

Geology 340 - Images of the Earth

Fall 2017 – Frank 205

Course web page: <http://guilfordgeo.com/geo340>

Syllabus

This course will focus on various ways to classify, represent, and visualize the Earth's surface. We will learn how to create and manipulate maps, aerial photographs, and satellite images. We will explore, construct, and use geographic information systems (GIS) and other computer-based methods to create maps and visualize data. We will apply our knowledge and techniques to issues such as ecosystem management, environmental assessment, urban planning, geologic mapping, global change, and archaeology.

The laboratory sessions will include individual and group work, including problem sets, map activities, manual and computer mapping, image processing, GPS and GIS. We will connect our work to field studies and ground-truthing of our maps and images, and we will finish up the laboratory work by developing individual GIS/image processing applications.

The course can count toward the geology major and minor, the environmental studies major and minor, and the CTIS major.

Instructor:

Dave Dobson 316-2278 (w)
Frank 215C 286-0337 (h) **Not after 9pm**
ddobson@guilford.edu

Office Hours: Mon/Wed 11:30-1
Thurs 10-12

Text:

There is no textbook for the course. Readings will be assigned as needed, either as handouts or on the web. These may include articles, studies, and documentation for the various software packages we use. Other optional readings may be assigned. Readings will be provided in class or on the course web page (see above).

Work Required:

- **Participation:** Class periods will include informal lectures twice a week and laboratory activities during the weekly sessions. **Attendance and participation** by students in lectures and laboratories is expected and required. Questions, discussion, attendance, computer work, etc. all lead to a participation grade. **Participation 10%**
- **Labs: Laboratory exercises** on map construction and interpretation, aerial photographs, computer maps, image processing, natural and demographic data sets, and GIS will be conducted weekly. **Labs 40%**
- **Project:** All students will complete a **final project**. Students must create a Geographic Information System database and one or more processed images to be used as a part of the GIS. The project must center around a question of scientific, social, or environmental interest that can be adequately addressed by a GIS. The project should include background research

and pertinent commentary. There will be four steps toward completing the project. First, you will submit a project proposal; second, a progress report including a first draft of the GIS; third, a short presentation of your work to the class; and fourth, a written summary and final draft of the GIS. This should include a copy of your presentation materials, the GIS data set itself, an explanation and guide to your GIS, and a brief summary including background research, the hypothesis you are testing, research methods, findings, conclusions, and sources used. **Final Project 25%**

- **Exams:** There will be two **examinations**, one at midterm in class and one take-home final examination. The final exam will be an open-book, open-note exam focusing on the software packages we use. **Midterm 10%, Final Exam 15%**

Attendance: Attendance and engagement in class contributes to the participation grade component. If you miss more than five lectures, you may be required to drop the class. Attendance is **REQUIRED** at all lab sessions.

Grading: Grades in this course will be determined as shown here, with grade weights in the table to the right. Grading will be on a straight scale with a supporting curve. For example, a student who scores 82% of the total available points is guaranteed a B. However, if that student is in the top 15% of the class, she will get an A- or A instead.

Late Work: The final project and the take home exam will not be accepted after their due dates, and a grade of zero will be applied. Lab assignments will be accepted after the due date for up to 14 days. For each day or portion of a day the work is late, a penalty of 5% of the student's grade may be assessed, to a maximum penalty of 50%. No late work will be accepted after 14 days except in emergency circumstances (major health problems or the equivalent). Note that it is **ALWAYS** better to turn in what you have than not to turn anything in at all. I'm generous with partial credit, but I have to give you zero credit if I've got zero to work with.

Workload: Guilford College and our accrediting agency expects students to work a total of 45 hours (including class time) for each credit hour. This is a four-credit course, so the total is 180 hours over 14 weeks, or about 12-13 hours per week. About half of these hours are outside of class (reading, working on labs, researching, reviewing with others, working on projects). You won't always work exactly 12-13 hours every week, and the different course activities may not take you the same amount of time as they do other students. However, an example of the breakdown could be something like the table shown at the right.

Grade % Range	Min % of class
A 90-100	15
B 80-89	35
C 70-79	35
D 60-69	10
F <60	

Graded Item	Weight
Exams	25%
Midterm	10%
Final exam	15%
Lab Activities	40%
Class Participation.....	10%
Final Project	25%
Total.....	100%

Average hours required per week	
Class meetings	5.3
Readings	1.1
Writing	2.9
Presentations/Projects/Study	0.9
Other assignments and homework	2.8
Total weekly hours	13
Total hours required for semester	
Class meetings and events	74.7
Readings	16
Writing	40
Presentations/Projects/Study	12
Other assignments and homework	39
Total hours for semester	181.7

Potential Pop Quizzes: There may occasionally be quizzes on subjects from lectures or readings taken in the first few minutes of class in place of roll-call attendance. I tend to do these when people aren't in class on time. Attendance and good performance on these quizzes will improve your final participation grade. Poor performance or missing the quizzes may hurt your class participation grade.

Guilford Honor Code: Guilford's Honor Code, "I have been honest and I have observed no dishonesty," applies to all of your work for this class. For the purposes of this class, this means that all work you turn in must be your own. With the exception of quizzes and exams, you may consult with others and work with others in doing your work. It is acceptable to work in groups and to give help to and receive help from fellow students, but you should indicate who you worked with and on what in your assignments when you turn them in. It is not acceptable merely to copy answers or solutions. Under no circumstances are you to turn in someone else's work, in full or in part, as your own. Violations of the honor code will be referred to the Judicial Board or other appropriate college unit. At a minimum, a violation will result in zero credit and, at the instructor's option, a failing grade in the course.

Learning Outcomes: Students in this class will develop a detailed understanding of coordinate systems, projections, mapping, digital image processing, data acquisition and processing, and construction of GIS databases. Students will be able to construct maps and datasets to address problems in social, governmental, environmental, and scientific areas. Students will develop skills with several software scripting languages and packages, including Excel, GMT, ArcGIS, and VRML.

Special Needs: If you have needs due to learning differences, physical disability, religious observances, or other causes, it is your responsibility to talk with me as soon as possible, so that I can make whatever appropriate arrangements needed to help you succeed in the course. I cannot make retroactive accommodations, but I am happy to help if I know in advance of a potential problem.

Guilford complies with the Americans with Disabilities Act by providing a process for disclosing disabilities and arranging for reasonable accommodations. The policy can be found online at

http://www.guilford.edu/academics/disability_resources/index.aspx

Schedule:

This schedule is tentative and is subject to updates during the term.

Week	Dates	Lecture/Lab/Reading
Week 1	28-Aug	30-Aug The Shape of the Earth; Coordinates and Navigation Lab 1: Introduction to Maps
Week 2	4-Sep	6-Sep Map Projections - Sphere to Plane; Intro to GMT Lab 2: Map Projections
Week 3	11-Sep	13-Sep The Third Dimension – Contouring techniques Lab 3: Contouring

Week 4	18-Sep	20-Sep	Introduction to GIS Concepts Lab 4: Basic ArcGIS Techniques
Week 5	25-Sep	27-Sep	More GIS Concepts – Vector data Lab 5: More ArcGIS Techniques
Week 6	2-Oct	4-Oct	Working with Spatial Data; Exam Review Lab 6: Raster Data in ArcGIS
Week 7	9-Oct	11-Oct	Raster data – Grids and Images MIDTERM EXAM Monday Oct. 9 in class Lab: Groundtruthing Simulation Exercise
Week 8	16-Oct	18-Oct	Fall Break No Lab
Week 9	23-Oct	25-Oct	3D Visualization Techniques Lab 7: 3D Visualization (VRML/Modeling)
Week 10	30-Oct	1-Nov	More Raster Data: Aerial Photos, Satellite Imagery Lab 7 Part 2: Frank in 3D FINAL PROJECT ASSIGNED
Week 11	6-Nov	8-Nov	Raster techniques (e.g. filters, shading) Lab 8: 3D Visualization in ArcGIS FINAL PROJECT PROPOSAL DUE
Week 12	13-Nov	15-Nov	Environmental GIS: Ecosystems, land use, and soils Lab 9: Fun with Rasters
Week 13	20-Nov	22-Nov	Data collection and integration No lab (Thanksgiving) FINAL PROJECT PROGRESS REPORT DUE
Week 14	27-Nov	29-Nov	Special topics – Applications of GIS and remote sensing Lab: Final Project Presentations
Week 15	4-Dec	6-Dec	Final Exam handed out; Future of GIS; Closing thoughts Lab: Final Project Presentations Final project GIS and writeup due Dec. 8
Final Exam: Dec 6-14			Take-Home Final Exam due 5:00 p.m. Thurs. Dec 14.