Master Syllabus Department of Geography

GEOG 340/540: Cartography and Visualization of Spatial Data

Course Description

The making of general purpose and thematic maps. Involves mastery of cartographic conventions, data classification, color theory, and *Illustrator* graphic software from Adobe's CS5 suite and *Excel* spreadsheet software from Microsoft Office. (3 credit hours).

Prerequisites: GEOG 240, Map Reading and GEOG 250, Spatial Analytical Methods in Geography.

Course Objectives

The objective of the course is to introduce students to the art and science of map making. A significant task is the mastery of a graphics software for computer construction of maps. Students are required to learn the current artistic and scientific conventions of map making as well as the theory behind these conventions. Topics basic to the construction of maps are introduced including map generalization and symbolization, essentials of map design, color theory, and data classification. Descriptive statistics are employed in the preparation of quantitative data for visual display as thematic maps. Various map forms for representing statistical data such as flow maps, choropleth maps, proportional symbol maps, and cartograms are introduced. Students are required to make a series of maps using *Illustrator CS5*. Microsoft *Excel* is used in the preparation of data for the thematic maps.

The specific aims of the course are to (1) master the graphics software, *Illustrator*, as needed for construction of maps, (2) learn conventions of the International Cartographic Association as related to visual hierarchy, lettering, element placement, and composition, (3) learn methods of classification including, natural breaks, equal interval, quartiles, and standard deviation, (4) master data management functions of *Excel* necessary for processing of data, (5) learn to access data from the US Census, and (6) learn correct construction of graphs to accompany maps.

Course Rationale

Cartography consists of the selection, assembly and graphic presentation of information required for the preparation of a map. Students will become familiar with standard cartographic conventions for the correct construction of maps as well as data acquisition and computer graphic software necessary for mapmaking, This training will equip students with the fundamentals of map making as required in the practice of geography in general and will lay the foundations needed for students taking more advanced

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cartography courses such as Geography 341 and Geography 444. Geography 340 partially fulfills elective requirements for Geography Options I, II, and IV. Geography 340 is a requirement for Option III: GIScience. In addition, cartography is one of the required courses for those seeking qualification for the title "GIS specialists" as awarded to those completing the GIS certificate program sanctioned by the University Consortium for Geographic Information Science.

Course Content and Format

Students will be presented content material in a lecture style while drawing software instruction will be given by way of classroom demonstration and assistance. The following shows an example of a potential outline of topics for this course, with time allotment for each topic at the discretion of the instructor:

- I. Introduction to the making of maps
 - Α. The art and science of cartography
 - B. Introduction to *Illustrator*
- II. Graphic display of qualitative and quantitative information
 - Map types and their uses Α.
 - Spatial dimensions of geographical phenomena (point, line, area, volume) В.
 - C. Discrete and continuous phenomena
 - Qualitative and quantitative data D.
- III. Cartographic abstraction and generalization
 - Α. Selection
 - B. Simplification
 - Classification C.
 - D. **Symbolization**
- IV. Map elements
 - Α. Graphic elements (figure-to-ground, symbols)
 - Type elements (title, subtitles, data classes, source)
- V. Color theory for cartography
 - Physical properties of color
 - Functions of color in cartography B.
 - C. Color conventions in mapping

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- VI. Esthetics, style, and design
 - Visual hierarchy Α.
 - B. Visual balance
 - C. Contrast
 - Intraparallelism D.
- VII. Cartographic conventions, typography
 - Typeface characteristics Α.
 - B. Typeface appropriateness
 - C. Type placement
 - Type legibility D.
- VIII. General purpose maps
 - Design considerations Α.
 - B. Base maps
 - C. Creating custom brushes
- IX. Thematic mapping, data classification
 - Percentages Α.
 - B. Density
 - C. Rates
 - D. Ratios
- X. The choropleth
 - Color selection for the choropleth Α.
 - Classification B.
 - C. Class interval construction methods
- XI. The proportional symbol map
 - Α. Conceptual basis for proportional symbol mapping
 - Data forms B.
 - C. Symbol shapes, perception of circles, square-root circles, range-graded circles
 - Graphic design considerations D.
- XII. The flow map
 - A. Data considerations
 - B. Classification for flow maps
 - C. Design considerations
 - D. Line scaling

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- XIII. The isopleth
 - Α. Data considerations
 - B. Requirements for isarithmic mapping (continuous surface)
 - C. Forms of isarithmic mapping (isometric, isoplethic)
 - Sources of error in isarithmic mapping D.
- XIV. The dot map
 - Dot form and size Α.
 - B. Dot placement
 - C. Advantages and disadvantages
- XV. The cartogram
 - Α. Contiguous
 - B. Non-contiguous
 - C. Mapping requirements
- XVI. Graphs
- XVII. Data sources

Textbook Suggestions

Slocum, Terry A., McMaster, Robert B., Kessler, Fritz C. and Howard, Hugh H. 2009: Thematic Cartography and Geographic Visualization, 3rd Ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Methods for Evaluating Student Performance

Forms of evaluation include examinations and mapping projects that demonstrate mastery of the map forms: choropleth, dot, proportional symbol, flow, general purpose, and cartogram. Thirty percent of the final grade will be from the final project. This involves graphic development of a theme using the various map forms, all arranged in poster form. Graduate students enrolled in the course as Geography 540 are expected to constrain their final project to a series of maps to be used in their thesis research and presentation.

Evaluation of the Course

Student evaluation of the course using university (and departmental) course evaluation forms.