

Syllabus

Course information

Lectures: Mondays and Wednesdays, 4:30-5:45 pm, ES&T L1116

Labs: Wednesdays, 11 am – 2 pm, ES&T L1114

Course instructors

Professor: Ken Ferrier

Office: ES&T 3244

Office hours: Mon. 11-12:30, Wed. 3-4

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TA: Amelia Winner

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Office hours: Mon./Tues./Thurs. 2-3 pm

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Course overview: Quantitative overview of the mechanical, chemical, and biological processes that shape topography, including river incision, glacial erosion, regolith development, soil transport, tectonic uplift, planetary surface processes, and channel network evolution.

Course goal and description: Landscapes are one of the most accessible and striking parts of a planet's geologic record. Because we live on Earth's surface, landscapes and the forces that shape them are also of considerable societal relevance. This course introduces students to the quantitative study of processes that shape Earth's surface. We will use a combination of theory and field observations to investigate major components of continental geomorphic systems, including hillslopes, rivers, and glaciers. Our ultimate goal will be to understand how the major factors that shape Earth's surface – tectonics, climate, and life – create the landscapes we observe. The course is designed to be accessible to graduate and advanced undergraduate students from a range of disciplines, including geoscience, engineering, environmental science and planning, and ecology. As such, we do not assume an extensive geology background. The only requirements are proficiency in mechanics, a basic familiarity with calculus and differential equations, and a willingness to roll up your sleeves and make some measurements.

Prerequisites: Familiarity with the fundamentals of mechanics and calculus are needed for this class. Familiarity with basic geologic principles will be helpful, but not necessary, as this class focuses on physical principles rather than geologic history. Courses that fulfill these requirements include EAS 2600 and PHYS 2211. Students with questions are encouraged to contact the instructor.

Recommended textbook: Anderson and Anderson, *Geomorphology: The Mechanics and Chemistry of Landscapes*, Cambridge University Press, 1st edition.

Grades: Grades will be based entirely on labs. Graduate students will be required to answer additional questions on each lab.

Lab 1: Glaciers (30%)

Lab 2: Alluvial rivers and flood frequency (20%)

Lab 3: Hillslope evolution (20%)

Lab 4: Bedrock rivers and Southern Appalachians (30%)

Grading scale: >90% = A, 80-89% = B, 70-79% = C, 60-69% = D, <60% = F.

Extra credit is not offered. An unexcused grade of zero on any lab will result in a final course grade of F. Requests to adjust lab grades must be resolved with 14 days of the due date of the lab.

Learning objectives: Upon completion of this course, students will be able to:

1. Determine the dominant geomorphic processes shaping topography.
2. Apply mathematical laws for mass transport that govern topographic evolution.
3. Write scientific reports in the form of a short journal article.

Important dates: Saturday, January 30 (Field trip #1)
Friday-Sunday, April 1-3 (Field trip #2)

All field trips are mandatory. Some labs require analyzing measurements you make during these field trips, and so will require your participation in the field.

Labs are due at the beginning of lab period on the given date.

Due dates: Lab 1: February 10, 11 am
Lab 2: March 2, 11 am
Lab 3: March 30, 11 am
Lab 4: May 4, 11 am

T-square: Announcements, lecture slides, upcoming labs, and grades will be posted on T-square.

Academic integrity: The instructors and students are bound by the Georgia Tech honor code (<http://honor.gatech.edu/content/2/the-honor-code>). Most importantly, during the preparation of lab materials, students are encouraged to collaborate with their fellow students, but the labs must be written up on your own. No copying.

Excused absences: You may be excused from labs or field trips for valid reasons, such as illness, job interviews, etc. However, you must obtain the appropriate approval and you must provide documentation for the absence. For example, if you have a job interview, you must send the professor a copy of the invitation for the interview along with your request to be excused. In all cases the absence can only be excused within two weeks of its occurrence. Note also that it is always easier to obtain approval in advance. The Institute Absence policy is available at: www.catalog.gatech.edu/rules/4/

Learning accommodations: If you are a student with a documented short-term or permanent disability seeking reasonable accommodations in this course, please

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contact The Office of Disability Services (disabilityservices.gatech.edu). Advance notice and appropriate documentation are required for accommodations.

Schedule

Date	Lecture topics	Reading	Labs
Jan. 11	Introduction, Glaciers I	Gilbert, 1877, Ch. V	
Jan. 13	Glaciers II	Ch. 1, 8, 9, Appendices	Lab 1: Glaciers
Jan. 18	<i>No class – MLK Jr. Day</i>		
Jan. 20	Alluvial channels	Ch. 12	Lab 1: Glaciers
Jan. 25	Flow mechanics I		
Jan. 27	Flow mechanics II		Lab 1: Glaciers
Jan. 30	(Saturday) Panola State Park field trip		
Feb. 1	Meanders		
Feb. 3	Sediment transport I	Ch. 14	Lab 1: Glaciers
Feb. 8	Sediment transport II		
Feb. 10	Alluvial longitudinal profiles		Lab 1 report due (30%) Lab 2: Rivers
Feb. 15	Bedrock channels I	Ch. 13	
Feb. 17	Bedrock channels II		Lab 2: Rivers
Feb. 22	Hillslopes I	Ch. 10	
Feb. 24	Hillslopes II		Lab 2: Rivers
Feb. 29	Hillslopes III		
Mar. 2	Landslides		Lab 2 report due (20%) Lab 3: Hillslopes
Mar. 7	Debris flows		
Mar. 9	Landscape evolution I	Ch. 18	Lab 3: Hillslopes
Mar. 14	Landscape evolution II		
Mar. 16	Channel networks		Lab 3: Hillslopes
Mar. 21	<i>No class – spring break</i>		
Mar. 23	<i>No class – spring break</i>		
Mar. 28	Tectonic geomorphology		
Mar. 30	Weathering and soils		Lab 3 report due (20%) Lab 4: Bedrock channels
Apr. 1-3	(Friday-Sunday) Southern Appalachians field trip		
Apr. 4	<i>No class – post-trip recovery</i>		
Apr. 6	Chronologic methods	Ch. 6	Lab 4: Bedrock channels
Apr. 11	Large scale topography		
Apr. 13	Island landscapes		Lab 4: Bedrock channels
Apr. 18	Topography and life		
Apr. 20	Sea level		Lab 4: Bedrock channels
Apr. 25	Planetary geomorphology		
Apr. 27	<i>No class – reading period</i>		
May 2	<i>No class – exam week</i>		
May 4			Lab 4 report due (30%)

* Unless otherwise noted, readings refer to chapters in Anderson & Anderson.