

# **GE 301 – Hydrogeologic Systems**

*3 credits - Spring 2004*

M and W 2:30 to 3:50 in 179 Dana

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Office hours: Tuesday 3 to 4:30 and Wednesday 9 to 10:30

## **About the course**

Water is one of the most important resources we have on Earth. Water provides life, but it can just as easily cause death (flooding, driving force for natural disasters, contamination). During this semester, we will study fundamental hydrologic processes such as precipitation (rain and snow), surface water flow, infiltration, and groundwater flow. Understanding and applying these processes and techniques are prerequisite to studying the impact of water on geologic processes or of man's impact on the hydrologic cycle. This course is NOT designed to detail groundwater contamination and pollutant transport. For such a course you will need this course and substantial a mathematic (such as calculus, differential equations, and linear algebra) and chemistry background that is beyond the prerequisite for this course.

## **Class structure**

This course is designed to have a mixture of lecture and in class activities. Some days will be heavily lecture based, you need to know the basics, other classes will be mainly group or individual activities. We will be doing a fair amount of analytical computation (read math), so be prepared to think quantitatively (bring a calculator to class). Some assignments will be done much more quickly and easily on spreadsheet programs such as Microsoft Excel, so start to get familiar with the annoying Excel help paperclip guy.

## **Field exercises**

We will have two Saturday field trips, one on February 7 and one on February 21. These trips are mandatory and include a fair amount of data collection in possibly cold and adverse weather conditions. There will not be make-up trips to the field (logistically difficult to impossible). Since both fieldtrips require group data collection, your classmates need you to attend. Unless the weather is life threatening we will go into the field (I have never had to cancel a trip, yet)!

To be productive and happy in the field you need to be prepared for the weather. You should have warm clothes (many layers are best), sturdy and warm footwear (you will be standing in the snow all day), a pair of sunglasses, warm mittens and hat, and anything else you can think of to keep you comfortable in the winter weather. Please pack water and an adequate lunch. You should also have a good field notebook (sturdy cover or clipboard) in which you can record data and observations and that can survive inclement weather. You can purchase these notebooks at <http://www.forestry-suppliers.com>. Just

type “waterproof notebook” in search engine and choose the one you want. The cost is under \$10.

### Quizzes

There will be several quizzes (but probably not weekly) held during the last 10 minutes of class on Wednesday. These quizzes are designed to make sure you are up to speed with the material. The material could cover anything from what you just learned that day, the reading assignments, or even some review from the previous week.

### Exams

There will be no exams during the semester.

### Assignments

You will be responsible to complete all assignments. All assignments will be typed and all figures or graphs will be neatly prepared and sequentially numbered. All graphs should be made using computer software unless otherwise stated (probability graphs are an exception). All homework/class assignments will be due at the beginning of the following class. Late assignments will lose 10% per day (including weekends, you can always email me to let me know that you put the assignment under my door). Prepare in advance! **Printer or computer problems (unless college wide) is not an acceptable excuse, so don't wait until the last minute to finish the assignment.** Please back up your work so you don't have a disk or computer failure just before your assignment is due (use a hard disk and use DATASTOR). Hand in your assignment early if need be.

### Field Assignments

You will have two major papers related to the field assignments. Each paper constitutes a significant percentage of your grade. Each paper is limited to 5 double spaced pages of text. Each paper should include the following sections: Abstract, Introduction, Methods, Results, Discussion, Conclusions, and References. Figures (including photos, sketches, graphs) and Table should be numbered sequentially at the end of the text (Figure 1, Figure 2...Table 1, Table 2...).

### Textbooks and Readings

Dunne, T. and Leopold, L.B., 1978, Water in Environmental Planning. W.H. Freeman and Company: New York, 818 p.

Sanders, L.L., 1998, A Manual of Field Hydrogeology. Prentice Hall: Upper Saddle River, New Jersey, 381 p.

Other readings will be handed out in class.

## **Grading**

Grading percentages are as follows:

Quizzes: 25%

Homework: 35%

Lake Report: 10%

Draft of Snow Report: 10%

Final Snow report: 10%

Class participation and attendance: 10%

Please notice that class participation can raise or lower your grade by a letter grade. These points are not awarded automatically; you must participate in class discussions to receive the best grade possible. Obviously, if you are absent you cannot participate in class, so it is in your best interest to come to every class.

## **Expectations**

This is a 300-level course, so the material is difficult. My job is to help you to learn the material so please use me when you need help. My expectations are that you prepare for class each day (do the reading), attend *every class promptly* (show up on time), ask questions, participate during class activities, complete assignments on time, and do your best. Most of all I expect you take the initiative to learn the material. If you do not understand something keep trying to understand it before you “give up” and come to me. Try to learn for yourself, but don’t stay confused. If you do all of these, you are on the right track to learning the material (and getting a good grade), although a good grade is not guaranteed.

## **Attendance**

I will not take attendance, but strongly encourage you to come to class each day. If there is a Wednesday quiz there will be no make-ups. Class participation is an important part of learning and thus your grade. I can’t guarantee perfect attendance will get you an A, but I can suggest that poor attendance is a good way to get a poor grade.

## **Email**

It is very important that you have, use, and check your Skidmore email account frequently. I will use email for announcements about class activities (at least one day in advance).

## **Student Objectives**

- Read and complete all assignments before class so you can participate and ask questions.
- Understand the technical terms so the class can communicate effectively.
- Use class knowledge to explore out-of-class hydrology situations (i.e. put your knowledge to use outside of class and ask questions if you don’t understand)
- Become an active and critical thinker about hydrology and the implications it has on geology and on the hundreds of environmental issues that face us each day.

**End of course self-assessment (learning goals)**

By the end of the semester you should be able to:

1. Perform unit analyses
2. Illustrate hydrologic processes in the water cycle
3. Predict precipitation and flood reoccurrence
4. Identify flood prone areas
5. Measure snow pack and model snow melt
6. Apply groundwater theory to geologic media
7. Understand well design and well field design
8. Be a better technical writer

## GE 301 - Schedule

### *Introduction to Hydrogeologic Systems*

Subject to change depending on class interest

Monday		Wednesday	
Jan. 26	Introduction Class stuff Hydrocycle	Jan. 28	Unit analysis Group work - Caesar <i>D&amp;L Chap. 1 and 2</i>
Feb. 2	Methods for basin precip. Precip. exercise	Feb. 4	Infiltration, flow paths Intro to Lake Trip <i>D&amp;L Chap. 6 and 9</i>
Feb. 9	Lake Trip data reduction	Feb. 11	Evaporation <i>D&amp;L Chap. 3 and 4</i>
Feb. 16	Precip Frequency analysis and storm patterns	Feb. 18	Snow hydrology and metamorphism <i>D&amp;L Chap. 13</i> <b><i>Lake Report Due</i></b>
Feb. 23	Snow trip data reduction	Feb. 25	Snow melt hydrology Exercise and model
Mar. 1	Flood frequency <i>D&amp;L Chap 10 (it is long)</i>	Mar. 3	runoff vs. basin area <i>D&amp;L Chap 10</i>
Mar. 8	Hydrographs <i>D&amp;L Chap 10</i>	Mar. 10	Humans and floods <i>D&amp;L Chap. 11</i> <b><i>Snow Report Due</i></b>
Mar. 15	Spring Break	Mar. 17	Spring Break
Mar. 22	Sign up for snow report Discussion (5 minutes each)	Mar. 24	No Class - NEGSA
Mar. 29	Welcome to groundwater <i>D&amp;L Chap. 7 and Sand Chap.4</i>	Mar. 31	Principles of Aquifers <b><i>Final Snow Report Due</i></b>
Apr. 5	Groundwater flow <i>Read handout</i>	Apr. 7	Darcy Tubes <i>Read handout</i>
Apr. 12	Flow nets <i>D&amp;L Chap. 7 and Sand.Chap. 10</i>	Apr. 14	Pumping tests <i>Sand. Chap. 5</i>

Apr. 19	Well design <i>Sand. Chap. 7 and 8</i>	Apr. 21	Intro. to future well field <i>Sand. Chap. 6</i>
Apr. 26	Surficial mapping for well field	Apr. 28	Surficial mapping for well field
May 3	Intro. to water pollution Hand in maps and recommendations	May 5	Classes are over!

Saturday field trips  
Feb. 7 – Lake Trip  
Feb. 21 – Snow Trip