

Introduction to Geographic Information Systems (GIS)

GARP 0244

This course provides you with the fundamentals of GIS and digital mapping. You will be introduced to basic GIS skills and the structure of geospatial databases necessary to create a GIS, using the ArcGIS 9.2 suite of software applications. The goal of this course is to understand GIS as a useful and flexible tool that you can use to address and solve a wide range of everyday 'geographic' questions and problems. We will also create interactive maps using Google Maps and Google Earth.

- No prerequisites, but robust computer and statistic skills are necessary to be successful in this course (e.g. Microsoft Excel) – consult with me if you have any concerns.
- This course is a prerequisite for GARP0344 (Advanced Geographic Information Systems, Spring 2009 semester).

Time, Location, Numbers

- GARP 0244; CRN 11475, 3 credit hours
- Tuesday and Thursday, 15:45 to 17:00, Wilson 139 computer lab

Please note: We meet formally only twice every week.

Missing class (for any reason) leaves you with a considerable gap in your learning process. This schedule also implies that you will have to spend significant additional time each week outside of class practicing with the software and working on the exercises, homework assignments, and GIS projects.

→ There is no time allotted during class meetings to work on GIS projects and homework assignments.

Your Instructor

Dr. Carsten Braun

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413.572.5595

Office: Bates 06

Office Hours: MWF, 12:15 to 13:15 (or anytime by appointment)

→ If you feel that you are not progressing as well as you hoped, please feel free to talk to me during my office hours or a mutually convenient time – the sooner the better! Please do not wait until the end of the semester. I'm happy to support you to help you succeed.

Required Resources

Textbook #1: GIS Tutorial Updated for ArcGIS 9.2: Workbook for Arc View 9, 2nd edition

- W.L. Gorr and K.S. Kurland
- ISBN 978-1-58948-127-5, 354 pp., ESRI Press July 2007, \$69.95
- Available at the WSC bookstore

This excellent tutorial/textbook includes a series of chapters, exercises, and assignments to provoke critical thinking and develop quantitative problem-solving skills using a GIS. Please note: This is the 2nd edition of this textbook, updated for ArcGIS 9.2.

The GIS Tutorial includes one CD and one DVD. The CD contains the exercise data, the DVD contains a free 180-day fully-functional version of ArcGIS 9.2. The data and software are provided for you in the computer labs (Wilson and Bates). However, if you are planning to use the data and software on your own computer – then do NOT purchase a used copy of this book (the software may not work anymore).

Textbook #2: Google Earth for Dummies

- David A. Crowder
- ISBN 978-0-470-09528-7, 346 pp., Wiley Publishing 2007, \$24.99
- Available at the WSC bookstore

This excellent guide covers all aspects of Google Earth, the freely downloadable application from Google that allows users to view satellite images from all points of the globe. The book explains modifying general options, managing the layer and place mark systems, and tackling some of the more technical aspects, such as interfacing with GPS and creating custom content. The book also includes an good introduction to Google Sketch-Up.

USB thumb-drive/memory stick/flash drive

- A USB thumb-drive or memory stick is required for this class (in order to save your data, exercises, assignments, and GIS projects).
- Suggested size: 1GB and greater; approximate cost: \$15 and up.

A notebook and 3-ring binder

- To create and continuously update your own personal GIS tutorial/help function. The software comes with a very comprehensive help function, but it is always more efficient to write down your own tricks and procedures.
- To organize hand-outs and printed maps.

Course Logistics – The Big Picture

Geospatial databases (i.e. GIS) are fairly complex – ‘learning-by-doing’ is therefore the most appropriate and efficient teaching/learning method. We will create and foster a cooperative learning environment in-class and beyond by supporting each other in order to understand concepts and to solve problems.

One of the best techniques to learn yourself is by teaching others!

I encourage you to collaborate with other students in-class, on the assignments, and the GIS projects (except the Final Project, see below). However, you are always responsible to submit your own original work by the assigned due dates.

I expect a high level of individual effort and engagement, especially when it comes to the in-class exercises, assignments/exercises, and GIS projects. What you get out of this class is primarily a function of the amount of effort you put in. This is not a class where you can sit back and wait for ‘learning to happen’. In this course, you have to consistently and actively engage with the tasks, questions, assignments/exercises, and GIS projects in order to (a) learn to use the GIS software and (b) to understand what a GIS can do for you.

➔ If you feel that you are not progressing as well as you hoped, please feel free to talk to me.

Course Logistics – Details

Each week is broadly arranged around a corresponding chapter in the GIS Tutorial (see course schedule below). There will be usually a short introduction lecture and a review of the previous week's topics and assignments (as needed). I may also arrange for suitable guest speaker(s) – GIS professionals who actually use GIS as part of their daily work. Dates tbd.

Each chapter of the GIS Tutorial takes you through a series of tasks and steps to familiarize yourself with the topic/theme of the chapter. Once you're finished with that particular section, you can start with the homework assignment or work on the GIS projects. It remains your responsibility to complete the homework assignments and projects by the assigned due dates. About half of the homework assignments are taken from the GIS Tutorial, the other half are specially designed to practice important GIS skills.

GIS Short Projects

The three short projects (see course schedule) are designed to further practice important aspects of GIS.

- 1) Mapping with Google Maps and Google Earth
Start: 09/16/2008; Due: 10/09/2008

- 2) 'Lying with Maps'
Start: 10/14/2008; Due: 10/30/2008

- 3) Congressional Districts in Massachusetts
Start: 10/28/2008; Due: 11/13/2008

The MassGIS Project

The MassGIS project involves downloading different types of geospatial data from the MassGIS WWW site and creating a series of meaningful maps, graphs, and tables to analyze and interpret land use changes in Massachusetts over time. We will dedicate the class on 12/11/2008 to project presentations and discussion.

- Start: 11/04/2008
- Due: 12/04/2008

The Final Project

The Final Project takes you through a series of tasks and steps in order to plan, conduct, and interpret a 'real' GIS project. You will receive the Final Project on Thursday, 12/11/2008 (last GARP 0244 class) and you can start immediately. The Final Project is due Thursday, 12/18/2008 at 12:00 noon.

➔ You have to complete the Final Project on your own!

Assessment

Your final course grade is a function of your performance throughout the entire semester and combines the grades from the 8 homework assignments, the three GIS Short Projects, the MassGIS project, and the Final Project. If you are concerned about your grades or performance in the course – please talk to me.

- 8 homework assignments 30 percent of your final grade
- 3 GIS Short Projects 30 percent of your final grade
- MassGIS Project 30 percent of your final grade
- Final Project 10 percent of your final grade

Please note: The assigned due dates are mandatory.
5 points deduction for each late day. No exceptions.

Letter	Points	Letter	Points	Letter	Points
A	93 to 100	B–	80 to 82	D+	67 to 69
A–	90 to 92	C+	77 to 79	D	56 to 66
B+	87 to 89	C	73 to 76	F	< 55
B	83 to 86	C–	70 to 72		

Westfield State College Academic Calendar (Fall 2008)

FALL 2008	
September 1	Labor Day – No Classes
September 2	Opening Day College Meeting
September 3	Classes Begin
September 27	Family Day/Convocation
October 9	Last Day to Withdraw for Session A
October 13	Columbus Day – No Classes
October 17	Follow Monday Schedule
October 24	Session A Classes End
October 27	Session B Classes Begin
November 11	Veterans' Day - No Classes
November 18	Last Day to Withdraw for Full Semester Classes
November 25	Last Day to Withdraw for Session B
November 26	Thanksgiving Recess (begins at 12:20 p.m.)
December 1	Classes Resume
December 12	Classes End – Day Division
December 15, 16, 17, 18	Examination period
December 19	Snow Make-Up Day
December 29	All Grades Due by Noon

The Fine Print

- Attendance is mandatory – missing class is unacceptable.
- If you have to miss class...you have to inform me beforehand.
- The required resources are mandatory.
- The due dates are mandatory.
- Please be on time and don't leave before the end of class.

GARP 0244 Class Schedule (Fall 2008 Semester)

Week	Date	Topic/Theme	In-Class Task(s)	Assignment
Week 1	Th 09/04	What is GIS?	Online Research	HW #1
Week 2	Tu 09/09 Th 09/11	Google Maps Google Earth	Creating personalized content with Google Maps and Google Earth	HW #2
Week 3	Tu 09/16 Th 09/18	Google Maps Google Earth	Start Project 1: Mapping with Google Maps and Google Earth	
Week 4	Tu 09/23 Th 09/25	Introduction: ArcMap and ArcCatalog	GIS Tutorial Ch. 1	HW #3
Week 5	Tu 09/30 Th 10/02	GIS Map Design: Choropleth Maps	GIS Tutorial Ch. 2	HW #4
Week 6	Tu 10/07 Th 10/09	GIS Outputs: Creating a Map	GIS Tutorial Ch. 3	HW #5
Week 7	Tu 10/14 Th 10/16	Review Week	Start Project 2: 'Lying with Maps'	
Week 8	Tu 10/21 Th 10/23	What is MassGIS?	Downloading geospatial data from MassGIS	HW #6
Week 9	Tu 10/28 Th 11/30	Using MassGIS	Start Project 3: Congressional Districts in Massachusetts	
Week 10	Tu 11/04 Th 11/06	Using MassGIS	Start MassGIS Project	
Week 11	Th 11/13	Digitizing and creating GIS data	GIS Tutorial Ch. 6	HW #7
Week 12	Tu 11/18 Th 11/20	Digitizing and creating GIS data	GIS Tutorial Ch. 6	
Week 13	Tu 11/25	Spatial Data Analysis	GIS Tutorial Ch. 8/9	HW #8
Week 14	Tu 12/02 Th 12/04	Spatial Data Analysis	GIS Tutorial Ch. 8/9	
Week 15	Tu 12/09 Th 12/11	Print MassGIS Project Project Presentations		

What is GIS?

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically-referenced information.

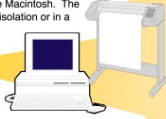
- A GIS is most often associated with a map. A map, however, is only one way you can work with geographic data in a GIS, and only one type of product generated by a GIS. A GIS can provide a great deal more problem-solving capabilities than using a simple mapping program or adding data to an online mapping tool such as Google Earth.
- Fundamentally, GIS data are stored in database tables and can be viewed and analyzed as such. The 'database view' is similar to working with a spreadsheet program, such as Microsoft Excel.
- A GIS can create 2D and 3D maps of the underlying data stored as database tables to evaluate and analyze spatial patterns and relationships.

A Geographic Information System (GIS) links locational (spatial) and database (tabular) information and enables a person to visualize patterns, relationships, and trends. This process gives an entirely new perspective to data analysis that cannot be seen in a table or list format. The five components of a GIS are listed below.

HARDWARE

The hardware is the computer and peripherals on which the GIS operates. Today, this could be a centralized computer server running the UNIX or Windows NT operating systems, a desktop PC, or an Apple Macintosh. The computer may operate in isolation or in a networked configuration.

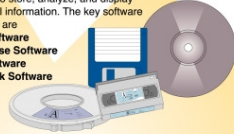
- Computers
- Networks
- Peripheral Devices
- Printers
- Plotters
- Digitizers



SOFTWARE

GIS software provides the functions and tools users need to store, analyze, and display geographical information. The key software components are

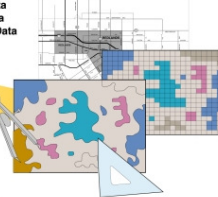
- GIS Software
- Database Software
- OS Software
- Network Software



DATA

One of the most important component of GIS is the data. It is absolutely essential that data be accurate. The following are different data types:

- Vector Data
- Raster Data
- Image Data
- Attribute Data



GIS

PEOPLE

GIS technology is clearly of limited value without people to manage the system and to develop plans for applying it. Users of GIS range from highly qualified technical specialists to planners, foresters, and market analysts who use GIS to help with their everyday work.

- Administrators
- Managers
- GIS Technicians
- Application Experts
- End Users
- Consumers



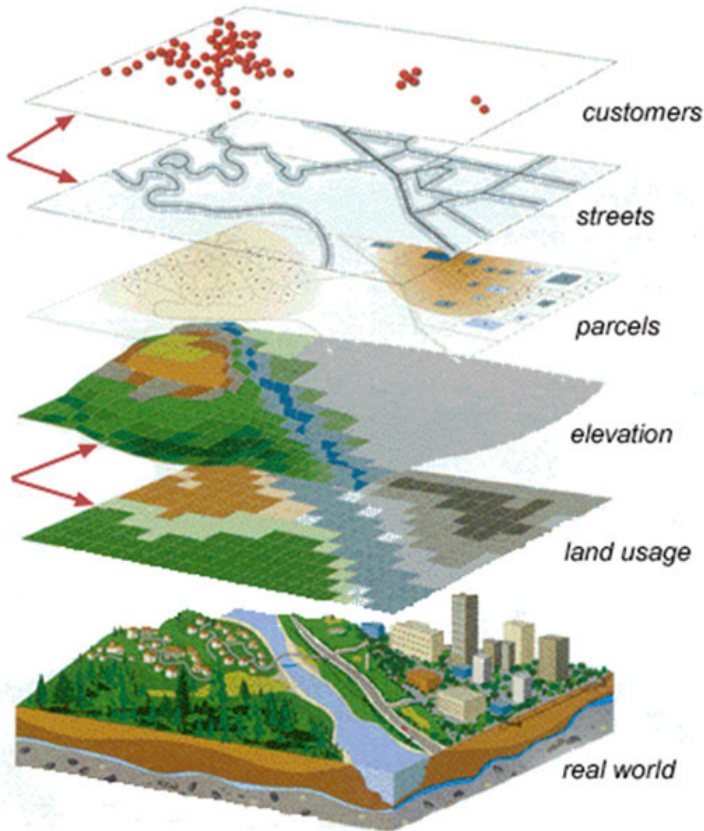
METHODS

Methods are well designed plans and application-specific business rules describing how technology is applied. This includes the following:

- Guidelines
- Specifications
- Standards
- Procedures



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