GEOL 5323
Advanced Spatial Analysis & Modeling
SPR 2016
CRN 28607

Lecture: **M 9:30-11:20 GEO 320**
Lab: **W 9:30-11:20 GEO 409**

Instructor

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Office Hours: Mon/Wed 11:30-12:30, during lab, or by appointment

General Information

This course focuses on research applications of GIS-based spatial analysis in the earth and environmental sciences. Students will use analytical tools such as spatial data interpolation techniques, point pattern, and density analysis in their quest to understand questions of interest about earth and environmental phenomena. In addition, students will be exposed to recent research in this area, learn how to conduct and report GIS research, and complete a final project of their choice.
Prerequisite: An introductory GIS course.

Course Objectives

- Expose students to current research applications of GIS in earth and environmental sciences
- Develop skills critiquing and communicating GIS analyses orally and in writing, appropriate for research contexts
- Foster ability to efficiently solve complex geospatial problems by clearly defining a project objective, determining the tools and parameters needed to achieve the objective, and automating the final workflow
- Expand breadth and depth of knowledge of tools, techniques, theory, and methods used in spatial modeling
- Complete a GIS project using best practices
- Introduce students to principles and practice of model design and development using model building and scripting languages

Makeup policy

Due dates are firm. 10% will be deducted for each day work is late. No late summaries of the reading will be accepted. The drop deadline is April 1, 2016. No course drops will be approved by the College of Science after that date.

Academic dishonesty

A student's submission of work for academic credit indicates that the work is the student's own. Any outside assistance should be acknowledged. While cooperation during class and the

lab is encouraged, homework and the lab reports must be constructed and written by each individual student.

Students with Disabilities

Students with disabilities are encouraged to meet with the instructor in order that course materials can be updated and adapted appropriately to better foster a positive teaching and learning experience.

Course Textbooks

de Smith, Goodchild, Longley (2015), Geospatial Analysis – 5th Edition, (Online free textbook) http://www.spatialanalysisonline.com/

A reading list of journal articles will be compiled the second week of the semester. These readings will be made available to you in one of the following ways (depending on logistics and copyright issues):

- on the Internet (e.g., certain open-access journal articles and websites);
- from a UTEP library database (go to the UTEP library home page, and type the exact name of the journal's title into the search window on the left side under E-Journals. This usually results in your being able to access the journal from one or more sources. Be aware that sometimes the listing suggests that fewer years are available than actually are, so always click as far as you can); or
- sent by email to the email address that UTEP has on file for you.

Grading

Class participation	15%
Homework (10)	20%
Lab reports (4)	25%
Report reviews	15%
Poster presentation	5%
Final project	20%

Class participation

The classroom component of this course will be a two hour session each Monday morning. This part of the course will be taught with discussion and in-class exercises based on the reading. Participation in these class activities is a significant portion of your grade and depends on your prior preparation. VERY IMPORTANT: Reading assignments must be completed before class. Therefore, at the beginning of each class you must turn in a summary about the assigned journal article(s) (1/2 page) along with two questions about the reading that you can potentially raise in class. Your participation grade will be based on these summaries, attendance, and leading a discussion about an article you select.

Lab reports

Lab will be comprised of a set problems to be solved through a combination of guided questioning, suggested analytical tasks, and student-designed analyses. Each lab will require two weeks of effort and substantial time outside of the scheduled lab period. Labs are due the following week, before the next lab starts. Although questions will be raised to direct the student to observe certain things, no answers to the questions will be handed in. Rather, a technical report similar to a journal article will be written based on the lab. The report will require you to identify the problem, describe the methods, reflect on the different steps in the lab and synthesize what you learned from it. It should be a comprehensive report that includes one or more maps and the results from your analyses, and must be written in a professional manner. The final section of every lab report must include a paragraph describing how the lab was extended with additional analyses to answer additional questions about the spatial relationships in the data. A report template and a grading rubric will be provided to students.

Lab report reviews

As a GIS professional, the quality of your work will always be judged in comparison with others, and you will likely have situations where you are expected to critique the work of others. This class will simulate this experience – critiquing and being critiqued by peers. Each student's lab report will be made anonymous and sent to two classmates for review according to a review rubric that will be provided. The reviews are due the following week. The reviews will be considered during the assignment of a lab grade by the instructor.

	STUDENT	INSTRUCTOR	PEERS
Week 1	Lab A Wednesday		
Week 2	Lab A Wednesday		
Week 3	Lab A Report due Lab B	Reviewers assigned	
Week 4	Lab B		Review due Wednesday
Week 5	Lab B Report due	Grade assigned	

Homework

Homework will be assigned during class. Many of these will include hands on classroom activities conducted in groups with other students. The results of this group work should be further developed individually by each student, then turned in. Under no circumstances should homework be identical for multiple students.

Final Project

The project must involve a major GIS component on a topic chosen by the student. It should draw on analytical elements covered during the class and lab. Simply providing maps is insufficient; there must be a substantive analysis. Results will be presented during a poster session and in a project report. More details will be provided regarding expectations and a grading rubric.

Spatial Analysis and Modeling in Earth & Environmental Science
Spring Semester, 2016

GA = Geospatial Analysis – 4th Edition, de Smith, Goodchild, Longley (Online textbook)

DATE	TOPIC	DUE
Jan 20	Lab 1: GIS refresher	
Jan 25	Introduction; Scientific narrative	
Jan 27	Lab 1: GIS refresher	
Feb 1	Basic statistics Read: GA 1.1-1.2; 2.1 Read: Ma et al. (2012)	Article summary HW 1: GIS article
Feb 3	Lab 2: Earthquakes	Refresher lab
Feb 8	ESDA and Geovisualization Read: GA 5.1-5.2 Read: Al-Ahmadi et al. (2014)	Article summary HW 2: Nearest Neighbor Analysis
Feb 10	Lab 2: Earthquakes (continued)	
Feb 15	Point sets and distance statistics Pt 1 Read: GA 5.4 Read article: Tonini et al. (2014)	Article summary HW 3 Basic statistics
Feb 17	UTEP closed	Earthquakes lab report
Feb 22	Point sets and distance statistics Pt 2 Read: GA 5.5-5.6 Read article: Marques et al. (2015)	Article summary HW 4 Sumatra website & storymaps
Feb 24	Lab 3: Prairie dog mounds – Point pattern analysis	Earthquakes reviews
Feb 29	Suitability analysis Read: GA 3.1-3.3 (project design) Read: Cetin (2015); Uddameri (2014)	Article summary
Mar 2	Lab 3: Prairie dog mounds (continued)	
	Spring break	
Mar 14	Grid-based statistics and metrics Pt 1: Kappa Read: GA 5.3.1-5.3.2 Read article: Villarreal et al. (2013)	HW 5 Project proposal Article summary
Mar 16	Lab 4: Land change/landscape patterns	Prairie dog lab report
Mar 21	Grid-based statistics and metrics Pt 2: Quadrat analysis & Landscape metrics Read: GA 5.3.3 Read: Yang et al. (2014)	Article summary HW 6 Error analysis
Mar 23	Lab 4: Land change/landscape patterns (continued)	Prairie dog reviews
Mar 28	Grid-based statistics and metrics Pt 3: Connectivity Read: GA 5.3.4 Read article: Lausch et al. (2015)	Article summary
Mar 30	No lab	Landscape change lab report
April 4	Land change analysis Read article: Yeh (2015)	Article summary
Apr 6	Lab 5: Topography	Landscape change reviews

Apr 11	Land change: snow and ice Read article: Jones et al. (2015); Poggio (2015)	Article summary
Apr 13	Lab 5: Topography	
Apr 18	Space time cubes Read article: Dong (2015), Petras et al. (2015) Andrea Everett primer on StoryMaps	Article summary
Apr 20	Lab: Work on project	Topography lab report
Apr 25	Deana out of town – no class	
Apr 27	Lab: Work on project (Deana out)	Topography reviews
May 2	Presentations	Storymap presentation
May 4	Lab: Work on project	
May 9	Finals	Project report due