



Syllabus: Cartographic Design – GST 104

Authors: Hugh Howard, American River Community College Cartography course as modularized by Ann Johnson

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COURSE DESCRIPTION:

Introduction to the fundamentals of Cartographic Design including topics important to the creation of cartographic visualizations using Geographic Information Systems (GIS) for digital and hardcopy maps. Topics include: what is a map, types of maps, data standardization, map projections, symbolization, map elements, color, typology, map types and cartographic design. This course is designed to be used as an lower division course in a geospatial program (Certificate or Degree) or can be used as a stand-alone course to complement other disciplines needing knowledge of cartographic design.

Note: The content for this course is based upon the American River Community College Cartography Course created by Hugh Howard. Some topics have been revised, divide into Modules and shortened and advanced topics are not included. The Cartographic Concepts are also aligned to the United States Department of Labor's Geospatial Technology Competency Model (as updated in 2014) for entry-level geospatial occupations including Geospatial or GIS Technicians and Technologists and Remote Sensing Technologists and the updated (2014) MetaDACUM and Program Content Tool Cartographic Design course. Learning Objectives keyed to competencies listed in the Program Content Tool are listed below.

PREREQUISITES: Basic computer literacy is required and it is suggested that students have an introductory course in geospatial technology either prior to or in conjunction with this course .

COURSE LEARNING OUTCOMES:

After completing this course, a student will be able to:

- a. apply cartographic principles appropriately.
- b. describe what type of data can be visualized and how it can be presented in a map
- c. select the appropriate projections, datum and coordinate system for a given task
- d. create cartographic products and visualizations for digital and hardcopy formats
- e. answer spatial questions and produce cartographic outputs and visualizations that accurately present those results
- f. describe the importance of and demonstrate the use of color appropriately in visualizations
- g. describe different map elements and demonstrate how they can be used
- h. describe different types of maps and demonstrate how they can be used
- i. demonstrate how to use a design process workflow to create maps and visualizations for geospatial projects

COURSE FRAMEWORK:

Specific content are at the discretion of the instructor/developer and are offered as samples; not mandatory components in the course. The objective of the GeoTech Center is to provide

the content for as complete of a model course as possible without being too prescriptive on the method of delivery (Face to Face, online or hybrid). It is expected that faculty who adopt the content will modify the material to meet their own local needs under a creative commons license with prominent attribution to the GeoTech Center and NSF DUE#1304591 and reference to the GeoTech Center and Hugh Howard, American River Community College as the source for content. Exercises are not currently provided, but can be located by using tutorial online courses or books (see texts below) from Esri and other sources.

Caution to users of this content: please insure that related materials or references may be referred to throughout this course and that using portions (and not the entire course) may constitute use out of context. The GeoTech Center will not be responsible for any content used out of its original context within this course.

Unit	Module Titles and Learning Objectives Describing What Students Will be Able to Do
1. Introduction to Cartographic Design	<p>Module 1.1: What is a Map and Types of Maps</p> <ol style="list-style-type: none"> 1) Describe what a map is. 2) Describe different types of maps and their uses. <p>Module 1.2: What is Cartography</p> <ol style="list-style-type: none"> 3) Describe what cartography is 4) Discuss cartography's historical perspective 5) Describe the Map Communication Model and its use in creating maps
2. Data Standardization and Classification	<p>Module 2.1 Data Standardization</p> <ol style="list-style-type: none"> 1) Investigate and demonstrate their understanding of various types and sources of data 2) Describe how data can be transformed, organized, and normalized. 3) Describe the difference between Median, Mean and other statistical terms. <p>Module 2.2 Data Classification</p> <ol style="list-style-type: none"> 4) Organize attribute data into groups (Natural breaks, Quantile, equal interval) 5) Demonstrate the difference between qualitative and quantitative methods 6) Describe the difference between nominal, ordinal, interval or ratio scales.
3. Map Projections	<p>Module 3.1 Map Projections</p> <ol style="list-style-type: none"> 1) Describe the different types of map projections and how they are created 2) Describe the difference between Case and Aspect in relation to Map Projections <p>Module 3.2 Projection Classes</p> <ol style="list-style-type: none"> 3) Recognize and select the appropriate map projection based on least distortion possible for a given map <p>Module 3.3 Selecting the Appropriate Map Projection</p> <ol style="list-style-type: none"> 4) Create cartographic products and visualization using an appropriate map projection based on data types, types of analysis, regions being mapped
4. Symbolization	<p>Module 4.1 Maps and Symbolization</p> <ol style="list-style-type: none"> 1. Define what a map is 2. Describe different dimensions of vector features

	<ol style="list-style-type: none"> 3. Describe how a maps scale affects feature selection 4. Describe the difference between discrete (discontinuous) and continuous types of features 5. Describe measurement scales (Nominal, Ordinal, Interval, Ratio) 6. Select symbols for different data formats (raster/vector) and map scale. <p>Module 4.2 Qualitative and Quantitative Symbolization</p> <ol style="list-style-type: none"> 7. Describe and demonstrate different types symbolization used in thematic maps 8. Describe different types of symbolization for quantitative versus qualitative data <p>Module 4.3 Comparison of Common Thematic Maps using Different Types of Symbols</p> <ol style="list-style-type: none"> 9. Describe different may types and its symbolization
<p>5. Map Elements</p>	<p>Module 5.1 Introduction to Map Elements – Neat Lines and Mapped Areas</p> <ol style="list-style-type: none"> 1. Create maps using map elements correctly 2. Create maps that use map area effectively <p>Module 5.2 Other Map Elements</p> <ol style="list-style-type: none"> 3. Create Inset maps 4. Include titles and subtitles, legends and data sources <p>Module 5.3 Other Map Elements: Scale, Orientation and Type Size</p> <ol style="list-style-type: none"> 5. Include appropriate type of Map Scale 6. Include where appropriate North Arrows 7. Understand and use appropriate type sizes for map elements.
<p>6. Color In Cartography</p>	<p>Module 6.1 What is Color?</p> <ol style="list-style-type: none"> 1. Understand the basic concepts in the use of color. 2. Describe the physical and psychological concepts of color. 3. Describe the difference between additive and subtractive primary colors. <p>Module 6.2 Color Conventions</p> <ol style="list-style-type: none"> 4. Describe Qualitative and Quantitative Color Conventions 5. Describe how to use theme-oriented color schemes <p>Module 6.3 Color Tools</p> <ol style="list-style-type: none"> 6. Appropriately use tools to choose colors for different types of maps.
<p>7. Symbology, Typography and Labeling</p>	<p>Module 7.1 Symbology and Legends</p> <ol style="list-style-type: none"> 1. Use appropriate symbology size and shape for maps 2. Understand how map projections affect symbology 3. Choose appropriate type, size and color of symbols 4. Create appropriate Legends for different types of symbols <p>Module 7.2 Introduction to typography, Labeling and Filtering Features</p> <ol style="list-style-type: none"> 5. Effectively use different styles and sizes of type for labels 6. Understand how to arrange and place labels on maps
<p>8. Map Types and Visualization</p>	<p>Module 8.1 Introduction to Map types</p> <ol style="list-style-type: none"> 1. Compare the different types of maps 2. Describe what an Isarithmic map is and how it is used <p>Module 8.2 Thematic Maps (continued)</p> <ol style="list-style-type: none"> 3. Describe and appropriately choose a type of thematic Map to visualize spatial data.

9. Cartographic Design Printed Maps and Digital Maps on the Web	Module 9.1 Map Production <ol style="list-style-type: none"> 1. Describe how the design process is affected by the way it will be reproduced. 2. Describe a Copyright trap 3. Demonstrate the steps to effectively edit a map 4. Understand the process and tools used in printing maps Module 9.2 Map Design Process and Principles <ol style="list-style-type: none"> 5. Describe and use the Seven Design Process steps 6. Discuss the principle of Visual Hierarchy, Contrast, Figure-Ground, and Balance
10. Cartographic Design And Case Study	Module 10.1 What is Cartographic Design and Gestalt Principles of Perceptual Organization <ol style="list-style-type: none"> 1. Design a map that communicates effectively 2. Discuss map design research Module 10.2 Cartographic Design Case Study <ol style="list-style-type: none"> 3. Follow the steps and principles to create an effective map

METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- I. Quizzes
- II. Lab Exercises
- III. Exams
- IV. Final Project

METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

- * Lecture/Discussion
- * Online Learning Modules
- * Audio-Visual (online videos and screencasts)
- * Collaborative Learning
- * Lecture-Lab Combination (Hybrid)
- * Computer-Assisted Active Learning

REQUIRED TEXTS AND SUPPLIES:

1. Reading materials may include, but are not limited to:
 - a. Text: Slocum, McMaster, Kessler, and Howard, *Thematic Cartography and Geovisualization*, 3rd edition. Be aware that certain topics in the textbook will not be addressed
 - b. Periodicals:
 - i. *ESRI ArcNews*, <http://www.esri.com/news/arcnews/index.html>

- ii. *ESRI ArcUser*, <http://www.esri.com/news/arcuser/index.html>
2. Exercise Manuals:
- i. ***GIS Tutorial***, Esri Press, 4th ed., ISBN: 9781589482593 and other Esri Press Tutorials books or online elearning courses.
 - ii. GeoTech Center Exercises
3. SOFTWARE: Access to industry standard GIS software such as ArcGIS Desktop or QGIS.
4. SUPPLIES: Computer with an Internet connection. Color printers.



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