8/29/06

GLY 4866-001 COMPUTATIONAL GEOLOGY, 2006

T,Th 9:30-10:45; CHE 303, 3 credits.

Instructor: L. Vacher, SCA 504 (974-5267) Office Hours: T,Th 11-12, 3-4 or by appointment.
Assistant: Dorien McGee, SCA 516 (974-8382) Off hrs: M,T,W 12-1 or by apptmnt.

PURPOSE OF COURSE: This course is on geological-mathematical problem solving. Its purpose is to enhance computational skills and increase quantitative literacy. The course is included in the GLY major so students will be more competent and confident when they encounter geological problems with mathematical content.

PREREQUISITES: Must have had or be enrolled in Calculus 2. Must have access to a computer with Excel and Power Point and the ability to connect to the course Website via USF's Blackboard delivery system.

TEXTBOOK and other resources

- Andersen and Swanson, *Understanding our Quantitative World*. The Mathematical Association of America, 2005. You will be expected to read specific chapters before specific quizzes (see schedule). Self-study.
- Vacher. *Computational Geology*. http://www.nagt.org/nagt/jge/columns/compgeo.html. Series of articles covering various mathematical topics in geological context. From *Journal of Geoscience Education*. CG1 and CG6 are required reading. Others are useful for collateral reading. They also provide material for team projects.
- Spreadsheet Modules, which will be posted on Blackboard as they are needed. You will work through 12-16 of these as homework ("spreadsheet assignments"). Eight of the modules will be the subject of specific quizzes (see schedule).
- Excel tutorials on the Web. Two that we like especially are:
  http://www.bcschools.net/staff/ExcelHelp.htm A getting-started tutorial out of Bay City Public Schools in MI.
  http://phoenix.phys.clemson.edu/tutorials/excel/ Excel operations for physics lab course at Clemson.

OBJECTIVES

1. Develop insight about mathematics as it applies to geology. Promote ability to think mathematically about geological problems. Develop problem-solving skills. Therefore, in-class problem-solving sessions followed by study of the Spreadsheet Modules. For the mathematical perspective: self-study of assigned chapters in *Quantitative World*. Assessment: Quizzes and exams (50% of course grade) and spreadsheet assignments (25%).
2. Develop ability to communicate about geological-mathematical content. Therefore, team project. Assessment: posting and in-class presentation of a module (25% of course grade)

COURSE WEBSITE. Much of the content will be delivered on the course website via Blackboard. It is essential that you get connected to this site in the first week of classes. The website will be maintained by Dorien McGee. Any questions about material on the site and connecting to it should be directed to her.

QUIZZES. For most of the semester, the first 10 minutes of class will be devoted to a quiz covering either material on a previous spreadsheet module (Tues) or a reading assignment (Thurs). The quizzes will include calculations, including unit conversions, and in some cases a spreadsheet issue. For the calculations, you will be expected to get the answer correct, including significant figures, and show good, readable layout of your problem-solving approach. It is not sufficient to write down the correct answer without including your work in readable form. Nor is it sufficient to write out your work and not get the correct answer. Your quiz grade for the semester will consist of your best 12 quizzes (16 quizzes are scheduled). There are no make-up quizzes. Late-arrivers will not be given extra time.

EXAM. The final exam (12/14) will be comprehensive. The quizzes and exam together will make up 50% of your grade. Within the 50%, they will be weighted 2:1, with whichever is highest being weighted twice. In other words, if Quizzes>Exam, then the quizzes count 1/3 and the exam counts 1/6 of the course grade. Alternatively, if Exam>Quizzes, then the exam counts 1/3 and the quizzes count 1/6 of the course grade.

SPREADSHEET ASSIGNMENTS. Much of the course will involve Power Point modules that elaborate on one or more geological-mathematical problems and how to solve them with spreadsheets. You will be asked to modify these spreadsheets in some way and hand in something to be graded. You will need to recreate the spreadsheets, including the cell equations. This work will take quite a bit of thought in some cases. You may work together on these assignments, but note that the quizzes/exam will assume you have the skills required to do the spreadsheets.

TEAM PROJECT. By mid-October you will have seen and worked through several Spreadsheet Modules. The Team Project is for you to develop, present, and post one of your own. Teams will consist of ~3 students. Each team will develop and present a Spreadsheet Module. Every member of the team must participate in the presentation. There will be a team grade based on the quality of the module, the presentation, and every team member's understanding of the geological-mathematical problem(s) and solution(s). "Quality of the module" includes the content level of the geological-mathematical problem, the correctness of the solution, and the effectiveness of the module. "Effectiveness" will be judged by the following question: Would students benefit from working through this module? Individual grades will be the team grade times a weighting factor worked out from a matrix of teammate-generated distribution functions.

TIMELINE FOR TEAM PROJECT

10/17, 10/19. Sort yourselves into teams. Consider logistics/common interests. Pick topic and problem.

10/24. In class on this date (after quiz), each team will meet with the instructors to report on what you are thinking about doing. Each team will have only 5-10 minutes, so be ready to use the time well. All students must be on a team by this date.

11/14-11/16: Team meetings (on campus, or not). There will be no class on these days.

11/21-12/05: Class presentations of your modules. Each presentation will be 15 minutes long. Each team member must participate an equal amount. Each team must give Dorien a disk with the Power Point and Excel files for posting on the Website.

SCHEDULE of Quizzes and Team Project Events

8/29 First Class	8/31 **Computer Lab, 1 (SCA 222)**
9/05	9/07 **Computer Lab, 2 (SCA 222)**
9/12 Quiz 1: module (Ton of Rocks)	9/14 Quiz 2: CG6, Problem solving; CG1, Significant figures
9/19 Quiz 3: module (Yonder Mountain)	9/21 Quiz 4: Chap 1, Functions
9/26 Quiz 5: module (E'quake Magnitude)	9/28 Quiz 6: Chaps 2, 3 Graphs
10/03 Quiz 7: (Great Pyramid, 1)	10/05 Quiz 8: Chaps 4,5 Data
10/10 Quiz 9: module (Shaking Ground)	10/12 Quiz 10: Chap 6, Multivariable functions
10/17 Quiz 11: module (Isotopes to Paleoclimate)	10/19 Quiz 12: Chaps 7,8 Linear equations, correlation and regression **TPC**
10/24 **Team Project Meetings**	10/26 **Computer Lab, 3 (SCA 222)**
10/31 Quiz 13: module (Radiometric decay)	11/02 Quiz 14: Chaps 9, 10, Exponential and logarithmic functions
11/07 Quiz 15: module (Pyramid, 2)	11/09 Quiz 16: Chaps 11,12, Periodic and power functions
11/14 **Team Project Meetings**	11/16 **Team Project Meetings**
11/21 ***Project Presentations***	11/23 *Thanksgiving*
11/28 ***Project Presentations***	11/30 ***Project Presentations***
12/05 Final Exam Material	12/07 Final Exam Material
12/12	12/14 **Final Exam** 10:30-12:30

Notes:

- The Tuesday quizzes will be on material covered in indicated spreadsheet modules.
- The Thursday quizzes will be on material in the indicated reading.
- Days labeled "Team Project Meetings" are intended for you to meet on your own.
- TPC = Team Project conference: Be prepared to discuss your plans for the team project with the instructors.

GRADE SCHEDULE. Grades will be curved from exam scores and homework assignments by using *z*-scores, which will be converted to letter grades. Grade boundaries will be no higher than the following: A, 90; A-, 87; B+, 83; B, 80; B-, 77; C+, 73, C, 70; C-, 67; D+, 63; D, 60; D-, 57.