

EART 140 Geomorphology



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Course overview:

From the NRC report Landscapes on the Edge: New Horizons for Research on Earth's Surface (Pg. 18): "Earth's surface is a dynamic interface across which the atmosphere, water, biota, and tectonics interact to transform rock into landscapes with distinctive features crucial to the function and existence of water resources, natural hazards, climate, biogeochemical cycles, and life. Interacting physical, chemical, biotic, and human processes — 'Earth surface processes' — alter and reshape Earth's surface on spatial scales that range from those of atomic particles to continents and over time scales that operate from nanoseconds to millions of years.

In this class, we will study many of the 'Earth surface processes' that govern landscape evolution. Our mantra will be "process from form." That is, the form of a landscape can provide insight into the physical processes responsible for its creation. Specifically, we will study river, hillslope, glacier, and coastal processes.

Learning Outcomes

1. Understand the processes that govern the form and evolution of river networks, hillslopes, coastlines, and glaciated mountains.
2. Utilize principles of physics and mass conservation to quantitatively link landscape process and landscape form
3. Collect field data in order to test scientific hypotheses. Present this analysis in a clear, organized, and logical fashion

Instructor: Noah Finnegan

Contact Info: Office: E&MS A115, email: nfinnega@ucsc.edu

Office Hours in EMS A142: Tuesday & Thursday, 9:30 AM – 10:30 AM or by appointment (email please). Feel free to come as a group to office hours.

Lectures: T/Th 1:30 – 3:05 PM, E&MS D258

Teaching Assistants:

Colleen Murphy, cormurph@ucsc.edu, office hours: TBD

Nick Mason, niamason@ucsc.edu, office hours: TBD

Lab 1: Wednesday, 9:00 AM – 12:00 AM, EMS D258

Lab 2: Wednesday, 1:00 PM – 4:00 PM, EMS D258

Text: R.S. Anderson and S.P. Anderson: The Mechanics and Chemistry of Landscapes; Notes posted by instructor

Evaluation/Assignments:

- 7 lab exercises
 - 2 Reports Based on Field Trips (1/19/19, 2/9/19)
 - Open Book, Open Notes Take Home Mid-Term
 - Open Book, Open Notes, Take Home Final
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Grading

Labs and problem sets can and should be done together in groups. Although I encourage you to discuss together the data collected during the weekend field trips I expect that you will ultimately work alone in actually drafting the scientific reports. If you collaborate on the writing of a scientific report with another person, you will both receive no credit for the report. I will give you very specific objectives for the reports when I assign them.

The weighting of the assignments for the 5 credit lecture is as follows

Report 1 – 30%

Report 2 – 30% *

*Together Reports 1 and 2 constitute 1/2 of the UCSC disciplinary writing requirement

Mid-Term – 15%

Open Notes, Open Book, Take Home Final – 25%

Your lab grade will be separate from the lecture.

Late Policy: 5 % will be deducted for every day after the due date that an assignment or lab is turned in.

Attendance Policy: You are responsible for the material that is presented in class every day. It is in your best interest to attend class. I will not take attendance. However, it is VERY unlikely that you will be able to pass this course without attending the lectures. If you miss a class, please make arrangements to get a copy of lecture notes from a friend.

Distribution of Readings and Course Materials

For the reports, labs, and lectures I will periodically post materials on Canvas. Power points and lecture notes will be posted prior to each lecture on Canvas.

Course Schedule and Reading Assignments

Week 1

1/7/20 Lecture 1. Syllabus overview, class pictures, why geomorphology?
Classical views of Geomorphology, review of mass conservation.

Lab 1: Excel Basics

1/9/20 Lecture 2. Precipitation, Runoff and Hydrographs

Reading For Class: Chapter 11, stop at equation 11.38 and skip groundwater

section

Week 2

1/14/20 Lecture 3. Alluvial Rivers I

Reading For Class: 395-408

Lab 2: Precipitation and Channel Flow on Titan; Surveying Basics, Quantifying Grain Size in a River,

1/16/20 Lecture 4. Alluvial Rivers II, Effective Report Writing, **Report 1 Assigned**

Reading For Class: TBD

**1/18/20 Mandatory Fieldtrip 1, San Lorenzo River Valley (8 AM-6 PM),
Meet at E&MS Loading Dock at 8 AM. Rain or Shine. *Bring: Warm
Clothes, Rain Gear, Food, Water, and a field notebook.***

Week 3:

1/21/20. Lecture 5. Planform Morphology of Rivers, Alluvial Fans, Floodplains, and Deltas

Reading: TBD

Lab 3: Data Assimilation and Processing for Report 1

1/23/20 Lecture 6. Weathering, Soil Production, and the Critical Zone;

Due in Class: Introduction to Report (1 Page)

Reading For Class: Chapter 7

Week 4

1/28/20 Lecture 7. Hillslopes

Reading For Class: Chapter 10 through page 328,

Lab 4: Hillslope Sediment Transport; **Due in Lab: Results for Report 1 (~ 3 Pages)**

1/30/20 Lecture 8. Landslides and Mass-wasting

Reading For Class: 330-335 .

Week 5

2/4/20 Lecture 9. Landslides and Mass-wasting II

Reading For Class: Chapter 8,

Mid-Term Exam Passed Out

Due in Class: Discussion and Conclusion for Report 1 (~ 3 Pages)

Lab 5: Glacial Geomorphology and Mechanics

2/6/20 Lecture 10. Glaciers I

2/7/20: **Mid-Term Exam Due in My Mailbox or Office by 3:30 PM**

2/8/20 Mandatory Fieldtrip 2, Sunol Ohlone Regional Wilderness (8 AM-6 PM), Meet at E&MS Loading Dock at 8 AM. Rain or Shine.

Reading For Fieldtrip TBD

Week 6

2/11/20 Lecture 10. Glaciers II.

Reading For Class: Chapter 8

Due in Class: Introduction to Report 2 (1 Page)

Lab 6: Work on Data Analysis for Report 2

2/13/20 Lecture 11.

TBD

Week 7

2/18/20 Lecture 12. Tectonic Geomorphology II – Bedrock River Channels

Reading for Class: Chapter 13

Lab 7: Climate, Tectonics and the Morphology of the Andes

Due in Lab: Results for Report 2 (~ 3 Pages)

2/20/20 Lecture 13., Whole Landscapes I: Coupling of Hillslope and Channel Processes

Week 8

2/25/20 Lecture 14. Geochronology and Geomorphology I.

Reading For Class: Chapter 6

Lab 8: Tectonics, Topography, and Bedrock River Profiles

2/27/20 Lecture 15. Geochronology and Geomorphology II,

Reading For Class: Chapter 6

Due in Class: Discussion and Conclusion for Report 2 (~ 3 Pages)

Week 9:

3/4/20 Lecture 16. Coastal Processes

Chapter 16

Lab 9: Santa Cruz Marine Terraces

3/6/20 Lecture 17. Coastal Processes cont. / Geomorphology and Tectonics of Santa Cruz

Reading TBD

Week 10:

3/11/20 Lecture 18. Eco-geomorphology

Lab 10: No Lab

3/13/20 Review For Final

Take Home Final Posted

3/20/20, 3 PM, Take Home Final due in my office (A115) or in my mailbox in the department office