

APPLIED GIS

GEOG 204 ... SPRING 2005

BEN MARSH ... 116 COLEMAN

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W & F at 3:00-4:22pm in COLE 220

OVERVIEW

The purpose of this course is to enable you to solve problems of

- 1) spatial data collection,*
- 2) cartographic design, and*
- 3) spatial analysis using ArcMap GIS software.*

The course seeks to emphasize understanding and design-decisions over mechanical work and map production — but much of the course work involves making maps.

The key to mapping is understanding how maps work—knowing what is a good map and why. The rest of the job is using a computer application — like word-processing. By the end of the semester you should know:

1. **About maps** — what maps do, how various kinds of data are turned into maps, some of the differences between good and bad maps, the mechanics of map construction (scale, projection), and the graphic characteristics of an attractive and readable map.
2. **About GIS** — data storage, map types, digitizing and editing map elements, geometric conversions, producing “cartographic products.”
3. **About spatial data** — collecting, storing, evaluating, combining, structuring, data from the world, from published sources, from imagery, from the internet.
4. **About analysis** — creating, evaluating, and supporting hypotheses about the world from maps, GIS, and spatial data

A **GIS** — “geographic information system” — is a complex program for handling and presenting spatial data. The word is also used for a set of spatial data used within such program. Many fields — geography, planning, archaeology, geology, ecology, engineering, environmental science — are heavily dependent on maps and map-able data. Essentially all data handling in those fields will be computerized within the next decade and GIS competence will be necessary for most research. ArcMap is currently the standard program for this purpose.

The course has four key elements: lecture, internet information resources, a computer program, and mapping exercises.

1. The lectures provide a broad structure for the ideas about maps and GIS — ideas that are repeated in the exercises
2. We will rely on various internet sources for examples of map uses, for information about GIS, and for data to work with. I have unsuccessfully used a text in this course in the past ... it is typically a bad match between the way texts work (linear, static) and the way we use computers. If you feel like you *need* a book, I can recommend (or lend) a few to choose from.
3. The program — *ArcMap* — is the canonical GIS package, the one you are most likely to use in a job or research project. It is installed on the 14 computers in 220 Coleman. You will find it to be powerful, flexible, and frequently frustrating. Some frustration is from your own learning curve, and some is from the weaknesses of the program.
4. Making maps is the best way to learn about making maps, so the exercises are the most important part of the course. There is one assigned nearly every week. They are planned as a progression that teaches you about maps and about the software ... it is important that you keep up-to-date on the assignments and do them in order. You will invest a lot of time in the exercises; it's the only way to learn this.

GRADING

Grading will be based on about twelve mapping exercises, two exams (technical information + opportunities to solve map problems), and a couple of “map reviews” during class. Your grade will be weighed in comparison to the grades of your colleagues. The approximate weights of the various elements are:

| | |
|---|------------|
| Approx. 12 map exercises @ 5 points | 60 points |
| Two exams..... | 25 points |
| Map reviews | 10 points |
| Presentations, in-class contributions | 5 points |
| TOTAL..... | 100 points |

MAPPING EXERCISES

Assignments are due two weeks after the day upon which they are assigned. Each map will be graded on a scale of 0 to 10. If a map gets below a 4, you may and you should redo it and hand it back in to be re-graded. Turning an assignment in late will cost you about a point (e.g., 10%) per class period. The translation to letter grades is approximately:

| | |
|--------------|---|
| 8 - 10 | A |
| 6 - 8 | B |
| 4 - 6 | C |
| 2 - 4 | D |

This means that anyone with patience enough to do the work on time and hand back in projects with low grades should get a high C or better on the maps.

A map is handed in when a **folder** is placed in my “dropbox”, containing (1) “jpg” files of the map or maps, (2) a very brief text description of an the choices you made in its production and critique identifying errors or inappropriate choices that you might do differently another time, and (3) and a bibliography/set of sources, including copies of any special data you used in constructing the map ... numbers or scanned images, say. The name of the folder should be yourname_assignmentnumber ... like “marsh_project3”. And send me an email announcing that you’d done it, please. I’ll work you through this on the second day; not as complex as it sounds.

ARCMAP AND THE LAB

You will need to be facile with ArcMap, a Windows-based program. Be certain at each step along the way through the semester that you understand how to use the computer in the way that we have that week ... assignments build on previous assignments.

Expect to invest heavily in lab time (even though we don’t have a scheduled shared period). The lab, Coleman 220, is basically *our* room this semester. We should keep it neat, but we will have access pretty much as we need it, day or night.

My goal is for you to be comfortable in your own abilities to solve GIS problems, so I am setting you to work with relatively skeletal instructions. Please feel entirely free to ask for as much help as you need to know how to deal with the program — from your colleagues or from me. My office is right down stairs; come see me or call. Student assistant Liz Marut is also available to help you ... lmarut@bucknell.edu.

COURSE OUTLINE (...*PERHAPS ONLY AN ELABORATE FICTION*)

| Date | Day | Topic | Assignment |
|--------|-----|---|-------------------------|
| 19-Jan | W | Introduction to GIS —. The course and the course requirements. You & Bill Gates: computer basics | |
| 21-Jan | F | Maps, mapping, computer applications | Bad Maps |
| 26-Jan | W | Mapping basics — what a map does GIS map types | |
| 28-Jan | F | Introduction to ArcMap | Simple thematic map |
| 2-Feb | W | Cartographic choices Symbology | |
| 4-Feb | F | Sources of data | Importing thematic data |
| 9-Feb | W | Data types Databases ... the join | |
| 11-Feb | F | Classing, generalization & simplification | Classing data |

| | | | |
|--------|---|---|----------------------|
| 16-Feb | W | The problem of scale | |
| 18-Feb | F | The spherical earth Projections & their uses | Map projections |
| 23-Feb | W | Choosing projections | |
| 25-Feb | F | Gridded data Data sources | Data collection |
| 2-Mar | W | Interpolation Grid math | |
| 4-Mar | F | The contour line | Grid manipulations |
| 9-Mar | W | "Image" map types | |
| 11-Mar | F | break | |
| 16-Mar | W | break | |
| 18-Mar | F | Combining images and other maps Converting image type to other types | Incorporating images |
| 23-Mar | W | Importing spatial data | |
| 25-Mar | F | Digitizing | Digitizing |
| 30-Mar | W | Geocoding | |
| 1-Apr | F | Survey & GPS Field survey | Survey |
| 6-Apr | W | EXAM | |
| 8-Apr | F | Local maps | Publishing a map set |
| 13-Apr | W | Coherence & comparability Map series | |
| 15-Apr | F | Spatial analysis | Queries |
| 20-Apr | W | Spatial query | |
| 22-Apr | F | Modeling | Semester project |
| 27-Apr | W | GIS applications — examples and case studies | |
| 29-Apr | F | reports | |