

GY320: Surface Processes and Geomorphology

Block 1, 2009



Dolomite Peak, Canadian Rockies

Course Information

Professor:

Eric Leonard

Office: Palmer 9C, x6513

Email: eleonard@coloradocollege.edu

Paraprofessionals:

Dan Woodell

Office: Palmer 9H, x6515

Email: daniel.woodell@coloradocollege.edu

This course is a one-block introduction to geomorphology -- the study of earth-surface processes and landforms. The course will emphasize physical and chemical *processes* acting at the earth surface, but we will also spend time looking at and interpreting landforms and landscapes in the lab and the field. Perhaps the most exciting development in geomorphology over the last decades have been a revival of interest in understanding the long-term evolution of landscapes, making use of all sorts of new analytical and computational tools, and an emerging appreciation of the complex feedback relationships between tectonics, climate, and erosion, topics we will take up towards the end of the course. My goal in teaching this course is to give a background in the fundamental elements of geomorphology that are necessary for reading landscapes and making these large-scale connections. In the course we will cover:

- Weathering Process and Soils
- Hillslopes: Mass Movement Processes, Slope Morphology/ Evolution
- Drainage Basins: Hydrology and Floods
- Fluvial Processes: River Mechanics, Sediment Transport, Channel Morphology, Fluvial Landforms
- Tectonic Geomorphology and Landscape Evolution Models
- We will also cover aspects of glacial and periglacial geomorphology, largely in the field

The course subject matter is geomorphology, but we will also work on research design, sampling methodologies, data collection and analysis, and reading and writing of scientific papers. We will work with several modern field instruments and Geographical Information Systems (GIS) computer programs. We will introduce this material in the context of geomorphology, but much of it should be useful in other aspects of geology, and beyond geology.

Class Schedule

When on campus we will meet each morning in Palmer 15 at 9:00 AM and continue until 11:30-12:00. Most afternoons will involve field or lab work and we will meet at 1:15 except as noted on the schedule. There will be two overnight field trips (September 3-4 and 17-18), and several half-day trips.

Readings

Course Text: Process Geomorphology, 4th edition, Ritter, Kochel and Miller, Waveland Press 2006 (ISBN 13: 978-1-57766-461-1).

Other assigned readings will be handed out in class or posted at PDFs. Below is list of supplementary texts that may be of some use and will be available in the classroom.

- Benn and Evans – *Glaciers and Glaciation*
- Birkeland – *Soils and Geomorphology*
- Bloom – *Geomorphology*
- Burbank and Anderson – *Tectonic Geomorphology*
- Knighton – *Fluvial Forms & Processes*
- Selby – *Hillslope Materials and Processes*
- Summerfield – *Global Geomorphology*
- Walker – *Quaternary Dating Methods*

Evaluation

Grades will be based on problems sets, laboratory and field work write ups, two quizzes, one exam, and class participation. Below are the **approximate** weightings, which will undoubtedly change as weather, instrument and computer glitches, etc. may keep us from finishing some projects.

Small assignments (4)*	10% (3% or fewer each)
Problem sets (2)	8%
Four Mile/Horseshoe Cirque Project	10%
Fountain Creek Project	10%
Sangre de Cristo GIS Project	10%
Arkansas R. Valley Project	12%
Quizzes (2)	15%
Final exam	20%
Class Participation	5%
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100%	

* Field sketches, Intro GIS lab, reading discussion

Note on quizzes and exam – Both quizzes will be closed book/closed notes. The final exam will be closed book, but you may use your class notes, your own project write-ups, etc. On the final you may use only material that you yourself wrote or word-processed. The only exceptions to this are that you may use your group write-ups of group projects and that you may use items that I handed out during class.

Field and Lab Supplies

For fieldwork you will need a hand lens, field notebook, mechanical pencil (*not* a pen), and a clipboard or map board. A hammer, a trowel, and an old pocketknife would also be helpful, if not essential. For lab work you will need a scientific calculator, tracing paper, a few colored pencils, and a plastic ruler marked in tenths of inches and millimeters. The ruler may be helpful in the field too, if you can avoid losing it.

For our overnight field trip you will need normal camping gear (tent, sleeping bag, pad, warm clothes, raingear, boots, day pack, water bottles). We will arrange food as a group.

Honor Code

Students in GY320 are expected to uphold and adhere to the Colorado College Honor Code, in every respect. Your responsibilities include, but are not limited to, doing all of your own work on quizzes, exams, lab exercises, and papers, unless the instructions state otherwise for group activities and projects (such as group data collection, analysis and presentation). You may not use any material from previous versions of this class. In addition you must take care to acknowledge all sources of information you use in reports and write-ups (print literature; internet; and other). Please see <http://www.coloradocollege.edu/academics/honorcode.asp> to acquaint yourself with the Constitution of the Honor Code. It is your responsibility to understand the terms of the Honor Code and to clarify ambiguous situations if they arise. If you aren't sure, please ask me.

Use of internet sources for research and reading is encouraged; however, students must take extreme care not to plagiarize and to credit scrupulously all internet sources with clear and obvious citations, for diagrams and textual materials. To avoid plagiarism, present material learned from electronic sources in your own words, and cite the source of the material.

Disability Accommodation

If you have a disability and require accommodations for this course, please speak with me as soon as possible so that your needs may be appropriately met. If you have not already done so, you will need to register with Disability Services (Learning Commons at Tutt Library, Room 152, 227-8285), the office responsible for coordinating accommodations and services for students with disabilities.

Additional Student Resources at Colorado College

Quantitative Reasoning Center: *“tutoring to help students improve their quantitative and problem solving skills...”*

- More information and a list of drop-in tutoring hours can be found at:
 - <http://www.coloradocollege.edu/learningcommons/academicsupport/qr.asp>

Writing Center: *“work through your writing process at any stage...”*

- More information and list of tutoring hours can be found at:
 - <http://www.coloradocollege.edu/learningcommons/writingcenter/index.asp>

GY 320 -- SURFICIAL PROCESSES AND GEOMORPHOLOGY -- BLOCK 1, 2009

DAY	MORNING 9:00 unless otherwise noted	AFTERNOON 1:15 unless otherwise noted	READING in Ritter unless otherwise noted
Mon 8/31	10:30 Course introduction	1:00: FIELD – Cheyenne Canyon, Mesa Road	
Tues 9/1	Weathering/soils I	Lab: Air photo introduction Handout slope stability problems	For class: 43-58, 80-92 For lab: Chapter 10
Wed 9/2	Mass movement I: Slope mechanics, falls, slides	Lab: Four Mile/Horseshoe Cirque project Complete slope stability problems	92-125
Thur 9/3	Mass movement II: creep and flow	1:00 FIELD– Four Mile/Horseshoe Cirque field trip (overnight)	Field Trip Readings: Chapter 11
Fri 9/4	IN FIELD Four Mile/Horseshoe Cirque (return about 5:30 PM)		Meierding & Birkeland, 1980 Pierce, 2004
Mon 9/7	QUIZ – Weathering/Mass movement 10:00 Class – Slopes and drainage basins: runoff generation, hydrographs	Complete Four Mile/Horseshoe Cirque projects	125-133, 135-173
Tues 9/8	Fluvial geomorphology: - Open channel flow, sediment transport	Lab: GIS/DEM introduction Flow hydraulics warm-up problems	190-200
Wed 9/9	Fluvial geomorphology: Alluvial and bedrock channels	1:00 FIELD: Fountain Creek project	200-225
Thur 9/10	8:30 FIELD: Fountain Creek project	Lab: Fountain Creek flood frequency analysis and air photo interpretation	For lab: review 165-173
Fri 9/11	Fluvial geomorphology: Fluvial landforms, fluvial adjustment to changing conditions	Work on Fountain Creek project	225-231, Chapter 7
Mon 9/14	QUIZ -- Hillslopes/Fluvial Geomorphology 10:00 Class -- local terrace sequence and soil chronosequences	1:00 Field Trip: Terrace soils	58-78,242-248,259-264
Tues 9/15	Tectonic geomorphology	Lab: Sangre de Cristo GIS project	Ch 2
Wed 9/16	Landscape evolution/Cenozoic geomorphic evolution of the Rocky Mountain region	Lab: Sangre de Cristo GIS project continuation	Ritter 173-187; Summerfield 457-468. Rocky Mountain readings -- TBA
Thur 9/17	7:30 FIELD TRIP - Upper Arkansas River Valley (overnight)		Leonard et al.1-5
Fri 9/18	FIELD TRIP - Upper Arkansas River Valley (return about 5:30 PM)		
Mon 9/21	Work on Arkansas Valley Projects	Group Presentations - Arkansas Valley Project, then work on project write-up	
Tues 9/22	Human as geomorphic agents – readings/presentations	5:00 -- Arkansas Valley projects due	TBA
Wed 9/23	FINAL EXAM		

PROJECTS AND DUE DATES

Local field trip sketches – Due Tuesday 9/1 at 9:00 AM

Slope stability problems – Due Thursday 9/3 at 9:00 AM

4 Mile/Horseshoe Cirque

Rough maps must be completed before we leave for the field on Thursday 9/3 at 1:00 PM

Final maps and map write up – Due Tuesday 9/8 at 9:00 AM

Field project write-up – Due Friday 9/11 at 9:00 AM

Intro GIS lab – Due Tuesday 9/8 on leaving lab

Flow hydraulics warm-up problems – Due Wednesday 9/9 at 1:00 PM

Fountain Creek write up – Due Monday 9/14 at 9:00 AM

Terrace and soils sketches – Due Wednesday 9/16 at 9:00 AM

Sangre de Cristo GIS project – Due Thursday 9/17 at 9:00 AM

Upper Arkansas Valley Projects

Group talks with appropriate visual aids – Monday 9/21 at 1:00 PM

Individual write ups – Due Tuesday 9/25 at 3:00 PM

QUIZES AND EXAM

Quiz I (closed book/closed notes) – Monday 9/7, 9:00-10:00

Quiz II (closed book/closed notes) – Monday 9/14, 9:00-10:00

Final Exam (closed book/open notes) – Wednesday 9/23