GEOLOGY 229
Geographic Information Systems in the Geosciences

Class Information: Fall Semester, 2009

Lecture:	M-W-F: 10:00am – 10:50am	Van Wickle Hall: Room 120
Laboratory:	Tuesday: 1:10pm – 4:00pm	Van Wickle Hall: Room 120

Instructor:
John Wilson (wilsonj@lafayette.edu) Van Wickle Hall: Room 115
(610) 330-5197
Office Hours: Monday and Thursday 11:00am – 12:00pm or By Appt.

Course Information:
Readings will be assigned throughout the semester from various sources, including web sites, books in the library, and professional papers. You are expected to read these and take pertinent notes on them, as they will be used during class discussions and as exam material.

Lab Material: Will be available at course moodle Web Site. http://moodle.lafayette.edu You are expected to have printed and read the lab before each lab session. This will provide you a general idea of the days activities.

Course Description: A broad introduction to the use of Geographic Information Systems (GIS) and Remote Sensing within the Geosciences. The relationships between geography, geology, and society will be pursued. Exposure to both pertinent computer and analytical skills common to GIS will be discussed in both lecture and laboratory. Laboratory exercises, including both field and computer based projects will explore spatial data (regions, rocks), and their associated attributes (feature data).

Academic Honesty: Students will be expected to follow the guidelines described in The Student Handbook on Academic Honesty for all work in this course.

Grading:

Practical Exam 1	20%	Final Project:	20%
Map Project	20%	Lab Exercises	20%
Tutorials	20%		
Total	100%		

(Late assignments will be docked two points for each day it is late)

General Information:

This course involves many new topics and techniques. Reading the appropriate texts, and asking questions in lectures will provide a good start to understanding the material, and doing well in the class. If at any time, you feel that you do not understand material being discussed in lecture or lab, please ask for assistance from your classmates or from me.

In addition, computer techniques will be employed in laboratory and tutorial style exercises. In order to take full advantage of the software in the course, there will be

application sessions during occasional lectures. These lectures will provide valuable information, which will be utilized in lab. Failure to attend these and any lectures will result in poor performance in the class.

Lab Information

The laboratory component of Geology 229, will focus on the relevant computer techniques of Geographic Information Systems that are used in geologic and environmental applications. Exercises will involve geologically and environmentally relevant material from various places in the United States, especially focusing on Pennsylvania and the areas around Easton. There will be opportunities to explore data from regions around the world.

Due to the extensive use of computers in this course, problems may arise. Both hardware and software issues may arise during the semester. I ask in advance for your patience with these issues, as it will make solving them easier. With this in mind, there are numerous things that can be done to prevent errors, and to troubleshoot problems. They will be listed below in the HELP and TIPS section of this document.

Room 120 in Van Wickle Hall is the Geology Department's dedicated computing facility. The Dell PC's in this room have all necessary software to complete lab exercises, and the final project. In addition, the PC's in the Geomorphology Lab (room 101C), and the Geophysics Lab (PC #1, Room 117) have the software loaded.

The computer room is open from 8:00am to 5:00pm during the week. Your KeyCard will provide you with 24-hour access to the computer lab. There may be times during the semester where the lab is locked, but overall you will have full access to the lab. Please note that this means that you have an added responsibility in having 24 hour access. Please behave responsibly, and follow all posted guidelines. In addition, because there may be computer problems, please schedule your work times appropriately. Also note that NO food or drink is allowed.

SOFTWARE:

The software that we will be using is ArcView 9.3.1, which is part of the ArcGIS product line from ESRI (Environmental Systems Research Incorporated). ESRI is one of the industry standards in GIS software and digital cartography. The course is designed to show you how GIS can be used in the geosciences, not teach you all the finer points of ArcView. With this in mind, sometimes you may need to find instructions in addition to those given for each lab assignment. Help is available in multiple places, including but not limited to help sections in the software, the Internet, and from the instructor. Listed below are a few starting places for help with ArcView.

We will also be using ERDAS IMAGINE Remote Sensing software. ERDAS provides high end image processing and classification.

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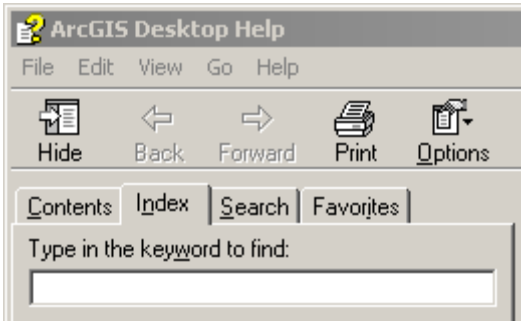
HELP

ArcVIEW Help menu topic: This menu item provides a typical windows interface help dialog box. Choose the INDEX tab to type in keywords to your query.



ESRI.COM: ESRI offers an in-depth support page. To access this, navigate your web browser to www.esri.com, and choose the following links: In the upper left of the main ESRI page, is a link to **SUPPORT** (Fig. 1). At the support page you have two options. The first is to type in your query keywords in the **Knowledge Base** box (Fig. 2) and press go, or second, you can choose ArcGIS Desktop (Fig. 2) from the **Product Support** menu, and then type in your query there. I would recommend the second option, as it wil give you answers relevant to the software that you are using.

Figure 1

Figure 2

Blackboard Discussion Forum: Use the discussion forum to post questions or concerns. I will answer theses questions in quick time. Feel free to answer other students questions if you have any assistance to give.

Instructor Wilson: Please feel free to come ask me any questions you have regarding the use of the software. Realize that I will ask you if you have checked either of the first two options, and direct you to them if you haven't checked those resources.

The following tips are provided for you to use, as they will make your work easier, safer, and more intuitive.

TIPS

-In ArcView, Right Click. This will provide you with many new options not in the menu options.
-Always use the computer after a fresh restart…..The computer will work better.
-Know how to access your H: drive on the Lafayette College servers. This will provide a safe place for you to store data and your projects. And since it is under your password, only you have access to it.
-Save your work often. It is always easier to have to redo a few steps, than an entire project.
-Ask your classmates for assistance. They may have run into a similar problem, and might be able to tell you a simple solution.
-Set up and use a common folder in the computer where all of your data and projects are stored. Use this directory to save your ArcView documents, and the analyses you perform. This file can then be backed up on a ZIP Disk, or to your H-Drive. (BE AWARE: The computers are regularly cleaned, so make sure that you save necessary files to your ZIP Disks and/or your H: drive.

Using a GIS can be very beneficial to all scientists, both physical and social. The key to using a GIS to its full capacity is data. The right types of data are necessary to any successful project. The data can be made, or it can be found. Many types of data are available online from various agencies. A list of places where data is available on the Internet is shown below. These links are a good starting point for your final project.

Data Links

Pennsylvania

http://www.pasda.psu.edu/access/index.shtml
http://www.dcnr.state.pa.us/topogeo/maps&photos.htm

New Jersey

http://www.state.nj.us/dep/njgs/
http://www.state.nj.us/dep/gis/

For a list of other states and various agencies

http://www.rdms.udel.edu/rdms/main/statedata.html
http://www-sul.stanford.edu/depts/gis/web.html
http://www.sdc.ucsb.edu/holdings/drg.htm
http://www.esri.com/data/download/census2000_tigerline/index.html
http://data.geocomm.com/catalog/

For other data, I highly recommend to perform a search at http://www.google.com/ using the following keywords: digital data, gis, spatial. Use any modifiers necessary to refine your search, such as Nevada, or biological, or environmental.

Date		Topic	DUE DATE
8/31/2009	Lecture 1	Intro To GIS	
9/1/2009	Lab 1	Lab Exercise 1: Intro to ArcMap	
9/2/2009	Tutorial 1	Review ArcMap	
9/4/2009	Lecture 2	Intro To GIS	
9/7/2009	Tutorial 2	Map Layouts	
9/8/2009	Lab 2	Lab Exercise 2: Creating Maps/Manipulating Data Sets	Lab 1 Due
9/9/2009	Tutorial 3	Enhanced Map Layout	
9/11/2009	Lecture 3	Basic Geography	
9/14/2009	Tutorial 4	Data Access	Tutorial 2 Due
9/15/2009	Lab 3	Lab Exercise 3 Tabular Attribute Data/Joins	Lab 2 Due
9/16/2009	Lecture 4	Coordinates and Projections	Tutorial 3 Due
9/18/2009	Lecture 5	Data Acquisition/Formats Part 1	
9/21/2009	Tutorial 5	Data Formats: Geocoding	Tutorial 4 Due
9/22/2009	Lab 4	Lab Exercise 4: GPS	Lab 3 Due
9/23/2009	Lecture 6	GPS Mission Planning/Differential GPS	
9/25/2009	Lecture 7	Data Acquisition/Formats Part 2	
9/28/2009	Tutorial 6	RTK Demonstration	Tutorial 5 Due
9/29/2009	Lab	Map Project	Lab 4 Due
9/30/2009	Lecture 8	Modelling Reality: Raster	
10/2/2009	Lecture 9	Modelling Reality: Vector	
10/5/2009	Tutorial 7	Georeferencing Images	
10/6/2009	Lab 5	Lab Exercise 5 & Map Project	Lab 4 Due
10/7/2009	Tutorial 8	Advanced Editing	
10/9/2009	Lecture 10	Database Format	
10/12/2009	FALL	NO	
10/13/2009	BREAK	CLASS	
10/14/2009	Tutorial 9	Symbols and Symbol Sets	
10/16/2009	Lecture 11	Digital Terrain Models	Map Due 8:00an
10/19/2009	PROJECT	Peer Review	
10/20/2009	Lab 5	Lab Exercise 5: External Data Input	
10/21/2009	Lecture 12	Digital Terrain Models	
10/23/2009	Tutorial 10	DEMs from X-Y Data	
10/26/2009	Lab 6	Lab Exercise 6: DEM Analysis	
10/27/2009	PROJECT	Map Project Display	Lab 5 Due
10/28/2009	Tutorial 11	Advanced DEM Analysis	
10/30/2009	Lecture 12	Remote Sensing	
11/2/2009	Tutorial 12	Image Interpretation	
11/3/2009	PROJECT	Regional GIS Project	Lab 6 Due
11/4/2009	Lecture 13	Remote Sensing	Tutorial 11 Due
11/6/2009	Tutorial 13	Black Body Calculator	
11/9/2009	Tutorial 14	Remote Sensing in ArcMap	Tutorial 12 Due
11/10/2009	Lab 7	Lab Exercise 7: Geologic Mapping by RS/DEM	

11/11/2009	Tutorial 15	IMAGINE RS Software	
11/13/2009	Lecture 14	Remote Sensing: Resolution	Tutorial 13 Due
11/16/2009	Lecture 15	Classification	Tutorial 14 Due
11/17/2009	Lab 8	Lab Exercise 8: Remote Sensing in ArcMap	Lab 7 Due
11/18/2009	PROJECT	Regional GIS Project	Tutorial 15 Due
11/20/2009	Lecture 16	Remote Sensing: Radar	
11/23/2009	Tutorial 16	Radar DEM	
11/24/2009	Lab 9	Lab Exercise 9: RS in IMAGINE	Lab 8 Due
11/25/2009		NO CLASS	
11/27/2009		NO CLASS	
11/30/2009	Tutorial 17	CHOICE	Tutorial 16 Due
12/1/2009	Lab 10	Lab Exercise 10: LU/LC RS and GIS combined	Lab 9 Due
12/2/2009			
12/4/2009	Lecture 17	Remote Sensing	
12/7/2009	Tutorial	Final Project	Tutorial 17 Due
12/8/2009	Lab	Final Project	Lab 10 Due
12/9/2009	Review	Final Project	
12/11/2009	Lecture 18	Applications of GIS	

FINALS WEEK	PRESENTATIONS	