*Fall 2010*

# *GEO327G/386G: GIS & GPS Applications in Earth Sciences*

## *Syllabus*

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| • Instructor: | Mark Helper; GEO 4.112; 471-1009<br>**helper@mail.utexas.edu** |
| • Lab: | Tu 2:00 - 4:00, Rm. 2.108 (**Lab Syllabus link**) |
| • Lecture: | T, Th 11 - 12:30, Rm. 2.108 |
| • Teaching Assistant: | Julio Leva Lopez<br>**julioleva@mail.utexas.edu**, Geo. Rm. 2.108 |
| • Office Hours: | T & Th 9:30 - 11 and whenever my door is open. |
| • Grading: | Exam 1: 15%<br>Exam 2: 15%<br>Labs: 35%<br>Project: 20%<br>Final Exam: 15% |
| • Texts: | P. Bolstad, **GIS Fundamentals, 2nd edition**. Eider Press, 543 p. An excellent text that is very well suited to the course.<br><br>Zeiler, M., **Modeling Our World**, ESRI press, 200 p.<br>This book, software manuals and other texts are available as PDF documents in the network class "**Digital Books**" folder.<br><br>Ormsby, T., et al., 2004, **Getting to Know ArcGIS Desktop**, ESRI press, 572 p. This is not a required text but you may find it useful for labs and future reference. It is a workbook with exercises that lead one through the various tools available in ArcGIS software. The 2nd edition contains a fully functional, 180-day "trial version" of ArcView 9; do not buy a used copy of either edition if you want the software.<br><br>**Power Point presentations** and printed notes will be available for most lectures. |
| • Website | **http://www.geo.utexas.edu/courses/371c**<br>The class web site will be used extensively for lab exercises and class information. *Equivalent information is posted on the class Blackboard site*. |
| • Term Projects: | A GIS **project** involving a component of spatial or image analysis is an integral part of the course. Term projects will be **posted** to a class web site. |
| • Email & Network Accounts: | All students must have an email address and a user ID/password for the Geo. Building network. |

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| • Academic Integrity: | Scholastic dishonesty of any type will not be tolerated. Violators will be referred to the Office of the Dean of Students for possible disciplinary action, which in the extreme may result in expulsion from the University. |
| • Students with Disabilities: | Please notify me of any modification/adaptation you may require to accommodate a disability-related need. You will be requested to provide documentation to the Dean of Students' Office, in order that the most appropriate accommodations can be determined. Specialized services are available on campus through Services for Students with Disabilities. |
| • Field Trips: | A **field trip** organized around GPS surveying is a required part of the class. **This year's trip is October 16-17**. Students participating in off-campus field trips are required by the University to have health insurance. Please let me know if you are not insured; I can arrange free coverage for the days of the trip. |

## *Labs*

### *General Lab Information*

- Data for lab exercises, web bookmarks, PDF copies of ESRI books, help files, and more, are available in the class folder. Browse the building network path: *geosrv/main/courses/course directories/Geo327g-386g* to get there, and/or map the location as a network drive for later use.

- See the TA lab syllabus for grading policy, due dates, etc. Julio Leva can be reached at **JulioLeva@mail.utexas.edu**. Office hours are held in room 2.108.

- A **schedule for room 2.108** shows when the room is occupied.

### *Maps of the Week*

- Fame, glory and the best from lab each week are at **Maps of the Week**! **Layout Guidelines** can get you there.

### *Software Tips*

- Useful techniques for labs or projects can be found in **Software Tips**.

### *Software Bugs and Workarounds*

- A **tabulation of frustrating stuff** and what to do about it (see also the discussion group on this subject in the class Blackboard site).

## *Schedule-2010 Fall*

| Date | Lecture | Lab |
|---|---|---|
| Aug. 26 | What is GIS? | No lab this week |
| 31 | Datums and Coordinate Systems | Introduction to ArcGIS v. 9.3 |
| Sept. 2 | Map Projections & Coordinate Systems | |
| 7 | Projections in ArcGIS | Map Projections |
| 9 | Maps as Numbers: Vector Data Models | |
| 14 | Vector Data Models in ArcGIS | Labeling, Annotations, Reference Scales, Graticules, Grids, Selecting in ArcMap |
| 16 | Databases | |
| 21 | Digitizing, Editing and Georeferencing with ArcGIS | Geodatabase Construction and Digitizing |
| 23 | The Raster Data Model | |
| 28 | Review/ArcGIS work session | Digitizing (cont.) |
| 30 | **Exam 1** | |
| Oct. 5 | The Global Positioning System | GPS Instruments / Exporting & Importing Data |
| 7 | GPS II | |
| 12 | Field Data Collection Software | Developing a GIS from GPS data and Orthophotos |
| 14 | Field Trip Preparation | |

---------- **GPS Field Trip; Oct. 16-17** ----------

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|---|---|---|
| 19 | Spatial Analysis: Raster Data | Completion of Field Project |
| 21 | Spatial Analysis: Raster Example | |
| 26 | Geostatistics | Spatial Analysis I |
| 28 | Exam Review/ArcGIS work Session | |
| Nov. 2 | **Exam 2** | Spatial Analysis II |
| 4 | DEMs & TINs: Terrain Modeling | -- ***Project ideas due*** -- |
| 9 | Remote Sensing & GIS | Spatial Analysis III |
| 11 | Remote Sensing & GIS II | |
| 16 | Internet mapping tools | Obtaining and Using Data from the Internet |
| 18 | ArcGIS work session | |
| 23 | ArcGIS work session | Project Work |
| 25 | Thanksgiving Holiday | |
| 30 | Evaluations, Review | Project Work |
| Dec. 2 | Project Work | **Project Due** |
| 10 | Final Exam 2-5 PM | |

## *Semester Project*

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**Project Description, Fall 2010**

The purpose of the class project is to use GIS to ***answer a question*** that can only be, or is best, answered using GIS methods. Making a map might only be a small part of this. Simply collecting data from the web and using it to make a map misses the point. Data should be used in a way that creates new information, and this new information should be used to answer a question. The question need not be profound but needs to be more than "can these data be overlain to make a map?".

GIS software provides a powerful way to quantify all sorts of spatial relationships and data; volumes, areas, statistical trends, and myriad other quantities can all be summarized, graphed and compared. Quantifiable results should be a part of the goal of your project; if possible find a way to ask questions about "how much...", "how many...", etc. rather than just "where is...?".

The project can be broken down into several areas:

[1] **Problem formulation** (20 points)

Did you clearly state the question and outline the techniques/methods for arriving at an answer? You should be able to state your question (i.e. hypothesis) in no more than 2 short sentences. Can the result(s) be quantified? If so, how and by what measure?

[2] **Data collection** (20 points)

Did you utilize readily available GIS data appropriate to the study area? Did you supplement GIS data with importable point data appropriate to the study? Did you get, utilize and store applicable metadata (i.e. feature definitions, spatial and aspatial precisions/accuracies, age of data, datum/projection)? Metadata should be visible in ArcCatalog, even if no more than a brief description (abstract) of the data and it's source.

[3] **Data preprocessing** (20/0 points)

Did you appropriately convert GIS data into an ArcGIS-readable format? (For example, E00 interchange format => uncompressed coverage.) Did you appropriately process and import point data? The preprocessing step can involve considerable time and effort, and this needs to be recognized in grading. [In the event that a project reasonably involves no preprocessing step, the points for this section will be distributed evenly to sections 4, 5, and 6.]

[4] **ArcGIS processing** (30/36 points)

Did you develop an ArcGIS processing scheme appropriate to the study? ArcGIS steps should be fully documented in the write-up.

[5] **Data presentation** (30/36 points)

Did you make one or more maps or otherwise present results in a graphically legible and

attractive manner? Depending on the question addressed, making a single integrated map may be an appropriate subgoal. In other cases, a series of ArcMap screen captures that document the ArcGIS processing might be more appropriate. A common oversight is omission of figure captions and figure numbers that can be cited in the text. Another common problem is figures too small to show intended features. The software can be used to generate compelling maps and nicely labeled and annotated figures. I expect nothing less.

[6] **Write-up** (40/48 points)

Did you clearly state the question addressed, summarize the data collected to address it, document the data preprocessing, describe in detail the ArcGIS processing, and answer the question? Did you quantify your results in graphs or tables? Was your write-up in a form compatible with web-posting (i.e., in html-format with all related graphics saved as .gifs or .jpgs)?

For further details, consult the project **grading template**.

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## *Field Trip*

A weekend field trip to collect GPS data is planned for **the weekend of October 15-16**.

- See a **description of the field project**.
- See a **location map** of the field site.
- See a **geologic map** (large) of the field site.
- Though we will travel in Department vehicles, driving directions are also **available**.
- **Download** UT- and Department-required waiver forms.

We will depart 7:30 AM, Saturday, October 15 from the East basement door of the geology building and return the afternoon of Sun. October 16 before 5 PM.

See photos of **2001**, **2003**, **2006** and **2007**trips.