

Advanced GIS

NR 6930 - Advanced GIS for Natural Resource Applications



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Course Description

The course is designed for students looking to expand their GIS skill set and build proficiency in solving spatial problems with GIS analyses. Students will use Esri's ArcGIS Pro and ArcMap for most assignments. The first few labs are designed to reacquaint students with the software's functionality. The rest of the course is comprised of lab work that will build proficiency in GIS problem solving, advanced tools and plugins, and increase GIS professionalism. Topics covered include troubleshooting coordinate system issues, morphometric analyses, terrain modeling, DEM construction, hydrologic modeling, python scripting, cluster and hotspot analyses, complex raster/vector analyses, and error analysis to demonstrate data quality limitations and quantify accuracy of results.

While there are no specific prerequisites, students should have a strong working knowledge of Esri's ArcGIS software package for desktop. Unflappable computer literacy is absolutely assumed. Interest in spatial natural resources data is helpful.

The course is available to MNR students, working professionals, as well as any graduate level student interested in advancing their GIS skills as applied to natural resource issues.

Course Objectives

This course is designed to help students:

- Build a strong understanding of the fundamental theories of geographic information science behind Geographic Information Systems (GIS), and in so doing build an awareness of what GIS can and cannot be used for.

- Become proficient in the use of GIS tools to conduct spatial analyses and build maps that are fit-for-purpose and effectively convey the information for which they are intended.
- Build confidence in teaching yourself how to undertake new analyses (unfamiliar to you) using GIS, troubleshooting problems in GIS, and seeking help from the GIS community to solve your problems.
- Use GIS analyses to address applied problems and/or research questions.
- Become effective in building maps that can be shared with non-GIS users (e.g. PDF maps and interactive web maps).

Course Materials

Canvas: The course will use Canvas (<https://usu.instructure.com/courses/605917>) for course announcements, assignment delivery and submission, discussions, grades, etc. It is the student's responsibility to log in to and utilize the Canvas system. Help using the Canvas system can be obtained by contacting USU Information Technologies at 797-HELP or going to <http://it.usu.edu>.

Software: The ESRI education edition software package (a one year free trial of ArcGIS 10) will be made available to all students enrolled in the class.

Hardware: Students are required to have access to a computer which meets the system requirements to run the ArcGIS software and must have reliable internet access. Please see Esri's webpage on system requirements before registering for the course (<http://resources.arcgis.com/en/help/system-requirements/10.2/index.html#//01510000002000000>).

Note that ArcGIS will not run on an Apple OS. Most students who are dealing with computer issues after the start of the semester fall behind and have a very difficult time catching up, so please let me know right away if you run into any issues.

Internet Access: A reliable high-speed internet connection is required for all students enrolled in the course. Your success in this course will be determined in large part by the effectiveness of your computer and internet connection. If you suspect you will have limited internet access, you might consider putting off this course until a time when you will have full-time reliable internet access.

No Required Textbook

Suggested texts:

GIS Fundamentals 5th edition, Bolstad. ISBN: 978-1506695877 This is a very approachable text on the principles underlying GIS.

Mastering ArcGIS 5th edition, Price. ISBN: 9780077462956
This book is a thorough 'recipe' style GIS workbook. Includes data disk.

Course Structure

Each week is built around a central theme and lab assignment and may additionally include a reading assignment, discussion topic, or video tutorials. All course materials will be available on Canvas.

Lab exercises are designed to provide students the opportunity to learn GIS concepts through hands-on experience. Lab exercises have been written such that the first lab will help reacquaint students with the functionality of ArcMap while building professional cartographic skills. The labs will cover new topics each week and will build proficiency using fundamental tools. The pace of the class is rigorous in that students need to complete one lab assignment per week of the semester. *This is not a self-paced course.*

Reading/Video assignments are designed to inspire, foster discussion, and expose students to contemporary GIS applications in various natural resource fields. These will never be required

Discussions and Feedback Participation: Students are expected to interact with each other on the course discussion board in several ways

- Requesting or giving help with labs. If you ever run into an issue with an assignment, the Discussion board should be the first place you go. Here, people can post questions, and other students or I will help out. Students are invited to help each other work through encountered problems to further promote GIS problem solving
- Posting finished labs. Each week you'll post your finished work on a Canvas Discussion board. This is a positive environment to share your work with your peers and get some feedback as to what went well and what could use improvement.
- Lab Feedback for me. Occasionally I will ask for your feedback on a certain lab, and you can tell me which parts were fun, which parts were confusing, and what you would like to see changed in the future. This will help labs down the road be more enjoyable.

Workload: I'm not going to lie; this course will be a lot of work. You should expect to spend at least 10 hours per week (or maybe substantially more) on the activities for each module.

That being said, I don't want you to spend that time hitting your head against the wall on the same issue. Work with me and your peers to help get through the difficult parts.

Course assessment: Assessment of the class will occur during week 15 utilizing the IDEA course assessment tool.

Grading

The primary goal for the course is that you engage in achieving the course objectives. In other words, learn GIS, become confident in your ability to troubleshoot issues and evaluate your results, become a proficient presenter of GIS results. Your grade is a secondary concern. If you are effectively learning, your qualitative success is almost certainly guaranteed, and 'quantitative' success should naturally follow. However, here are some guidelines to help manage your expectations and workload:

Points Breakdown:

Weekly Labs: 700 pts (70 per week)

Critique: 50 pts (5 per week)

Feedback: 50 pts (5 per week)

Final Project: 200 pts

Total: 1000 pts

Utah State University Grading Scale:

A (93-100%)

A- (90-92%)

B+ (87-89%)

B (83-86%)

B- (80-82%)

C+ (77-79%)

C (73-76%)

C- (70-72%)

D (60-69%)

F (Below 60%)

Communication

I will be available via email to answer any questions or to clarify issues that arise throughout the semester. Email is a faster mode of communication than Canvas and I will make strong efforts to respond to students as quickly as possible. Canvas will be utilized for class-wide announcements and addressing frequently asked questions. Students are expected to monitor email and Canvas in order to receive communications about the class in a timely manner. Individual and specific feedback will be provided on Canvas.

In addition to the forum, the instructor will use screen capture demonstration videos and other technologies to ensure that adequate interaction and assistance is available.

Late work

Any work submitted 1 day past the due date will receive an automatic 5% reduction unless due to a pre-approved excused absence. 5% will be deducted for each subsequent day after that, down to a minimum of 50%. Partial credit can be received for work turned in late assuming the student has sought approval from the instructor. ***No work will be accepted more than two weeks after the original deadline regardless of the circumstances.***

Let yourself be reminded: I really hate grading late labs. Late labs take 2-3 times longer to grade which is unacceptably inefficient. It is easier and less Painful for everyone involved if you submit your labs on time. If you notify me before the lab is due that you won't be able to turn it in on time, and your reason is valid, I am willing to work with you and find a solution. I am much more lenient if you notify me before the lab is due.

Submissions

If you submit an ArcMap project (*.mxd) you will receive zero points for the assignment. This file type does not contain any visible data (only links to your computer's data) so it is useless to me.

Do not submit labs that have been uploaded to your website "on time" but no URL was submitted to Canvas (the instructor does not sit around monitoring your websites for activity and the instructor is not clairvoyant).

Do not email submitted labs to the instructor. Emailed labs don't count as submissions.

Ok, now for the serious stuff:

I am not here to evaluate how clever you are at looking things up on the internet. I am here to teach you GIS theory and skills. I am here to evaluate your understanding of GIS theory and skills.

This class has been publishing their results on Google sites for YEARS. This means there is a wealth of readily accessible material out there for you to find. Good for you that you have ways of evaluating yourself and your results.

However, if you feel compelled to take any of this material and submit it as your own work you will fail this course and you will be reported to the University's office of student conduct. No exceptions. Keep in mind that no assignment will be identical to its previous iterations, so stealing from these websites is not only immoral, it's also useless.

Here are the supporting details:

Working together. You are welcome and expected to discuss lab exercises and help each other overcome obstacles encountered. Please take advantage of the external class forum whenever possible to view questions and answers previously posted about the lab work. *However*, each student must undertake their own analyses, make their own maps, produce their own figures and prepare their own websites and reports.

Plagiarism will not be tolerated. *Copying figures or text without appropriate citations or permission will not be tolerated.* Instances of plagiarism will be reported to the University.

If you are unaware of the University's three strike policy, you can read about it at: <http://catalog.usu.edu/content.php?catoid=12&navoid=3140>

Honor Pledge: Students will be held accountable to the Honor Pledge, which they have agreed to: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity."

Academic Dishonesty: Don't cheat. The Instructor of this course will take appropriate actions in response to Academic Dishonesty, as defined the University's Student Code:

Acts of academic dishonesty include but are not limited to:

- 1. Cheating: (1) using or attempting to use or providing others with any unauthorized assistance in taking quizzes, tests, examinations, or in any other academic exercise or activity, including working in a group when the instructor has designated that the quiz, test, examination, or any other academic exercise or activity be done "individually"; (2) depending on the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; (3)*

substituting for another student, or permitting another student to substitute for oneself, in taking an examination or preparing academic work; (4) acquiring tests or other academic material belonging to a faculty member, staff member, or another student without express permission; (5) continuing to write after time has been called on a quiz, test, examination, or any other academic exercise or activity; (6) submitting substantially the same work for credit in more than one class, except with prior approval of the instructor; or (7) engaging in any form of research fraud.

2. Falsification: altering or fabricating any information or citation in an academic exercise or activity.

3. Plagiarism: representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials.

This instructor highly values the University's Academic Code of Conduct and the integrity of this course. Plagiarism will not be tolerated in this course. I recommend that you clearly cite all sources referenced in any part of the work you submit for this course. Give full credit to the original source (person or entity) for any ideas, thoughts, phrases (reworded or not), or data that you use, in part or in whole.

*Full text of the Student Code available at available at available at
<http://www.usu.edu/student-services/pdf/StudentCode.pdf>:*

Special needs: Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated through the Disability Resource

Center (DRC) in Room 101 of the University Inn, (435)797-2444 voice, (435)797-0740 TTY, (435)797-2444 VP, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.