

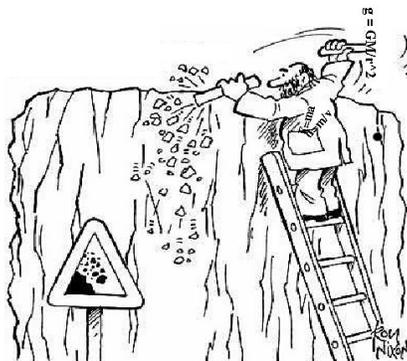
Mathematical Methods in Geology

GEOL 452/L

Dr. Dayanthie Weeraratne

"The right tool for the job"

"If people do not believe that mathematics is simple, it is only because they do not realize how complicated geology is."



Lecture: T/TH 8:30 - 9:20, LO, Room #1221

Lab: T/TH 9:30 - 10:45

Class webpage: <http://www.csun.edu/~dsw/geomath.htm>

Office Hours: Tuesday, 3:00-4:00

Office: LO #1203, email: dsw@csun.edu

Text: Mathematics - A Simple Tool for Geologist, by D. Waltham

Course Objectives: This course is designed to improve your quantitative and problem solving skills applied to geological problems. You probably use quantitative methods every day without realizing it. In this class we will try to have some fun with math by looking at geological applications. You will learn and practice various types of mathematical approaches used to quantify processes across a broad range of geoscience disciplines including mineralogy, petrology, structural geology, hydrogeology, and geophysics. Skills and techniques learned in this course will prepare you for future work in geotechnical firms, geological research, as well as general problem solving and data analysis using the scientific method.

Tentative Course Outline:

Week	Topic	Chapter
1. 01/19 - 01/21	Introduction and solving problems. Basins, forams, and bears, Oh My!	1.1, 1.2
2. 01/26 - 01/28	Algebra and Geology, history, algorithms, unit conversions	1.3, 1.4, 3.1-3.4
3. 02/2 - 02/4	Staying on the straight and narrow - linear relationships	2.1, 2.2, 2.8
4. 02/9 - 02/11	Speaking logarithmically and significant figures	1.5, 1.6
5. 02/16 - 02/18	Progressing geometrically	Notes/Handout
6. 02/23 - 02/25	Vectors, maps, and finding yourself	Notes/Handout
Midterm #1 (02/25)		
7. 03/3 - 03/5	If Geology, then calculus	8.1-8.3
8. 03/9 - 03/11	Power functions	2.3 - 2.6
9. 03/16 - 03/18	The algebra of deduction	Notes/Handout
10. 03/23 - 03/25	Exponential functions and Half lives	2.7

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>
11. 03/30 - 04/1	Taylor series and error propagation	2.4
	Midterm #2 (04/1)	
12. 04/5 - 04/10	Spring Break !	
13. 04/13 - 04/15	Statistics in Geology	7.1-7.8
14. 04/20 - 04/22	Differentials (1D, 2D, and 3D volumes), integrals, & error	8.4-8.5, 9.1-9.7
	Project Title Due (April 20, 2010)	
15. 04/27 - 04/29	Spread sheets, charts plots (Excel, Access, Octave)	Notes/Handout
	Project Outline Due (April 27, 2010)	
16. 05/4 - 05/6	Geological computation and graphics (GIS, Autocad)	Notes/Handout
	Final Project Due (May 6, 2010)	
17.	Final Exam, May 10-15, (Date TBA) 2010	

Evaluation Lecture:

- Midterms (2 at 100 pts each)	<u>Points</u> 200
- Final Exam (100 pts)	<u>100</u>
Total Points (Lecture)	300

Evaluation Lab:

- Lab assignments and reports (14 at 20 pts each)	280
- Class Project - Design and Solve a Mathematical Problem in	<u>70</u>
Total Points (Lab)	350

Class Project: Design and Solve a Mathematical Problem in Geology

For your lab class project, you will design and solve a mathematically relevant problem in geology - based on the work we have done in class. You can choose any of the mathematical techniques we discussed or tried in class. Your project must either solve a mathematical equation, gather geologic data and plot it on scales we have discussed (e.g. linear, logarithmic, polynomial), or calculate statistics of a geologic problem (samples, stratigraphic layers, etc.). You may use Matlab, Octave, Excel, GIS, or Autocad to plot and/or illustrate your project (extra credit for using GIS or Autocad). I will review each problem with you.

Academic Dishonesty: I will follow the University's policy on **academic dishonesty** described in the Schedule of Classes. Cheating will result in a zero grade for an exam any assignment and notification to the Dean of Students which can result in disciplinary action. It also defeats your ability to learn and grow. Spend the time to figure it out. You might enjoy it!

Please be respectful to those around you in class. Inappropriate behavior will not be tolerated. Please **turn off all electronics** before coming to class (it's only an hour!).

Some tips for how to succeed in this class:

1. Ask, ask, ask questions, if you do not understand something or just to participate.
2. "Wherever you go, there you are..." - Be present in the moment. You can minimize study time if you **come to class** and give your **full attention**.
3. **Read** ahead and write down your questions. You'll enjoy it and be more engaged in the class.
4. Keep up with assignments and get them out of the way soon.
5. If you miss a lecture - **read** the material and get a copy of the notes.
6. If you don't do well on the first exam **ask for help** right away, don't put it off.
7. If you have questions or thoughts ask in class, during lab, or **come by for office hours..**
8. If something interests you, explore it! Life is short!

Other Text References:

Davis, J.C., Statistics and Data Analysis in Geology, Wiley, 1986

Ferguson, J. Introduction to Linear Algebra in Geology, Chapman and Hall, 1994

Fowler, C.M.R., The Solid Earth, Cambridge University Press, 1990

Koch G.S., and Link, R.G., Statistical Analysis of Geological Data, Dover Publications, 1970

Turcotte and Schubert, Geodynamics, Wiley, 1982