Carnegie Mellon University
Dietrich College
Information Systems

67-279 – Introduction to Geographical Information Systems

Fall Semester, Mini A1, 2017

COURSE INFORMATION

Course Meetings:	Tuesday & Thursday, 3:00PM - 4:20PM
Instructor:	Randy S. Weinberg
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COURSE DESCRIPTION

Geographical Information Systems (GIS) allow us to visualize information that uses location. Through layers of information displayed in computer generated maps, we can see, analyze, understand and explore spatial patterns and relationships in interesting and novel ways.

People in many different fields use Geographical Information Systems in their work: for visualizing the environment, human development, demographics, traffic and transportation, public health and many more. In this course, students will learn the basics of GIS through discussion of concepts and hands-on experience with popular mapping tools. Sources of data, principles of coordinate and projection systems and elementary geoanalysis techniques will be included. Upon completion of the course, students will have the background to begin using GIS techniques in their own areas of interest and will be prepared for further study in advanced GIs courses.

A combination of short readings, hands-on exercises and assignments, quizzes and a final project will be required. Students will present their final projects during the final examination period.

COURSE LEARNING OBJECTIVES

As an introductory course, students will develop an appreciation for the remarkable capabilities of modern, computerized mapping (cartographic) systems. Hands-on exercises and assignments will build a basic skill set that can be applied to further study and more complex projects.

Upon successful completion of this course, students will have achieved the following learning objectives:

- Describe and apply the steps in the 'Geographic Inquiry Process'

- Ability to locate appropriate data for GIS applications

- Explain concepts of coordinate systems and projections

- Demonstrate basic proficiency in usage of industry leading GIS software tools; in particular, ESRI products ArcGIS Online and ArcGIS PRO v2.

- Ability to formulate and demonstrate a basic GIS application in a new problem domain.

TEXTS and SOFTWARE

We will be working with ESRI ArcGIS PRO v2 (Windows only). For Windows users, you can install a working version of this software on your own computer through the ESRI site or through the Heinz College license page (details to be provided). You can also access the software through Virtual Andrew (which is what I do).

REQUIRED TEXT: *GIS Tutorial 1 for ArcGIS® Pro: A Platform Workbook by Wilpen Gorr and Kristen Kurland* (of the Heinz College at CMU). We will be using pre-publication press copies of chapters from the book as they become available from the authors. We will be generally following this text Chapters 1-6.

While ArcGIS PRO does 3D mapping and rendering well on high-end machines, we will be concentrating on 2D maps since they render much faster on lower end configurations.

REFERENCES and SOURCES OF DATA

ESRI help/reference for ArcGIS PRO:
http://pro.arcgis.com/en/pro-app/help/main/welcome-to-the-arcgis-pro-app-help.htm

Example Tutorial: Connecting Mountain Lion Habitat in Los Angeles County
http://learn.arcgis.com/en/projects/build-a-model-to-connect-mountain-lion-habitat/

https://databasin.org/
http://learn.arcgis.com/en/arcgis-book/
http://ephtracking.cdc.gov/InfoByLocation/showInfoByLocation.action
http://opendata.arcgis.com/
http://doc.arcgis.com/en/living-atlas/about/
https://data.wprdc.org/
http://ephtracking.cdc.gov/showHome.action
http://pittsburghpa.gov/dcp/gis/
http://tools.wprdc.org/guides/dash-data-guide/
Plus, there are many open data portals for governments and municipalities.

TENTATIVE CLASS SCHEDULE

Week / Date	Coverage, Readings and Assignments
1 – Tues Aug 29	**TOPICS: GETTING STARTED & ArcGIS Online** - Introduction to Course Objectives, Course Themes and Course Logistics - Introduction to Geographic Inquiry Process - London Cholera Demonstration - Getting started with ESRI ArcGIS Online - Reference: The ArcGIS Book - http://learn.arcgis.com/en/arcgisbook/chapter1/
2 – Thurs Aug 31	**TOPIC: ArcGIS Online - 2** Continuing discussion and demonstration of ArcGIS Online and pointers to sources of data, including ESRI Gallery and Living Atlas. Definition and discussion of Shapefiles, CSV files and map design. Vector and Raster data types. Accessing ESRI ArcGIS software through Virtual Andrew (mac) or Windows ***DUE: ArcGIS Online Warm-Up Assignment (counts as quiz)***
3 – Tues Sept 5	**TOPIC: Using and Making Maps - GIS Tutorial (GIST) for ArcGIS Pro Chapter 1** Beginning with ArcGIS Pro Work with ArcGIS interface and data files (Project/Catalog panes, Open/Create Map Projects and files) Manage Layers (Add, Search, Display, Basic Layer Properties) Navigate GIS maps (Zoom, Pan, Magnify, Use Bookmarks, Identify Tool) Basic Map Functions (Distances, Selecting Attribute Records, Label functions) REQUIRED MEDIA AND READINGS: - GIS Tutorial Chapters 1 & 2 (*Really Required*: READ BEFORE CLASS) ***DUE: Assignment 1: ArcGIS Online*** ***DUE: MUST COMPLETE BEFORE CLASS! Have installed ArcGIS PRO to your Windows computer or to a Windows Partition on your Mac computer, or have installed the VMWare Horizon Client to access the ArcGIS software on a virtual lab computer.***
4 - Thurs Sept 7	**TOPIC: Using and Making Maps - GIS Tutorial Chapter 1, continued**
5 – Tues Sept 12	**TOPIC: Map Design (GIST Chapter 2)** Working With Layers: Symbols, Classes, Choropleth Representation, Scales of Visibility, Basic Queries, Selections ***Due: Assignment 2: Basic Map Operations***
6 - Thurs Sep 14	**TOPIC: Map Design (GIST Chapter 2), continued**
7 – Tues Sept 19	**TOPIC: Preparing and Presenting Maps (GIST Chapter 3)** Formatting for Presentation: Titles, legends, layout, color schemes, scale bars, credits, etc.

	Reference: Map Design, Borden D. Dent - Thematic Map Design, 5th Ed., Chapter 13 ***Due: Assignment 3: Presenting Informative Maps (GIST Chapter 2)***
8 - Thurs Sep 21	**TOPIC: Geodatabases and Basic Table Operations (GIST Chapter 4)** File geodatabases, table operations, attribute queries
9 – Tues Sept 26	**TOPIC: Geodatabases and Basic Table Operations (GIST Chapter 4) - continued** ***Due: Assignment 4: Presenting Informative Maps (GIST Chapter 3)***
10 – Thurs Sep 28	**TOPIC: Spatial Data (GIST Chapter 5)** Introduction to Coordinate Systems and Projections Projecting 3 dimensional surfaces onto 2 dimensions Additional References: "Map Projections": https://www.youtube.com/watch?v=nJ5r4HJMrfo (Particularly note discussion of Universal Transverse Mercator (UTM) projections) https://www.maptoaster.com/maptoaster-topo-nz/articles/projection/datum-projection.html Understanding Map Projections by ESRI (For very serious readers!); http://giscourses.cfans.umn.edu/sites/giscourses.cfans.umn.edu/files/understanding_map_projections.pdf
11 – Tue Oct 3	**TOPIC: Working with External Data Sources such as US Census, USGS Rasters, US Government, State and Local Data (GIST Chapter 5)** ***DUE: Assignment 5: Geoanalysis I (GIST Chapter 4)***
12 – Thurs Oct 5	**TOPIC: GIST Chapter 5, continued**
13 – Tues Oct 10	**TOPIC: Introduction to Geoprocessing (GIST Chapter 6)** ***DUE: Assignment 6: Geoanalysis II (GIST Chapter 4 and 5) and Final Project Proposal***
14 - Thurs Oct 12	**TOPIC: Introduction to Geoprocessing (GIST Chapter 6) continued** Various geoprocessing features not yet covered Class Discussion; Review of Proposals
Final:	***DUE: Final Project Presentations (logistics to be announced)***

COURSE EVALUATION

In order to successfully complete the course, students will be expected to complete the activities listed below. Additional details about each activity will be provided in class and provided on the Canvas site. Weights indicate the contribution to the final course grade. Assignments are due to the Canvas assignment system or other location specified by 3pm on their due dates.

In-class quizzes, discussion and attendance (20%): Each week, there will be in class exercises, occasional quizzes, discussion and peer feedback on the assigned readings and homework. Regular and punctual attendance, active class participation, and contribution to class discussion is expected from each individual.

Weekly Assignments (60%)
Weekly assignments (1-6) will be due and count at 10% each.

Final Project Presentation (20%) There are two parts: a) a project proposal (5%), and b) a demonstration / presentation of final project (15%). These components of the final grade are based upon quality of the project in terms of interest, presentation, usefulness, thoroughness and quality of research, care in preparation and quality of 'story telling'.

COURSE AND UNIVERSITY POLICIES

Attendance and Preparation for Class: You are expected to attend all class sessions and be prepared to participate in discussion. Preparation includes having read any assigned material in advance. Class sessions will include demonstrations and material that will usually go beyond the basic reading or text.

Please contact me ahead of time if you must be excused from class. Unexcused absences will result in progressive reductions in your grade.

Assignments and Late Policy: Assignments are due promptly by 3:00 PM on the dates indicated. All assignments must be submitted to the assignment boxes on Canvas, or otherwise, as instructed.

Since assignments will generally be discussed in class on the due date, late assignments will be accepted for up to 24 hours only and may be given partial credit, but only if they are of exceptional quality and demonstrate significant insights or analysis beyond the regular assignment. No credit will be given for assignments beyond that point. Computer or equipment failure is not an acceptable reason for turning in an assignment late.

Academic Integrity: It is expected that the work you do for this course is your own. It is your ethical responsibility to identify and properly attribute the conceptual sources of work submitted. Failure to do so is dishonest and is the basis for various actions including a charge of violations of academic integrity. More information at: Policies on Academic Integrity.

An Invitation to Students with Learning Disabilities: If you wish to request an accommodation due to a documented disability, please inform your instructor and contact: Office of Disability Resources, 412.268.6121, or email Ms. Catherine Getchell at: getchell@cmu.edu. Additional resources for students with disabilities can be found at this site:

https://www.cmu.edu/student-affairs/orientation/orientation/disabilities.html

Health and wellness
Carnegie Mellon University (and I) believe in hard work but a balanced lifestyle. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.