EnvSci 360 – Computer and Analytical Cartography
Spring 2017

- Syllabus -

This course is designed to give students an in-depth overview of cartography – the art and science of map-making. Students will learn the theory, principles, concepts and techniques involved in presenting geographically-referenced data to the map reader in order to effectively communicate spatial relationships and patterns and the results of spatial analysis. Students will gain practical experience in creating a wide variety of aesthetically-pleasing, professional-looking map themes using GIS software.

Topics covered include:

- The history of cartography as a communication tool and their use in a wide variety of fields as well as in everyday life
- Creative map composition and the conventional layout elements
- How to produce appropriate titles and legends
- The proper use of projections, coordinate systems, and scale
- Symbolization of base map and qualitative data
- Symbolizing and classifying numeric and quantitative data to produce thematic maps
- Using raster data (imagery) in maps
- Effective use of color, type, text, fonts and labeling
- How to get the most out of the cartographic tools available in different mapping software
- Producing maps for both hardcopy and softcopy media, including the challenges of designing maps to be displayed dynamically on the Web
- How to acquire and manipulate GIS data for their use in cartographic output
- The bias present in all maps
- Analyzing and critiquing maps

Prerequisites:

- Computer Applications in Geography (265) or
- Introduction to GIS (281) or
- Spatial Databases and Applications of GIS (381) or
- Permission of the instructor

Students are required to have experience with ESRI's ArcGIS Desktop software. Students are expected to have a working knowledge of the Microsoft Windows operating system, including file management with Windows Explorer (My Computer), and Web browsers.

Credits: 4 (3 if taken as for graduate credit)

Instructor:

Michael Trust
Sr. GIS Database Administrator
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Phone: (617) 619-5615 (at MassGIS)

Office Hours:
Mondays, room S-3-20, during and after lab session

Class Hours:

    Lecture: Wednesdays, 5:30 - 8:00 P.M., room S-3-20
    Lab: Mondays, 5:30 - 8:00 P.M., room S-3-20

Attendance is vital and expected. We will cover a large amount of material and move quickly through topics. Lectures will cover some material from the readings but will also significantly include other relevant topics and computer demonstrations. Lecture presentations will be posted on the class Web site. It is the responsibility of the student to review materials and arrange to get notes from other students if unable to attend classes. Class participation and asking questions is strongly encouraged. **Please inform the instructor ahead of time, if possible, if you will not be able to attend a class.**

Required Textbooks:

- **Making Maps, Third Edition: A Visual Guide to Map Design for GIS** (John Krygier PhD and Denis Wood PhD; 2016 The Guilford Press. ISBN: 1462509983. ISBN-13: 978-1462509980)
- **Designing Better Maps: A Guide for GIS Users** 2nd Edition (Cynthia Brewer; 2015 ESRI Press. ISBN: 1589484401. ISBN-13: 978-1589484405)
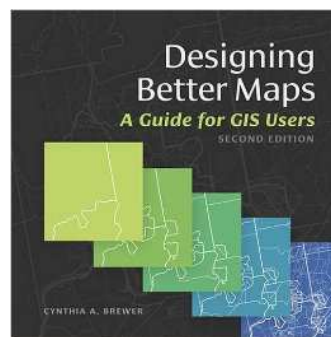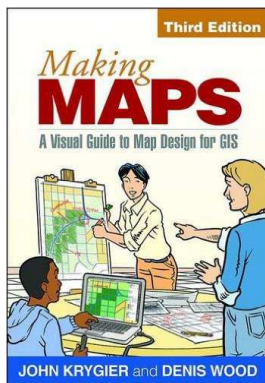
Recommended Books:

- How To Lie With Maps, 2nd Edition (Mark Monmonier; 1996 University Of Chicago Press. ISBN: 0226534219)
- Designed Maps: A Sourcebook for GIS Users (Cynthia Brewer; 2008 ESRI Press. ISBN: 1589481607)
- Elements of Cartography (Arthur H. Robinson, Joel L. Morrison, Phillip C. Muehrcke, Jon Kimerling, Stephen C. Guptill; 1995 Wiley. ISBN: 0471555797)
- Thematic Cartography and Geovisualization, 3rd Edition (Terry A. Slocum, Robert B McMaster, Fritz C Kessler, Hugh H Howard; 2008 Prentice Hall. ISBN: 0132298341)

Class Web Site:

http://www.faculty.umb.edu/michael.trust/
Lecture presentations, lab assignments, and various notes and Web links will be posted here.

Other Web References:

http://makingmaps.net/book/ - companion site to the Making Maps book
http://colorbrewer2.org - a web tool for selecting color schemes for thematic maps
http://desktop.arcgis.com/en/arcmap/ - ArcGIS Desktop Help

Labs:

Lab sessions are an integral part of the course and are intended to provide you with hands-on experience in creating a wide variety of maps. The GIS software used in this course primarily will be ArcGIS 10.4.1 (or 10.5) Desktop (ArcInfo, aka "Advanced" level). For Web-based mapping we will use ArcGIS Online. Students will also use Microsoft Office and Web browsers.

You are expected to have a personal laptop running Windows on which you can install the ArcGIS software. See the [ArcGIS Desktop system requirements](). The software is also installed on computers in the Healy Library Red Lab.

Assignments will relate to the topics covered in the lectures. The assignments will be posted on the class website and will be accompanied by an overview and some demonstrations during the scheduled lab session. Most likely you will need more time to complete the labs than allotted in the weekly lab session.

Each lab is due one week after it is assigned. Grading of exercises will be based on the completeness and accuracy of the work that is submitted. The total points available for each exercise will be listed on the assignment. **10% will be deducted for each week the exercise is late.** This policy is to ensure that students keep up with the weekly lab homework. To avoid the late penalty due to extenuating circumstances, students should notify the instructor ahead of time if meeting a due date will not be possible.

Remember: The best way to learn how to make maps is to sit in front of the computer and spend as much time as you have making maps. Think of the maps you create in this class as potential material to be included in a portfolio you bring to a job interview.

Project:

In addition to lab exercises, all students are required to complete an individual project. The purpose of the project is to demonstrate your grasp of cartographic concepts as acquired during the course. The actual mapping project need not be complex or involve GIS analysis, as the focus is on "layout" and communication of a message via cartographic techniques. More details and the specific requirements of the project will be provided later in the semester.

Policies:

All students enrolled in this course are expected to adhere to the guidelines set forward by the University of Massachusetts-Boston Code of Student Conduct. Any violations of this code (i.e. cheating or copying the work of others) will result in disciplinary action taken by the instructor and any further disciplinary action taken by the Office of Dean of Student Affairs.

Make-up exams will be given only in the event of personal illness (with a doctor's note) or extreme circumstances. The instructor must be notified before the exam date if there is prior knowledge that you will not be able to take the exam on the scheduled date.

** PLEASE - DO NOT USE CELL PHONES DURING LECTURES

Grading:

Lab Exercises	35%
Midterm Exam	25%
Final Project	30%
Attendance/participation	10%

Schedule:

Week	Lecture Topic(s), Labs	Readings
1. Jan. 23/25	***ArcGIS software setup on laptops*** Course overview Lecture 1: History of cartography, basic map design, layout Lecture 2: Data acquisition and processing	*Making Maps – Intro pages (ii-xix), Chaps. 1 and 2* *Designing Maps – Chap. 1*
2. Jan. 30/ Feb. 1	***Lab 1: Exploring symbolization in ArcMap*** Lecture 3: Geodesy, map projections, coordinate systems	*Making Maps – Chaps. 3 and 4* *Designing Maps – Chap. 2*
3. Feb. 6/8	***Lab 2: Mapping with different projections*** Lecture 4: Thematic mapping, choropleth maps	*Making Maps – Chap. 5* *Designing Maps – Chap. 3*
4. Feb. 13/15	***Lab 3: Qualitative data mapping with Land Use*** Lecture 5: Typography	*Making Maps – Chap. 11* *Designing Maps – Chaps. 5 and 6*
5. Feb. 22	*No class on 2/20 (Presidents Day)* Lecture: Map Critique; finish previous lectures….	*Making Maps – Chaps. 8 and 9*
6. Feb. 27/ Mar. 1	***Lab 4: Choropleth & proportional/graduated symbol maps*** Lecture 6: Color	*Making Maps – Chap. 12* *Designing Maps – Chaps. 7 and 8*
7. Mar. 6/8	***Lab 5: Maplex Tutorial; Labeling multiple layers*** Lecture 7: Mapping raster data (imagery) and surfaces	*Making Maps – Chaps. 6 and 7*
Mar. 13/15	Spring Break Week	
8. Mar. 20/22	***Lab 6: Dot density, Pie chart multivariate maps*** **** Mid-term Exam ****	
9. Mar. 27/29	***Lab 7: Black & white and Diverging color scheme maps;*** * **Representations Tutorial*** Lecture 8: Representations, other mapping techniques	*Making Maps – Chap. 10* *Designing Maps – Chap. 9*
10. Apr. 3/5	***Lab 8: Mapping with imagery*** Lecture 9: Mapping for the Web	*Designing Maps – Chap. 4*
11. Apr. 10/12	***Lab 9: Data Driven Pages*** Lecture 10: Using Open Source GIS software	*Web mapping articles*
12. Apr. 19	*No class on 4/17 (Patriot's Day)* Lecture 11: Bias in mapping	*Open source GIS articles*
13. Apr. 24/26	***Lab 10: Publishing maps online using ArcGIS Server*** *Project Work*	*ArcGIS Server and ArcGIS Online Help docs*
14. May 1/3	*Project Work (both Monday and Wednesday)*	
15. May 8/10	*Project Work /***Project Presentations**	