

## ***GY250 - Studies in Geology: Hydrology***

Colorado College, Block 6, Spring2013

### ***HYDROLOGY IN ACTION!!!***

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### ***COURSE DESCRIPTION***

This GY250 is course is an introductory hydrology course with a strong emphasis on experiential, field-based learning. This course provides an introduction to hydrologic concepts, field methods, and quantitative analyses. This will be a project-based course that will explore water in its many forms; focusing on the science of how it moves between our atmosphere, snowpack, streams, soils, aquifers, and human systems. Students will be evaluated on the basis of their ability to observe, analyze and interpret hydrology in the field, as well as creatively construct independent hydrology projects that have both a strong conceptual (scientific) and applied (social) components. Secondarily, traditional tests on classroom-based material will evaluate process-based and methodological understanding. The course is designed to build practical skills in practice of the scientific method, critical thinking, and quantitative analysis.

As usual at CC, we also emphasize interdisciplinary learning on these trips and we will meet with a diversity of water users and professional hydrologists from the public and private sector in both research-based and applied hydrologic fields. Such interconnectedness is crucial to the understanding of hydrologic systems, and will be useful for students pursuing degrees in any of the natural sciences and/or environmental studies. The bulk of the class will take place on field trips, with some in-the-building lecture/lab support.

### ***COURSE OBJECTIVES***

- **to provide an introduction to the hydrology of our region and world, including the impacts of human alterations to the water cycle**
- **to practice the use of the Scientific Method, critical thinking, and quantitative analysis**
- **to sharpen oral and written communication skills**
- **to understand basic processes within the water sciences**
- **to delve into concepts of the water cycle, and learn specific of each component**
- **to introduce a range of hydrology professions and provide students an idea of career paths**
- **to improve field-based observational and measurement skills in hydrology**

## ***COURSE DETAILS***

### **Assessment & Grading**

The grade for GY250 is based upon:

Daily Assignments	10%
Participation (Active and Engaged!)	10%
Learning Parties (Quizzes)	10%
Celebration of Knowledge (Exam)	20%
Final Hydrologic Research Proposal	50%

### ***What is meant by participation?***

Obviously to get any participation points you must attend (**and attendance on the field trips is necessary for a passing grade!**). However, mere attendance is not enough. I expect that you will come to class prepared and ready to actively participate (ask and answer questions). You need to be actively involved in hypothesis development and testing, particularly when developing questions at the numerous field sites we will visit. If you are unable to attend any part of the class, obtain permission beforehand.

### **Field Trips**

On the field trips be prepared for the weather and terrain. This course offers unique options for backcountry exposure to geologic learning opportunities; because of this backcountry nature increased risk is inherent. To mitigate this increased risk we will have multiple Wilderness First Responders and we will be acquiring detailed medical information from all students to ensure rapid support in case of injury or illness. We will be using Colorado College vehicles to transport students. Because parking is limited at many of the planned field trip stops, **you will not be permitted to drive personal vehicles on the field trips.**

Supplies, clothing, and field expectations/concerns will be discussed in detail the first day of class. Since the majority of the course is off-campus, below is a detailed packing list of required and suggested items for students, the better prepared you are, the more comfortable you will be under the range of weather possible. Additionally, besides personal clothing, **each student will be expected to acquire the following** geo-specific field equipment from the bookstore or paraprof (hand lens, acid bottle, ruler):

- Field notebook (size ~**5x8** inches)
- Colored pencils (at least a few colors; e.g. red, blue, green, brown)
- Fine-tipped felt marker (e.g. fine-tipped *Sharpie*)
- Protractor/small ruler
- Clipboard/map board
- Calculator (trigonometry-capable, most phones provide this)

We will be in the field for much of the course. **For any conflicts related to meetings (i.e. family, religious holidays, or medical reasons)—see me!**

### **Detailed Packing List**

\*If you aren't able to acquire these required items, they are available for rent from the CC Gear House:  
<http://www.coloradocollege.edu/offices/outdooreducation/get-involved/ahlberg-gear-house/>

General gear:

- Sleeping bag\*
- Large daypack\* (we will have several backcountry daytrips, and with the winter weather it is important to have space for EXTRA LAYERS...oh, and SNACKS!!!)

Clothing:

- Synthetic base-layer, long pants and long sleeved shirt
- Water-resistant outdoorwear (snow pants/bibs, ski-jacket/rain-jacket)

- Field boots—**snow-worthy**
- **Gators...or some way to keep the snow out of your boots! Could be some deep snow up high!**
- **Suggested: Rain-boots or waders (for going in those lil' streams!)**
- Non-field footwear; (while your boots are drying off at night)
- Many pairs of socks
- T-shirts and extra base-layers (so you don't lose friends, no one likes the stinky kid!)
- Shorts (for when you're feeling warm!)
- Warm hat, pile or wool (anticipate snow and wind)
- Gloves and an extra pair (or two)
- A complete set of layers: a pair of long johns, followed by a pullover (wool or pile), and outerwear, including an insulated jacket.
- Swimwear and towel (hot springs perhaps...?)

Personal items:

- Sun screen (!)
- Headlamp or flashlight
- Shampoo-soap-toothbrush-toothpaste, etc.
- Personal medication or regular over-the-counter drugs you commonly need. We will have several group first-aid kits for emergencies.

### **Additional Fees**

If you do not subscribe to the meal plan, **you will be required to pay for food on overnight outings (\$10/day)**. The professor will manage this money and food purchasing (with the aid of students!).

### **Office Hours and Requesting Additional Help**

Due to the high amount of field time, as an instructor I will be available 24/7 during the fieldtrips to answer questions and provide support. On campus, feel free to call or e-mail to arrange a time to meet.

### **Colorado College Honor Code**

Students are expected to uphold and adhere to the Colorado College Honor Code, in every respect, as is the case for all courses at CC. 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. In addition you must take care to acknowledge all sources of information you use in reports and write-ups (print literature; internet; and other). You can acquaint yourself with the Constitution of the Honor Code at <http://www2.coloradocollege.edu/academics/honorcouncil/Constitution.pdf>. It is the responsibility of the student to understand the terms of the Honor Code and to clarify ambiguous situations if they arise; so if you aren't sure, ask me.

### **Guidelines for Acknowledgement of Literature and Internet Sources**

Use of Internet sources for research and reading is encouraged—however, students must take extreme care not to plagiarize and to scrupulously credit 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 (guidelines for citation are below).

Presentations and documents should cite all sources on the page where the information appears, with the URL in small font at bottom of page. Complete list of website titles, URL, and date accessed should be provided in a list at end.

Written papers should cite (author, year) within the text, with full reference list provided at end of paper.

**The guidelines for paper preparation and citation style** can be found at:

<http://www.geosociety.org/pubs/geoguid5.htm>

Note that the table at the bottom of that webpage has clickable links to "Samples of different reference styles."

Citation of on-line resources should be in this format suggested by the American Chemical Society:

**1. Uniform Resource Locators (URLs) for Web Pages**

*Format:* Author, if available. Title of page as listed on the site. Address of page (date accessed).

*Example:* Lichtman, J.. American Chemical Society (ACS) Citation Style for Internet Sources. <http://www.lv.psu.edu/jkl1/chem/citing.html/> (accessed Sept.2005).

**2. Online Periodical Article**

*Format:* Author(s), Year, Title of article. *Journal name*, volume (number), Digital Object Identifier. URL.

*Example:* Luyendyk B. P., Wilson D. & Siddoway C.S., 2003. The eastern margin of the Ross Sea Rift in western Marie Byrd Land: Crustal structure and tectonic development. *Geochemistry, Geophysics, Geosystems (G3)*, 4 (10), 1090, doi:10.1029/2002GC000462.

**Course Schedule:**

Date		Topics	Notes
Mon, 18 <sup>th</sup>	9 a.m.	<i>Introductions, Expectations, Teaching Philosophy - The Hydrologic Cycle: Components, scales, fluxes</i>	
	11:15 a.m.	<i>The Responsible Company: What We've Learned From Patagonia's First 40 Years - please attend!</i>	Armstrong Theatre
	1: 30 p.m.	<i>Math Warm-up!! Oh Yeah!!!</i>	<i>Meet with Paraprof if you need equipment</i>
	<b>Assessment</b>	<b>Turn in Math Warm-up by 9am class-time Tue.</b>	
Tue, 19 <sup>th</sup>	9 a.m.	<i>Atmospheric Hydrology: Climate, Weather, Precipitation</i>	
	1:30 p.m.	<i>Regional Hydro-climatic Change Group-Activity</i>	<b>Students aid Paraprof in buying food!!!</b>
	<b>Assessment</b>	<b>Prepare Climate Change Handouts for CC Cabin</b>	
Wed, 20 <sup>th</sup>	<b>9 a.m. Depart</b>	<b>FIELD TRIP: CC Cabin!!!</b>	<i>FIELD THEMES! ...BECAUSE WHY NOT!</i>
	Field Lesson	<i>Infiltration, Physics of Porous Media, Vadose Zone Hydrology</i>	<i>'MERICA! CELEBRATE YOUR FREEDOM!!</i>
	Field Lesson	<i>Hill-slope Flow, Deep Recharge, Streamflow Generation</i>	
	<b>Assessment</b>	<b>Doom and Gloom (with a twist!) (Present Regional Hydro-climatic Change Handouts)</b>	
Thu, 21 <sup>st</sup>	Field Lesson	<i>Homogenous Flow, Darcy's Law, Groundwater Aquifers, Well Construction and Tests</i>	<i>FRENCHIES! ...FOR MY MAIN MAN, DARCY!</i>
	Field Lesson	<i>GW Mapping Exercise</i>	
	<b>Assessment</b>	<b>Turn in final maps for GW Mapping Exercise by 10pm</b>	
Fri, 22 <sup>nd</sup>	Field Lesson	<i>Heterogeneous Flow, Dual-porosity Systems, Saprolite, Faulting/Jointing</i>	<b>Return to CC: ~3 p.m.</b>
	<b>Assessment</b>	<b>Learning Party Uno!!!</b>	<b>Due by Baca Arrival via Field Notebook</b>
Sat, 23 <sup>rd</sup>	<i>Relax, get ready for another big week ahead, and perhaps enjoy some water-dependent experiences (e.g., go skiing, take a shower - both good options!)</i>		
Sun, 24 <sup>th</sup>			
Mon, 25 <sup>th</sup>	<b>9 a.m. Depart</b>	<b>FIELD TRIP: Baca and San Luis Valley!!!</b>	
	Field Lesson	<i>River Hydraulics, Fluvial Geomorphology</i>	<i>MER-PEOPLE!!</i>
	Field Lesson	<i>Flow Measurements, Gauging Stations, Stream Hydrographs, Flow Duration Curves, Low-flow Controls</i>	

Tue, 26 <sup>th</sup>	Morning	<i>Introduction to Final Research Proposal Project</i>	
	Field Lesson	<i>Marty Shellabarger: Flood-irrigator and old-time rancher</i>	
	Field Lesson	<i>George Whitten: President, Rio Grande Water Conservation District &amp; contemporary irrigator</i>	
	Field Lesson	<i>Rich Roberts: Hydrologist, Bureau of Reclamation</i>	
	Field Lesson	<i>Christine Canaly: Director, San Luis Valley Ecosystem Council</i>	
Wed, 27 <sup>th</sup>	Field Lesson	<b><u>Hydrology in the Sangres</u></b> <i>Snow Hydrology, Avalanche Disturbance, Sublimation, Evaporation, Transpiration (Actual and Potential), Interception-Throughfall, Ecohydrology - Plant Physiology</i>	<i>A CLASSIC... CROTCHETY PROSPECTORS! Also, see below...</i>
Thu, 28 <sup>th</sup>	Field Lesson	<b><u>Hydrology in the Sangres</u></b> <i>Ecohydrology - Plant Physiology cont'd, Terrestrial Heat Flux, Hyporheic Flow, Surface Water - GW Exchange</i>	<i>Will be in the backcountry (daytime) and will need full-weather gear</i>
	<b>Assessment</b>	<b>Learning Party Dos!!!</b>	<i>FIELD PROM!!</i>
Fri, 1 <sup>st</sup>	Field Lesson	<i>Mike Gibson: Manager, San Luis Valley Water Conservancy District</i>	
	Field Lesson	<i>Industrial-scale Irrigation and Water-use (Potatoes!)</i>	
	Field Lesson	<i>River Restoration: Rio Grande River Project</i>	
	Field Lesson	<i>Limnology, Reservoirs</i>	<b>Return to CC by Dinner Time (~6pm)</b>
Sat, 2 <sup>nd</sup>	<i>Enjoy another weekend and study up!</i>		
Sun, 3 <sup>rd</sup>	<b>Test Prep. (Optional) 8 p.m.</b>	<i>A question and answer review period before Monday's Celebration!</i>	<i>Meet in classroom</i>
Mon, 4 <sup>th</sup>	<b>9 a.m. Assessment</b>	<b>Celebration of Knowledge! - El Grandisimo!</b>	<b>Due by Noon (electronic Word .doc)</b>
	1:30 p.m.	<i>Epistemologies of Hydrology: Context for the final Research Proposal Project</i>	
Tue, 5 <sup>th</sup>	9 a.m.	<i>Flood Hydrology with Bob Jarrett, USGS</i>	
	Noon	<i>Department Lunch Seminar with Bob</i>	<i>Pizza!</i>
	<b>1:30 p.m.</b>	<b>Fieldtrip</b> to Garden of the Gods with Bob	<i>Prepare for all weather!</i>
Wed, 6 <sup>th</sup>	9 a.m.	<i>Land Use Hydrology with Lee MacDonald, CSU</i>	
	Noon	<i>Department Lunch Seminar with Lee</i>	<i>Pizza!</i>
	<b>1:30 p.m.</b>	<b>Fieldtrip</b> to recent burn-site @ Blodgett Peak Open Space with Lee	<i>Prepare for all weather!</i>

<i>Thu,</i> <i>7<sup>th</sup></i>	<b>Depart 9 a.m.</b>	<b><i>Fieldtrip - The World of Water Resources Consulting: Chris Sanchez, Bishop-Brogden &amp; Assoc.</i></b>	<i>Prepare for all weather!</i>
<i>Fri,</i> <i>8<sup>th</sup></i>	Group Meetings with Zion	<i>Review Research Proposal Outlines with Zion</i>	<i>Come prepared to show and discuss your proposal outline</i>
<i>Sat,</i> <i>9<sup>th</sup></i>	<i>Proposal Writing and Presentation Preparation (Time available for field-based methods testing and/or exploratory data collection)</i>		
<i>Sun,</i> <i>10<sup>th</sup></i>			
<i>Mon,</i> <i>11<sup>th</sup></i>	<b>Assessment</b>	<b><i>Practice Presentations</i></b>	<b><i>Schedule times for practice sessions with Zion</i></b>
	<b>Assessment</b>	<b><i>Rough Draft of Written Proposals Due</i></b>	<b><i>Due by Midnight (electronic Word .doc)</i></b>
<i>Tue,</i> <i>12<sup>th</sup></i>	Work Day	<i>Proposal and Presentation Editing</i>	<i>Proposals returned by Noon for revisions</i>
<i>Wed,</i> <i>13<sup>th</sup></i>	<b>9 a.m.</b>	<b><i>Final Research Proposal Presentations</i></b>	
	<b>Noon</b>	<b><i>Final Written Research Proposals Due</i></b>	<b><i>Due by Noon (electronic Word .doc)</i></b>