surface processes & geomorphology, we recommend you invest in a new text: Bierman & Montgomery, *Key Concepts in Geomorphology*, [W.H. Freeman & co.].

We may assemble printed materials that we will hand out in lecture. It is essential that you bring these packs to lecture and lab. They can also be found, along with all PowerPoints and images shown in class, posted in the weekly modules on Canvas.

Your lecture notes and documents posted on Canvas are the best place to review important concepts, such as the idea that many processes are governed by the same types of equations (e.g., topographic diffusion, heat conduction), or the idea that an understanding of pressure gradients, and shear and normal stresses can be applied to many processes (e.g., shallow landsliding, fault failure, ice flow). All lectures are recorded by Panopto video, accessible on Canvas.

**EXAMS AND GRADING POLICY** Exams will emphasize concepts and problem solving related to material presented in lectures and laboratory exercises. The final exam will be comprehensive, but it will deal primarily with material covered after the mid-term exam.

We regularly post Practice Problems and Questions, along with solutions/hints to most of them, under Lecture Materials on Canvas. The best way to be successful in this course is to actively participate in all lectures and labs, and to work through the relevant problems each week. Study groups are highly encouraged!

In-class midterm prep #1	8 Oct 10:30-11:20	JHN 075
Mid-term examination	2 Nov 10:30-11:20	KNE 110, 25% of your grade
Final examination	11 Dec 8:30-10:20	JHN 075/NAN181, 35% of your grade
Laboratory (including pre-lab quizzes)		JHN 011/JHN 366, 40% of your grade

**PREREQUISITE** The prerequisite for this course is PHYS 114 or 121, Mechanics. PHYS 121 requires previous or concurrent enrollment in MATH 124, Calculus.

**FIELD TRIP** To illustrate material covered in class and introduce you to field geology, we will run a voluntary weekend trip to the Columbia Plateau. It will depart on Saturday

morning, **October 6**, at 8 a.m. and return to Seattle late on Sunday afternoon, **October 7**. We will camp at Sun Lakes State Park, near Coulee City and Dry Falls. All class members are welcome to participate, and no experience with geoscience or camping is necessary. More details about the trip will be given in class, and on Canvas under [Field Trip Info](#).

**LABS** The labs begin on **Monday, October 1**, during the **second** week of classes. Labs **do not meet** during week 1 (September 26-28). Many labs will require you to work in pairs or small groups, but the work you ultimately hand in *must be your own individual effort*. Lecture and lab material are complementary. *Skills and content from BOTH lecture and lab will be on the midterm and final exams.*

**Bring the following to each lab:** pencils, eraser, straightedge, protractor, a few sheets of tracing paper. For the map interpretation and cross-section labs, you will also need colored pencils.

**ACADEMIC CONDUCT** 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, which require immediate reporting to the College of the Environment. For more information, see the College of the Environment Academic Misconduct Policy and the UW Community Standards and Student Conduct website. Please see the [Academic Conduct](#) webpage on Canvas for more information.

**ACCESS & ACCOMMODATIONS** Your experience in this class is important to us, and it is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you anticipate or experience barriers in this course to your learning or full participation based on disability, you are welcome to meet with your instructors to discuss options. Please see the [Access and Accommodations](#) webpage on Canvas for more information.

**DIVERSITY & INCLUSION** Increasing diversity in scientific professions is important to us! Your instructors are involved in a variety of educational outreach activities to increase diversity in science, and we invite you to get involved.

### Provisional Schedule (subject to change)

	Lecture topic	Lab topic
Week 0	Introduction to structural geology and geomorphology	NO LAB
	Earth composition and structure	NO LAB
Week 1	Density and lithostatic stress	Day 1: plate tectonics (JHN 011)
	Isostasy	Day 2: Gasworks park (field trip)
	Thermal gradients	
Oct 6-7	Optional <b>FIELD TRIP</b> to eastern Washington Camp at Sun Lakes State Park	
Week 2	<b>Oct 8, in-class practice midterm problems</b>	Day 1: Topographic maps (JHN 011)
	Structural geology	Day 2: Strike and dip (TBA)
	Faults, separation and slip	
Week 3	Stress, strain, structures	Day 1: Geometric principles (JHN 011)
	Separation and slip	Day 2: Geometric principles (JHN 011)
	Faults and geologic maps	
Week 4	Faults	Day 1: Geologic maps (JHN 011)
	Thrust faults, folds, geologic maps	Day 2: Geologic maps (JHN 011)
	Coulomb equation	
Week 5	Coulomb equation, critical wedge	Day 1: Cross sections (JHN 011)
31-Oct	<b>In-class review for midterm</b>	Day 2: cross sections (JHN 011)
2-Nov	<b>MIDTERM EXAM</b> *** NOTE LOCATION KNE 110***	
Week 6	Geomorphology	Day 1: Cross sections (JHN 011)
	Weathering	Day 2: Google Earth (JHN 366)
	Slope stability	
Week 7	NO CLASS VETERAN'S DAY	Day 1: NO LAB
	Slope stability	Day 2: Google Earth (JHN 366)
	Hillslope diffusion	
Week 8	Hydrology and groundwater, Darcy's law	Day 1: Hillslope (JHN 011 and OUTDOORS)
	Groundwater	Day 2: NO LAB
	NO CLASS THANKSGIVING	
Week 9	Rivers, laminar and turbulent flow	Day 1: Hillslope diffusion (TBA)
	Rivers, sediment transport	Day 2: Hillslope/Rivers (TBA)
	Ice sheets, glaciers	
Week 10	Ice sheets, glaciers	Day 1: Rivers and Watersheds
	<b>Wrap up and review geomorphology</b>	Day 2: Landscape Evolution (JHN 366)
	<b>In-class final preparation, course evaluations</b>	
10-Dec	<b>FINAL EXAM</b> *** NOTE half of class in JHN 075, half in NAN 181 ***	

Course information, lecture materials, lab materials and quizzes will be updated continually on the **Modules** page in Canvas.