

# Advanced Methods in GIS

## Geography 4140/6140, Fall 2020

Instructor: Chelsea Ackroyd

Lecture: Online (Canvas)

Lab: Monday (Section 02), Wednesday (Section 03) 11:50 AM – 1:10 PM in GC 1855

Office Hours: Tuesday and Thursday 10:00 – 11:30 AM via ConexED, or by appointment

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Lab Instructor: Matthew Shawcroft

Email: [matthew.shawcroft@utah.edu](mailto:matthew.shawcroft@utah.edu)

Office Hours: TBA

### Course Description

This course explores the practice of using a geographic information system (GIS) to support geographic inquiry and decision-making. Students will strengthen their technical knowledge and skills in the common tasks that geographic analysts face in applying a GIS to a variety of spatial problems. The lab sections offer an opportunity to gain hands-on experience using a leading commercial GIS to complete a series of real-world tasks. The primary objective of the course is to provide students with the core competencies typically required for an entry-level GIS position.

### Prerequisite

GEOG 3100 or instructor consent

### Required Text

1. SLG: Smith, Longley, and Goodchild. 2015. Geospatial Analysis - A comprehensive guide (free online at <http://www.spatialanalysisonline.com/>)
2. Chang, Kang-Tsung. 2015. Introduction to Geographic Information Systems (8<sup>th</sup> ed.), McGraw-Hill. (ISBN: 978-0077805401)

### Canvas

All course materials will be provided via Canvas, and all assignments are to be turned in via Canvas as well. Please check Canvas regularly for announcements (it is encouraged to set up email-forwarding to ensure you receive important messages in a timely manner).

### Lab Assignments

The lab sections are an opportunity for you to apply the knowledge you gain through lectures and reading, and are designed to give you a practical, hands-on experience. If you feel that you are capable of completing the lab assignments without assistance, you are welcome to do so on

your own time as lab attendance is not required. There are 11 lab assignments in this course, and each is due on the following Wednesday from the week it is assigned (see Canvas for exact due dates). Labs submitted late will lose 10% of their value each day they are late. Assignments submitted > 1 week past due date receive zero credit. If you have special circumstances that will lead to missing multiple due dates (e.g. military service, prolonged illness, etc.) accommodations may be made, but you will be required to provide appropriate documentation and must provide notification in advance.

You are encouraged to help your neighbors if they run into technical problems that you can address, but each person is responsible for completing their own work. File sharing is NOT allowed and constitutes academic misconduct according to University standards. Labs that have been wholly or partially plagiarized will receive a score of zero.

### **Exams**

There are two examinations: one **midterm (Wednesday, October 7<sup>th</sup> – Friday, October 9<sup>th</sup>)** and one **final exam (Wednesday, December 2<sup>nd</sup> – Friday, December 4<sup>th</sup>)**. Exams will be conducted via Canvas. Once started, each student will have 3 hours to complete the test. Exams may include multiple choice, short answer, and essay questions. Exams cannot be made-up unless the instructor is contacted prior to the exam date.

### **Project**

Students will be responsible for defining a geographic problem or question, gathering and integrating the data, performing an analysis, and presenting the results. You will demonstrate that you can combine all the skills, knowledge and techniques you learned to design and carry out a GIS project. Think of a spatial problem from a topic that interests you (traffic, demographics, recreation, geology, water, etc.) and start thinking in terms of a GIS workflow: which methods and which data sources would I need to address this problem? The last two weeks of class will be dedicated to working on your final projects. Students in Geog 4140 may work in small groups (2-3 people), while students in Geog 6140 are required to work independently. Students will be required to submit a project proposal (**due Friday, October 9<sup>th</sup> by 11:59 PM**) and a final report (**due Friday, December 11<sup>th</sup> by 11:59 PM**).

### **Important dates:**

Last day to add classes without a permission code – Friday, August 28

Last day to add, drop (delete), elect CR/NC, or audit classes – Friday, September 4

Last day to withdraw from classes – Friday, October 16

Classes End – Thursday, December 3

Final Exam Period – Mon-Fri, Dec 7-11

### Course Schedule and Topics

DATE	TOPIC	READINGS	LAB
AUG 24	Syllabus and Introduction, Review of GIS Fundamentals	SLG: 1.1, 1.2, 1.3	
AUG 31	Data Acquisition, Data Accuracy and Quality	Chang: Chapters 5 & 7	Lab 1: Data Acquisition
SEP 7	Geometric Transformation	Chang: Chapter 6	Lab 2: Georeferencing**
SEP 14	Spatial Data Structure and Topology, Data Editing, Coordinate Geometry	Chang: Chapters 3-4 & 7	Lab 3: Parcels and Topological Editing
SEP 21	Cartographic Methods: Map Types, Data Classification	Chang: Chapter 9	Lab 4: Map Types and Data Classification
SEP 28	Spatial Statistics, Spatial Regression	SLG: 5.6	Lab 5: Spatial Descriptive Statistics and Spatial Regression**
OCT 5	<b>Midterm (October 7 – 9)</b>	---	Project Proposal due Oct 9 by 11:59 PM
OCT 12	Vector Data Analysis: Point Pattern Analysis and Area Pattern Analysis	SLG: 5.4 & 5.5	Lab 6: Cluster Analysis
OCT 19	Raster Data Analysis: Imagery Classification and Change Detection	Eastman 2013 paper	Lab 7: Imagery Analysis
OCT 26	Terrain Mapping and Analysis, Viewsheds and Watersheds	SLG: 6.1-6.4	Lab 8: Terrain Analysis

NOV 2	Mobile GIS		Lab 9: Web App Studio – Creation of a Citizen Science App
NOV 9	Spatial Interpolation	Chang: Chapter 15	Lab 10: Spatial Interpolation
NOV 16	Least-Cost Path and Network Analysis	Chang: Chapter 17	Lab 11: Network Analyst
NOV 23	Work on projects	---	---
NOV 30	Final Exam	---	---

**\*\*In-person lab instruction will not be held this week; see lab videos on Canvas for additional assistance.**

### Course Grading and Assessments

#### Percentage Points:

Labs	40%
Exams	30%
Final project	20%
<u>In-class tasks</u>	<u>10%</u>
Total	100%

#### Grade Scale:

A	92-100%
A-	90-92%
B+	88-90%
B	82-88%
B-	80-82%
C+	78-80%
C	72-78%
C-	70-72%
D+	68-70%
D	62-68%
D-	60-62%
E	<60%

## COVID-19

Based on CDC guidelines, the University requires everyone to wear face coverings in shared public spaces on campus. Note that some students may qualify for accommodations through the Americans with Disabilities Act (ADA). If you think you meet these criteria and desire an exception to the face covering policy, contact the Center for Disability and Access (CDA). If you need to miss class because you or a family member have COVID-19, or are experiencing difficulties due to COVID-19, please let me know in advance so we can accommodate for absences and make sure you still have a successful learning experience and semester. **Please remember, you must self-report if you test positive for COVID-19 via [coronavirus.utah.edu](http://coronavirus.utah.edu).**

## Additional Information

**Scheduling Conflicts:** Please speak with the instructor within the first two weeks of class regarding any known conflicts you may have with the course schedule.

**Academic Integrity:** The University of Utah is committed to nurturing academic excellence, truth, honesty, and personal integrity. The faculty expects all students to maintain high ethical standards. Academic misconduct will not be tolerated. Penalties will include failure of an assignment, or possibly the entire course, and the filing of formal charges with appropriate university authorities. Academic misconduct includes, but is not limited to, cheating, misrepresenting one's work, and plagiarism:

- Cheating involves the unauthorized possession or use of information in an academic exercise, including unauthorized communication with another person during an exercise such as an examination.
- Misrepresenting one's work includes, but is not limited to, representing material prepared by another as one's own work or submitting the same work in more than one course without prior permission of all instructors.
- Plagiarism means the intentional unacknowledged use or incorporation of any other person's work in one's own work offered for academic consideration or public presentation.

**Faculty and Student Responsibilities:** The class will follow accepted University of Utah policies and procedures. Please refer to the University of Utah Faculty Handbook (<http://www.admin.utah.edu/fhb/>) and Student Code (<http://www.admin.utah.edu/ppmanual/8/8-10.html>).

**Specifically:** All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in the Code. The Code also specifies proscribed conduct that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content.

According to Faculty Rules and Regulations, it is the faculty's responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

**Disability Accommodation:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

**Harassment:** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

**Note:** The syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification, particularly when the modification is done to rectify an error that would disadvantage the student.