

Syllabus: GEOG 560 Geographic information systems

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Course goals

The overarching goals of this course are to learn how to display, interpret, create, manipulate, and analyze geospatial data in a geographic information system. A core concept in geography is that the “WHERE” matters in understanding the “WHY”, and GIS gives you an important tool for finding out just how much it matters. Thus, we want you to have a strong enough foundation in GIS that you can begin using spatial data to answer the “WHY” questions important in your field.

Reaching this goal requires a blend of computer technical skill and basic understanding of the geographic and computational principles involved. Much like piloting an airplane, we need to both know how to manipulate the many controls and know the physics and mechanics involved in making those controls reach your goal. Fortunately, we won’t drop out of the sky if we mess up in this class, but we want to strive toward the understanding that will keep our conclusions and products reliable and solid.

Overview

I use a “flipped” classroom approach. Rather than a standard lecture, you watch a set of video lectures I have pre-recorded, and ask questions on Canvas about them. We use class sessions as discussions to dig into your questions, and to cover questions about review question assignments (see below). Labs will be in the Digital Earth computer lab on Wednesdays and Thursdays. We will have two short exams during the term. Finally, through the term you will develop a GIS-focused proposal that could turn into a project in a later course.

Learning outcomes

By the end of this course, you should be able to:

- Complete basic GIS tasks, including: acquiring data, preparing data for analysis, conducting basic geospatial analysis, creating research-grade maps, and documenting data for others to use.
- Describe how vector data are arranged and manipulated, and conduct basic database queries and manipulation
- Describe how raster data are arranged and manipulated, and conduct basic algebra and masking operations
- Evaluate common sources of error in vector and raster data
- Conduct basic problem-solving in the interpretation of GIS results
- Describe the importance of metadata
- Articulate the role of space as a source for explanation and understanding.
- Assess the increasing use of geospatial data in popular, commercial, and governmental spheres

General weekly structure

Monday: By Sunday night, I will post videos. You have Monday and Tuesday to review them. Separately on Monday, you post your evaluation of your answers to the *prior week's* Review Questions (see Friday). Also, Monday night I'll post this week's Review Questions.

By Tuesday evening: You weigh in on a Canvas discussion with specific questions on the videos (getting participation credit).

Wednesday morning: Attend lecture. We will use the questions from the Canvas discussion to guide the class.

Wednesday or Thursday: Attend Lab, and turn in your lab writeup from the prior week (except for two-week labs at the end of the term).

Friday: Attend lecture. In addition to digging deeper into the material from Wednesday, we will cover any questions you have on the Review Questions.

By Friday evening: You post your answers to this week's Review Questions. I'll post the answers shortly thereafter. By next Monday you'll review your answers and write a brief written reflection on them.

Canvas

We rely heavily on Canvas. Go to Canvas: canvas.oregonstate.edu. You should see *GIS I: Intro Geog Info Science* in your options. That's us!

I'm organizing the course into Weekly Modules, so use the "Modules" tab on the left of your Canvas screen to navigate the course. Each module will hold the videos, discussions, and weekly review questions.

Calendar

This can change slightly over the term, so I prefer to use the Canvas site to keep a current copy of the course calendar.

Readings

Core readings are from "GIS Fundamentals" (6th Edition), by Paul Bolstad. You should be able to buy the book from the bookstore, but it's also quite easy to get on Amazon and it is not that pricey.

As each week progresses, I will specify on Canvas which subsections of a given chapter are most relevant to a given class period. As the term progresses, I may adjust or augment the reading list or schedule, and I will let you know to check for new versions of the calendar as necessary.

If you have earlier editions of the book, you should be roughly okay – I'll try to post both section headers on Canvas so you can orient with the older edition even if the page numbers are slightly different.

Grading

The breakdown of your grade is as follows:

Labs: 30%
Weekly Canvas Discussion Participation: 10%
Weekly Review Questions: 25%
Exams: 15%
Project proposal: 20%

Details on each course component follow in the next sections.

Final grades will be based on standard percentile breakdowns on a non-stretched scale: 90 to 100% of points will earn you an “A”, 80-90% of points a “B” (with + and – at the margins of the range), etc.

Course components

Labs (30% of your grade)

Labs are critical because GIS is a hands-on endeavor. While there is a blossoming world of open-source tools to conduct geospatial analysis, we need to pick software package to learn on, and for that I still lean on the industry standard ArcGIS Pro. Oregon State University has a campus-wide license that allows you to use and even download to your own computer the software. My goal is not to have you memorize this particular software package, but to use it to learn the material so you can go on your own way. In the last week of class, you can also choose to explore QGIS, an open-source software package.

Your lab will be in the Digital Earth computer lab in Wilkinson Hall. Your TA will give a short introduction and be available for questions during the remainder of the 2-hour lab period. There is no lab in week 0 – labs begin in Week 1.

NOTE: As with many geospatial courses, the labs often take longer than just 2 hours to get done. We will cover your options for returning to the Digital Earth lab at other times during the week. As an OSU student, you can also get a copy of ArcGIS Pro for your own computer, but it needs to run the Windows operating system.

Labs are worth 10-25 points each, depending on the lab. Note that these then get scaled to 40% of your total course grade.

Weekly Discussion Participation (10% of your grade)

After I post videos on Sunday evenings, you’ll have two days to watch them, and then weigh in on them by answering simple prompts I give you. Over the course of the term, we will have nine sets of videos.

Grading: Each week's discussion grade will have the same weight. You'll get up to three points if you simply answer each of the prompts sufficiently for me to see that you have devoted some brain cells to the topics, and one extra credit point if you give substantive feedback to one of your comrades-in-GIS on the discussion board.

Weekly Review Questions (25% of your grade)

We will use written, self-graded weekly assignments to help you track your progress and make sure you're learning the material that is important.

On Monday each week, I'll post a set of questions from the material we're covering that week. I try to make the questions span knowledge comprehension to evaluation and some synthesis. You post answers to the questions on a Canvas assignment by the Friday. Then you'll be able to see my answers to the questions. By the subsequent Monday, I want you to reflect on the topics – either something you learned or still don't understand, or perhaps where you can expand on a topic in some interesting way. You'll post this reflection to a public Canvas Discussion on the subsequent Monday.

You'll have eight sets of these through the term.

Grading: When you post your answers, you'll get two points just for answering all of the questions as best you can. When you post your reflection, you'll get two points for a thorough walk through of your answers – evaluate each answer and reflect on the items on which you agreed and disagreed with my answers.

Exams (15% of your grade)

We will have two short exams during the term. Both will be multiple-choice format designed to assess how you are doing on internalizing the core concepts. The questions will come directly from the weekly review questions. Note that these are a relatively small percentage of your grade meant to assess and point to areas of improvement, not to punish you. As noted above, these exams will occur on two Mondays during the term (Week 5 and Week 9).

Project Proposal (20% of your grade)

All of this GIS stuff is more fun if you can think how you would apply it to a project of your own interest. However, we don't attempt a full-on project in this course. That's largely because you're just starting out, and it's hard to know what a GIS project even would look like until you're almost done with this course. Plus, the follow-on course to this course (GEOG 561) is a project-based course. However, by the end of the term I hope you have some idea of the basic outlines that you might use spatial data to answer a question.

Thus, I ask you to construct a short project **proposal** to me. It has two components: A written narrative, and a workflow diagram (which we will be learning about throughout the term).

The narrative should only be about a page in length (250 words max), and should include:

- Problem statement: What is the gap in knowledge?
 - o Cite one or two papers from your own field that show why this gap exists.
- Solution overview: How can spatial analysis address the gap in knowledge?
 - o Cite one or two papers from geospatial peer-reviewed literature that give an example of the analysis
- Datasets: Describe the datasets (or the formats of ideal datasets) you would use or create
- Analyses: Describe what spatial analysis steps you would use to answer the core research question.

The workflow diagram should include a visual representation of the datasets, analysis, inputs and outputs of your work. We'll discuss more about the specific features of such a workflow diagram as the term progresses.

Grading:

Narrative (50%): You'll get full points if you make sure you are addressing all four points clearly, and that you've put some thought into questions and the approaches you'd use. If you go over and above with insightful (but concise and < 250 words!) ideas, you can earn up to 2 extra points.

Workflow (50%): You'll get full points if you include all of the characteristics of an effective workflow – clear inputs and outputs and a modular structure that is achievable.

Timing: This proposal is done in lieu of a final exam. It will be due at midnight on the Monday of finals week.

Late stuff

Check in advance if you have a problem meeting a due-date for a lab, assignment, etc. If you're sick but not deathly ill, try to at least email me. I'm a reasonable guy. If you don't check with me or with your TA, we'll have to consider it late.

And please do not turn stuff in late. Unless you've cleared with us before the original due date, you'll lose 10% of the points per day. After five days, we won't grade it. The one exception: For assignments that are not labs, I'll give each person a freebie to turn in one assignment up to two days late without penalty. If you're using your freebie, mark it clearly IN THE TEXT OF THE DOCUMENT! Thanks.

The Rules (yeah, the rules)

- Student conduct is governed by the university's policies. Please be aware of student conduct and community standards at OSU:
<http://oregonstate.edu/studentconduct/home/>
- You know the drill: Your work is your own. Maintain academic integrity and honesty. If you have any questions about what this means, it's your

responsibility to figure it out! Check out <http://oregonstate.edu/studentconduct/offenses>.

- Incomplete grades will be given only under the most dire of circumstances.

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.

Expectations for Student Conduct:

Student conduct is governed by the university's policies, as explained in the <http://studentlife.oregonstate.edu/studentconduct/offenses-0>

More specifically, in an academic community, students and faculty, and staff each have responsibility for maintaining an appropriate learning environment, whether online or in the classroom. Students, faculty, and staff have the responsibility to treat each other with understanding, dignity and respect. Disruption of teaching, administration, research, and other institutional activities is prohibited by [Oregon Administrative Rule 576-015-0015 \(1\) and \(2\)](#) and is subject to sanctions under university policies, [OSU Office of Student Conduct](#).

Students are therefore expected to conduct themselves in the course (e.g., in lab/classroom, on discussion boards, email postings) in compliance with the [university's regulations regarding civility](#). Disrespectful behavior to others (such as harassing behavior, personal insults, inappropriate language) or disruptive behaviors in the course (such as persistent and unreasonable demands for time and attention both in and out of the classroom) is unacceptable and can result in sanctions as defined by Oregon Administrative Rules [Division 015 Student Conduct Regulations](#).

Academic Integrity — Students are expected to comply with all regulations pertaining to academic honesty, defined as: *An intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work.* For further information, visit [Academic Integrity for Students](#) provided by the OSU Libraries.

Statement on the use of ChatGPT and other AI – AI-related technologies are unavoidable and can serve as useful tools to both learn and create content. They clearly can also be misused. By and large, the format of the assignments and labs in our class does not lend itself to abuse with AI. I have no issue with you utilizing AI to help you learn -- I simply request that you do not use it *in place of learning*. If it appears that AI is

being abused to avoid learning, I will take whatever action I need to ensure equity and parity across students in the class.

Diversity Statement:

Oregon State University strives to create an affirming climate for all students including underrepresented and marginalized individuals and groups. Diversity encompasses differences in age, color, ethnicity, national origin, gender, physical or mental ability, religion, socioeconomic background, veteran status, sexual orientation, and marginalized groups. We believe diversity is the synergy, connection, acceptance, and mutual learning fostered by the interaction of different human characteristics.

Religious Holiday Statement:

Oregon State University strives to respect all religious practices. If you have religious holidays that are in conflict with any of the requirements of this class, please see me immediately so that we can make alternative arrangements.

Student Assistance:

Contacting you:

If we need to get in contact with you personally, we will use the primary email that gets linked to you in your Canvas account. Please make sure that you read messages arriving at that address.

Contacting the instructor:

Email with questions (see below). If your question pertains to the course material, please post this question to the general Discussion Board so that everyone can benefit from the exchange.

Email etiquette

- **Preferentially use the Canvas email to communicate.** If you use regular email, please include "GEOG560" in the subject line of all emails with me so we can see it within the sea of other emails.
- We'll try to answer all appropriate emails within 24 hours. Don't expect an instant response, though.
- We'll respond quicker to emails that have clear subject lines.
 - A good subject line: "GEOG560: Problem saving file to my data directory"
 - Bad subject lines: "question....", "today", "confused", etc.
- We'll respond quicker to emails where the core question in the body of the email is put in bold face, and where separate ideas are in separate paragraphs. Stream-of-consciousness text works fine for some fiction, but I find it hard to parse out.

Please use full sentences in your email and make sure you've thought through the email. We reserve the right to not respond to lazy emails...

On Campus Tutoring:

OSU Academic Success Center: <http://success.oregonstate.edu/>

Course evaluation

Everyone can learn, even old fogeys like me, and it's especially important now. I may ask for feedback from you during the term so I can improve the course each year. Don't worry – I really do want feedback, even if it ain't glowing. Constructive ideas ("this is how you could improve the course") are way more helpful than ad hominem attacks ("you suck and your shirts are ugly").