

GEOGRAPHY 40313: ADVANCED GIS

Spring 2015

Texas Christian University

MWF 9:00 – 9:50

Professor: Dr. Kyle Walker

Email: kyle.walker@tcu.edu

Office phone: 817-257-5241

Classroom: Tucker 002

Office hours: W 12:00 – 1:00 or by appointment, Scharbauer 2015D

COURSE OVERVIEW

This course builds upon introductory-level coursework in Geographic Information Systems (GIS) and introduces several more advanced applications of GIS software. Course topics will include the following:

- Advanced applications in ESRI geodatabase management;
- “Heat” mapping and interpolation of point data;
- Surface analysis and 3D modeling of environmental data;
- Open source alternatives to ESRI GIS software;
- Spatial databases, SQL, and web mapping;
- Developing scripts in the Python programming language to perform GIS operations.

In addition to these topics, students will complete a semester-long course project on a topic of their interest, culminating in a poster presentation to be given the final week of the semester.

As this is an advanced course, students should have completed GEOG 30313: Introduction to GIS or an equivalent introductory GIS course. Students who wish to substitute GIS experience for coursework as a prerequisite must have instructor approval to do so.

COURSE FORMAT

Class sessions will be hybrids of lecture, discussion, tutorials, and lab work. Generally speaking, Mondays will be devoted to lecture, discussion, and tutorials, and Fridays to lab assignments; Wednesdays will be split between content and lab time. While there is no required textbook for this course, I will be assigning various readings that correspond to course topics. These readings will be posted to the course Learning Studio website as PDF documents, and students are expected to complete the readings before class to facilitate class discussion.

The class will be managed through its corresponding Learning Studio website, accessible through the portals at <http://my.tcu.edu> or <http://tcuglobal.edu>. You will submit all of your assignments via the Learning Studio website, and I'll use the website to post relevant course announcements and lecture notes.

EVALUATION AND COURSE POLICIES

Evaluation for this course will be based upon regular lab assignments, in-class tutorials, a take-home midterm assignment, and the successful completion of a semester-long course project. Except when otherwise specified, all assignments will be due by midnight on the Friday of the week that they are listed in the course schedule.

Lab assignments will give students practical experience with the topics we cover in class. They will consist largely of problem-solving exercises that employ the GIS methods learned by the students. There will be seven lab assignments during the semester, each worth **5 points**. Lab assignments will be due two weeks after the day that they are assigned.

In-class tutorials will be based on walkthrough assignments or exercises that we work together on during class. You'll be asked to submit the results of your walkthrough work to show that you completed the tutorial. In sum, the tutorials will comprise **12 points**.

The midterm assignment will be a take-home examination that simulates the type of task you might be assigned as a professional working with GIS. You will be given a project to complete in mid-February, and the assignment will be due just before Spring Break on due March 6. Your deliverable will consist of a coherent short project report, complete with maps, data tables, and a write-up. The exam is worth **20 points**.

The semester project is the centerpiece of your work for the course. In consultation with the professor, you will choose a topic of interest to you to investigate with GIS. The project is worth a total of **33 points** and includes the following components:

- A one-paragraph description of your proposed research project, due on January 23. This paragraph should simply consist of your ideas for a project you are interested in completing; we'll use this brief proposal to help refine your topic over the next month. The proposal will account for your tutorial points for week 2.
- A poster presentation of the results of your research project, worth **8 points** and due April 24.
- A final 8 page report that presents the results of your research project. The report should include an introduction, literature review, methodology section, results section, and conclusion. The report is due May 6 (the Monday of finals week), and is worth **25 points**.

Interested students are encouraged to present their posters at the AddRan Festival of Undergraduate Research, which will take place in mid-April in the BLUU. This festival takes place before the formal poster due date, so students who choose to present will need to finish their posters early. Students who present at the Festival will receive extra credit. For more information, visit the following website:

http://www.econ.tcu.edu/harvey/AddRan_Research/AddRanFestival.html.

All late assignments will receive a **10 percent penalty** for each day they are submitted past the due date. I cannot accept late final reports.

The minimum point totals to achieve a specific grade are as follows:

94: A	73: C
90: A-	70: C-
87: B+	67: D+
83: B	63: D
80: B-	60: D-
77: C+	Below 60 percent: F

I will award an incomplete (I) only in the most extreme and exceptional circumstances. Please notify me as soon as possible if you are in a situation where you feel you require an I.

The attendance policy for this course corresponds to the official TCU attendance policy, which reads, ***“Regular and punctual class attendance is essential, and no assigned work is summarily excused because of absence, no matter what the cause.”*** Make-up tutorials or deadline extensions will only be permitted in the instance of a documented illness or emergency or a documented TCU-sanctioned activity.

COURSE SCHEDULE

Date	Topics	Assignments
Week 1: January 12	Course introduction and review of introductory GIS principles;	Lab 1: ArcGIS review; ArcToolbox

	discussion of semester project ArcToolbox and geoprocessing in ArcGIS	
Week 2: January 19	GIS project management No class Monday for MLK holiday	One-paragraph research proposal due January 23 (Friday)
Week 3: January 26	Topics in geodatabase construction and management Reading: “Inside the geodatabase” from <i>Modeling our World</i>	Lab 2: Building a geodatabase
Week 4: February 2	Spatial sampling, density mapping, and interpolation Reading: ArcGIS documentation (links on Learning Studio)	Lab 3: Interpolation
Week 5: February 9	Surface analysis and 3D GIS Reading: ArcGIS documentation (links on Learning Studio)	Lab 4: Terrain modeling and 3D visualization
Week 6: February 16	Open source GIS Reading: read through the QGIS user’s guide (link on Learning Studio)	Lab 5: Working with QGIS
Week 7: February 23	Open source GIS II	
Week 8: March 2	Web mapping and cloud computing Reading: “Online GIS”	Midterm assignment due March 6
Week 9: March 9	SPRING BREAK – NO CLASS	
Week 10: March 16	Spatial databases and SQL Reading: “SQL and PostGIS in	Lab 6: Building a web map with CartoDB

	CartoDB” (linked on Learning Studio)	
Week 11: March 23	Python I Reading: “Introducing Python” from <i>Python Scripting for ArcGIS</i>	
Week 12: March 30	Python II Reading: “Geoprocessing using Python” from <i>Python Scripting for ArcGIS</i> No class Friday for Good Friday holiday	Lab 7: Geoprocessing with Python
Week 13: April 6	The state of the GIS field Readings: selected blog posts (linked on Learning Studio)	
Week 14: April 13	Project work	
Week 15: April 20	Project work Kyle in Chicago for AAG meetings	Poster due April 24
Week 16: April 27	Presentations	Final report due May 4 (Monday)

SOFTWARE

The primary software used in this course will be ArcGIS 10.2, produced by the Environmental Systems Research Institute (ESRI, pronounced *ez-ree*). We will also be using QGIS (QGIS), an open-source desktop GIS (<http://qgis.org/en/site/>), CartoDB, a web-based spatial database and mapping platform (<http://cartodb.com/>), and the Python programming language (<https://www.python.org/>). There are many websites and books available to provide you with

further assistance with the software. The ESRI ArcGIS help documentation (<http://resources.arcgis.com/en/help/main/10.2/>) is quite extensive and can assist with questions ranging from the very basic to the very complicated. Additionally, ESRI maintains online forums (<https://geonet.esri.com/community/discussions-lobby>) where you can browse user questions regarding ArcGIS and ask your own. GIS Stack Exchange (<http://gis.stackexchange.com>) is also a very good resource for GIS professionals, and you may find some of your questions answered on this site.

ArcGIS is available for use in our classroom (Tucker 002), the Institute for Urban Living and Innovation computer lab in SCHAR 2015A, and the TCU Library computer lab, and can be accessed outside of class hours. Additionally, I have student licenses of ArcGIS available for you to download and install on your home computers if you are interested. Please let me know as soon as possible, and I will send you the installation instructions and the license code. Unfortunately for Mac users, ArcGIS still runs exclusively on Windows at this time.

QGIS can be downloaded to your home computer for free and is platform-independent; you can download it at <http://qgis.org/en/site/forusers/download.html>.

OTHER ISSUES

Academic conduct:

This course will comply with TCU policies on academic conduct and plagiarism. The TCU statement on academic misconduct from the Student Handbook (Section 3.4) is below:

Academic Misconduct (Sec. 3.4 from the Student Handbook) –Any act that violates the academic integrity of the institution is considered academic misconduct. The procedures used to resolve suspected acts of academic misconduct are available in the offices of Academic Deans and the Office of Campus Life and are listed in detail in the Undergraduate Catalog (Student Policies>Academic Conduct Policy Details; http://www.catalog.tcu.edu/current_year/undergraduate/). Specific examples include, but are not limited to:

- *Cheating: Copying from another student's test paper, laboratory report, other report, or computer files and listings; using, during any academic exercise, material and/or devices not authorized by the person in charge of the test; collaborating with or seeking aid from another student during a test or laboratory without permission; knowingly using, buying, selling, stealing, transporting, or soliciting in its entirety or in part, the contents of a test or other assignment unauthorized for release; substituting for another student or permitting another student to substitute for oneself.*

- *Plagiarism: The appropriation, theft, purchase or obtaining by any means another's work, and the unacknowledged submission or incorporation of that work as one's own offered for credit. Appropriation includes the quoting or paraphrasing of another's work without giving credit therefore.*
- *Collusion: The unauthorized collaboration with another in preparing work offered for credit.*

In short: please don't cheat, as it is a very serious offense and you will get caught. Your assignments and reports will be checked for plagiarism using Turnitin, TCU's anti-plagiarism software. If you are in any way struggling in the course and tempted to cheat, please come talk to me so we can address your issues face to face.

Finally, the classroom is a place where diversity of opinions and perspectives is not only welcomed, but highly encouraged. I ask you to always be mindful and respectful of the diversity (broadly defined) of your classmates.

Disability statement:

TCU's statement on disabilities is as follows:

Disabilities Statement: Texas Christian University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973 regarding students with disabilities. Eligible students seeking accommodations should contact the Coordinator of Student Disabilities Services in the Center for Academic Services located in Sadler Hall, 1010. Accommodations are not retroactive, therefore, students should contact the Coordinator as soon as possible in the term for which they are seeking accommodations. Further information can be obtained from the Center for Academic Services, TCU Box 297710, Fort Worth, TX 76129, or at (817) 257-6567.

STATEMENT ON USE OF THE SYLLABUS

This syllabus is intended for your use as a guide to assist in your planning for the semester. I **reserve the right to make changes to the syllabus and schedule if necessary**. However, rest assured that if I do make any changes to the syllabus, I will give you plenty of advance notice.