GEOG 492/592/USP 592 Advanced GIS: Course Syllabus

Instructor Information

- Instructor: Geoffrey Duh
- Teaching Assistant: Luke Mitchell-Nelson
- The School of Earth, Environment, & Society - Geography Academic Area
- Office Hours: Check with the Geography front desk at Cramer Hall 409. Make appointments with Geoffrey Duh at https://calendly.com/jduh/30min.
- Preferred Contact Information: Post questions on Slack course workspace. Contact Geoffrey Duh (jduh@pdx.edu) for other course questions.

Course Information

- Spring 2026
- CRN: GEOG 492 61104 / GEOG 592 61118 / USP 592 63276
- Credits: 4
- Location and/or modality: Online with optional in-person/online labs at VSC B1-08 and Zoom
- Meeting times: Optional labs Monday 11 am - 12:40 pm in-person and Zoom and Thursday 1:30 pm - 3:10 pm Zoom only

Course Description and Learning Objectives

Students will learn how to solve spatial decision problems with GIS and understand the limitations and pitfalls of using GIS. The major learning objectives of the course are that students will 1) develop problem-solving skills and 2) interpret quantitative (statistics) results of GIS analysis correctly. The course includes the theory and methods involved in multicriteria spatial analysis, network analysis, GIS modeling, spatial interpolation, and geostatistical analysis. The practical component includes the use of ESRI's ArcGIS Online, ArcGIS Pro, and its extensions, including Spatial Analyst, Network Analyst, and Geostatistical Analyst. Both the theoretical and practical components of the course are important. Students will work on a final project in which they investigate a GIS application in depth based on the concepts and techniques learned in class.

How to succeed in an online course?

More and more people in the workforce—and mostly knowledge workers—will have to manage themselves.

—Peter F. Drucker, Management Challenges for the 21st Century

Learning self-management is also one of the goals of this online GIS course. Given the open-ended nature of data science inquiries, GIS professionals must be good at self-management to be productive. Among other benefits, taking an online course is a good opportunity to learn and practice self-management. You must develop new skills (finding meanings in the tasks you are undertaking, time management, and others) to succeed in an online course. Here is one useful tip: "Students really, really need to be organized from the beginning to be successful in an online course, all assignment due dates should be in their calendar, online or paper folders should be created for each week, [and] the work area should be not only quiet but clean—keeping all coursework materials together." - Karen Stevens, chief undergraduate adviser of the University of Massachusetts—Amherst's University Without Walls program. Read the complete article here.

The course lecture materials are delivered online. The online components (readings, discussions, and quizzes) are administered automatically on Canvas based on a strict weekly schedule (midnight Sunday to 11:59 pm the following Sunday). The weekly online materials become available at the beginning of the week (Sunday). All online activities for that week must be completed by the end of the week (11:59 pm on the Sunday of the weekend). See the class schedule table below for the beginning and ending dates of the weeks. Make sure that you start working on Canvas weekly assignment(s) at the beginning of the week.

STEM Course Support at The Learning Center

At The Learning Center Academic Coaches offer free, personalized one-on-one sessions to enhance study strategies, time management skills, test preparation, and more. We have coaches with a variety of specializations, including STEM. Explore our Meet the Coaches page to schedule a session with a coach that aligns with your specific needs. Additionally, our tutors are available for many lower division STEM courses. Schedule a tutoring session through the Penji tutoring page to receive assistance in your STEM studies.

Course Prerequisites

GEOG 488 / 588

Required Materials

There is no required textbook for this class. Instead, students will read articles from peer-reviewed journals. These articles will be available on Canvas. See the Readings section for a complete reading list. Students need to have access to ArcGIS Pro software in the GIS labs or on their personal computers. It’s highly recommended that students have access to a USB 3.0 thumb drive (512 MB or larger) to transfer their class data between different computers.

Major Assignments

Lab Exercises

The course has reserved a specific time slot for VSV B1-09 for students in this class. Students are welcome to use VSV B1-09 during these hours. TA and the instructor have maintained separate office hours. TA office hours' attendance is not mandatory but highly recommended for students that need help with their assignments. This class has two TA office hour sessions (Monday and Friday over Zoom) during which TA is available for answering questions. Students can attend either one or both. These practical exercises provide a way to acquire skills using ArcGIS and to apply the course concepts to real data. All exercises require a significant amount of time to finish, so make sure you pace your lab exercises appropriately so that you keep up with their schedule. The lab instructions are available on Canvas. You can do the labs on your own computer or using CH 475, VSC B1-09, or VSC B1-13. Please refer to the Lab syllabus for lab submission, due dates, and late policies.

Students should post lab questions on GIS II Slack channel. Students are encouraged to answer questions posted by their peers.

Exams

There are 5 quizzes throughout the term (see the schedule table for the exact quiz schedule). There is no final exam. Students have one week to complete the quizzes, from Monday morning to Sunday midnight. All quizzes are open-book and do not have a time limit to complete them, as long as they are submitted by Sunday midnight. Students are allowed to have two attempts on these quizzes. Some quiz questions are specific to ArcGIS software. Feel free to try out the answers in ArcGIS before providing an answer.

Class Participation

You are expected to read the weekly readings. There are several quizzes associated with the technical readings and ESRI online courses for the instructor to evaluate your progress in class. We will also read a couple non-technical, but important GIS articles this term. To facilitate the exchange and sharing of your thoughts and opinions on these articles (weeks 3 and 9), there are Canvas online discussions that you must participate. You need to respond to all the posted questions by the end of the week and are encouraged (and welcome) to engage in any follow-up discussions on Canvas. The instructor will monitor the discussion activities on Canvas and use the information for grading the class participation component of the final grade.

e-Portfolio

By the end of Week 9, students must create an e-portfolio as an ArcGIS Online story map using the materials from their lab work. The portfolio should highlight the key GIS techniques of each lab. Each e-Portfolio entry, which represents a specific GIS technique that students learned in the labs, includes a short paragraph (with 3 to 4 sentences) and a one-page images/pictures/maps. Each lab in the e-Portfolio must have at least one but no more than four e-Portfolio entries. An e-Portfolio counts towards 5% of a student's overall grade.

Students have the option to correct the errors they made in their labs and reclaim some of the deducted points by including the corrected materials in their e-Portfolio. If a student plans to use their e-Portfolio

materials to make up for their lab points, then for each lab they must write an email to the instructor (jduh@pdx.edu) with a narrative stating how the issues are addressed in the portfolio and the number of points they request to be reinstated. See course's Canvas e-Portfolio module for more information.

Graduate students also need to include the 250 words final project abstract and a concise summary of their project in their e-Portfolio. The summary should highlight the objectives, methods, and results of their project. See the Project section below for more information on the graduate requirements for the final project. The final project entry in the e-Portfolio will be counted toward the student's grade of their final project. The deadline for this e-Portfolio component is the same as the deadline for the final project.

Project

A GIS project is required for all students. Students could work alone or as a group depending on the scale of the project. The project should investigate a particular research problem using the GIS software packages that we use in class. You will acquire spatial data and, if necessary, digitize the data yourselves. The project must involve some types of spatial analysis with a quantitative component. The deliverable is an ArcGIS Online StoryMap that will be reviewed by your classmates during the final exam period. Please visit the instructor's student project page for examples of previous GIS student projects.

Graduate students also need to submit a 250 words project abstract that provides a comprehensive description of the project. See this wiki page or any journal articles we read this term for examples of how to write an effective abstract. In addition, graduate students are required to add the abstract and a summary of their final project to their e-Portfolio.

There are two major milestones of the project:

Project proposal: (see Schedule Table for the due date): Submit a one page project proposal. See Canvas for proposal preparation instructions. If you have any questions, please meet with the instructor before the due date to discuss your proposal.

Peer-Review of StoryMaps: You will create an ArcGIS Online StoryMap for your final project. Students will perform a peer-review on the story maps during the final exam period. See Canvas for AGOL StoryMap instructions.

Grading Criteria

The final grades will be assigned based on separate curves for graduate and undergrad students. Please note that Canvas grade book only keeps track of some of the grading components. Its reported grade/scores might not reflect your final grade in this class. The components of the grade are:

- Lab assignments: 30%
- Class quizzes: 25%
- Class participation: 15%
- e-Portfolio: 5%
- Final project: 25%

Flexibility Statement

The instructor reserves the right to modify course content and/or substitute assignments and learning activities in response to institutional, weather, or class situations.

Course Calendar/Schedule

Week 1

- Course Overview & Basic GIS Concepts Review
- Lab 1: Raster Analysis Tools in ArcGIS

Week 2:

- Raster Data Analysis
- ESRI Online course: Suitability Modeling: Creating a Weighted Suitability Model
- Lab 1 continued

Week 3:

- Environmental Justice Analysis (Online Quiz #1 - 10 points)
- Canvas Online Discussion: Volunteered Geographic Information
- Lab 2: ArcGIS Online Web Maps and Map Applications

Week 4:

- Dasymetric Mapping
- Lab 3: ArcGIS ModelBuilder

Week 5:

- Project Proposal due by Sunday midnight
- Multi-Criteria Decision Making and Geostatistical Interpolation: Introduction (Online Quiz #2 - 10 points)
- Lab 4: Dasymetric Mapping

Week 6:

- ESRI Online course: Network Analysis (Online Quiz #3 - 10 points)
- Lab 5: Network Analyst

Week 7:

- Spatial Pattern Analysis
- ESRI Online course: Mapping Clusters: Introduction to Statistical Cluster Analysis (Online Quiz #4 - 10 points)
- Lab 6: Spatial Pattern Analysis

Week 8:

- Statistical GIS Modeling

- ESRI Online course: Introduction to Regression Analysis Using ArcGIS Pro (Online Quiz #5 - 10 points)
- Work on final projects

Week 9:

- Canvas Online Discussion: Online: Critical GIS
- Work on term projects

Week 10:

- Work on term projects

Final Week:

- Online Project Story Map Peer-Review (see course schedule table below for due date)

Week	*Date*	*Lab & e-Portfolio Due Date*	*Canvas Quiz*	*Canvas Class Participations*	*Final Project*
1	Mar 30 - Apr 5	-	-	Getting Started	-
2	Apr 6 - 12	Lab 1 Apr 10	-	-	-
3	Apr 13 - 19	Lab 2 Apr 17	Quiz #1	Canvas Discussion	-
4	Apr 20 - 26	Lab 3A Apr 22 Lab 3B Apr 24	-	-	-
5	Apr 27 - May 3	Lab 4 May 1	Quiz #2	-	Proposal due (May 3 midnight)
6	May 4 - 10	Lab 5 May 8	Quiz #3	-	-
7	May 11 - 17	Lab 6 May 15	Quiz #4	-	-
8	May 18 - 24	-	Quiz #5	-	-
9	May 25 - 31	e-Portfolio May 31	-	Canvas Discussion	Share project storymap
10	Jun 1 - 7	-	-	-	-
11	**Finals week**	-	-	-	**Project due: Jun 10, noon** Online Peer-Review

Readings

The pdf files of the class readings are available on Canvas.

Week 1: Course Overview

- ESRI. 2013. The Language of Spatial Analysis.

Week 2: Raster Data Analysis

- ArcGIS Pro Spatial Analyst Online Documents - Performing Analysis (https://pro.arcgis.com/en/pro-app/latest/help/analysis/spatial-analyst/performing-analysis). Read all subtopics in the Performing Analysis container.

Week 3: Environmental Justice Analysis & Volunteered Geographic Information

- Chakraborty, J. and Armstrong, M.P. (2001). Assessing the impact of airborne toxic release on populations with special needs. Professional Geographer, 53(1):119-131. (ChakrabortyArmstrong_2001.pdf)
- Elwood, S., et al. 2012. Researching Volunteered Geographic Information: Spatial Data, Geographic Research, and New Social Practice. Annals of the Association of American Geographers, 102(3): 571–590. (Elwood_2012.pdf)

Week 4: Dasymetric Mapping

- Eicher, Cory and Brewer, Cynthia 2001. Dasymetric mapping and areal interpolation: Implementation and evaluation. Cartography in Geographic Information Science, Vol. 28, No. 2 pp. 125-138. (EicherBrewer_2001.pdf)
- Holloway, S. R.,J. Schumacher, and R. Redmond. 1996. People and place: Dasymetric mapping using Arc/Info. Missoula: Wildlife Spatial Analysis Lab, University of Montana.

Week 5: Multi-Criteria Decision Making & Geostatistical Interpolation: Introduction

- Fuller, D.O., Williamson. R., Jeffe, M., and James, D. 2003. Multi-criteria evaluation of safety and risks along transportation corridors on the Hopi Reservation. Applied Geography, 23 (2-3): 177-188. (Fuller_etal_2003.pdf)
- ESRI E-Learning course: Geostatistical Interpolation: Introduction
- Pages 49-79. Using ArcGIS Geostatisical Analyst (Using_Geostatistical_Analyst.pdf)

Week 6: Network Analysis

- ESRI E-Learning course: ArcGIS Network Analyst: An Introduction
- ESRI online documentation on Network Analyst

Week 7: Spatial Pattern Analysis & Exploring Spatial Patterns in Your Data Using ArcGIS

- Zhang, C. et al. 2008. Use of local Moran's I and GIS to identify pollution hotspots of Pb in urban soils of Galway, Ireland. Science of the Total Environment, 398, pp. 212-221. (Zhang_etal_2008.pdf)
- ESRI E-Learning course: Mapping Clusters: Introduction to Statistical Cluster Analysis
- Read ArcGIS Online Help for all tools in the Spatial Statistics Toolbox.

Week 8: Statistical GIS Modeling

- Lee, S. and Pradhan, P. 2007. Landslide hazard mapping at Selangor, Malaysia using frequency ratio and logistic regression models. Landslides, 4: 33-41. (LeePradhan_2007.pdf)
- ESRI E-Learning course: Introduction to Regression Analysis Using ArcGIS Pro

Week 9: Critical GIS

- Schuurman, Nadine (2006). Formalization matters: Critical GIS and Ontology research Annals of the Association of American Geographers, 96(4), 2006, pp. 726-739. (Schuurman_2006.pdf)

Week 10:

- No reading

PSU Policies and Resources

Academic Integrity & Grading Policies

- PSU Academic Calendar
- PSU Grading System
- Student Code of Conduct
- Incomplete Grades Policy

Student Support Resources

- How to Find Help at PSU
- Access and Inclusion for Students with Disabilities
- Understanding Sexual Misconduct
- Title IX Reporting
- Religious Accommodations

Technology Usage

AI Usage

In this course, generative AI tools are generally allowed with attribution.

The instructors accept, but do not encourage, any use of AI tools to supplement your learning in class. Any use of AI, except for editorial corrections, must be attributed in your submitted assignments. The generation of content through AI without appropriate attribution constitutes academic misconduct. You should practice

ethical, mindful uses of AI that are in accordance with PSU AI guidelines and student codes of conduct. Always embrace the human-in-the-loop (HITL) approach when interacting with AI tools.

See this OIT page for GenAI resources on campus.

Recording Technology Notice

We might use technology for virtual meetings and recordings in this course. Our use of such technology is governed by FERPA, the Acceptable Use Policy and PSU's Student Code of Conduct. A record of all meetings and recordings is kept and stored by PSU, in accordance with the Acceptable Use Policy and FERPA. I will not share recordings of your class activities outside of course participants, which include your fellow students, TAs/GAs/Mentors, and any guest faculty or community-based learning partners that we may engage with. You may not share recordings outside this course. Doing so may result in disciplinary action.

Turnitin

Students agree that by taking this course all required papers may be subject to submission review for textual similarity for the purpose of detection of unoriginal writing, including plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting unoriginal writing, including plagiarism of such papers. Use of the Turnitin.com service is subject to the Turnitin Acceptable Use posted on the Turnitin.com website.

Zoom AI

We might use the Zoom AI features for virtual meetings, recordings, and transcriptions in this course. Our use of these tools is governed by FERPA, PSU's Acceptable Use Policy, and the Student Code of Conduct. Meeting records, recordings, and transcripts will be stored securely by PSU. You may not share recordings or transcripts outside of this course without explicit instructor permission.

Google AI Studio

In this course, we may use Google AI Studio. Data entered into Google AI Studio may be used by Google to train future models or for human review and is therefore not appropriate for sensitive or personally identifiable information (e.g., information that could specifically distinguish or trace to you or others).

In Case of Emergency

- **Call 9-1-1 for Emergencies**: Immediate threat to life and safety

For issues such as a medical emergency, urgent violent incident, fire, etc., you can also call 503-725-5911

- **Call 503-725-4407** for Non-Emergencies: Campus Public Safety Office (CPSO) – Non-Emergency

  For non-emergency issues such as vandalism, disturbance, suspicious person, theft, suspicious packages, access control, etc.

GIS II LAB SYLLABUS

GIS II (Spring 2026)
GEOG 492/592 & USP 592

TA: Luke Mitchell-Nelson (lmitch@pdx.edu)

Lab Hours (i.e., TA's Office Hours):

- **Monday** 11 am – 12:40 pm (in person at VSC B1-08 and Zoom)
  - Monday Zoom URL: https://pdx.zoom.us/j/84948273924
- **Thursday 1:30 pm - 3:10 pm (Zoom only)**
  - Thursday Zoom URL: https://pdx.zoom.us/j/89539558479
- Or by appointment. (Start the conversation on Slack! Post your lab questions on the course's Slack channel so we can learn together as we complete each lab. We will monitor this space regularly to assist while outside office hours.)

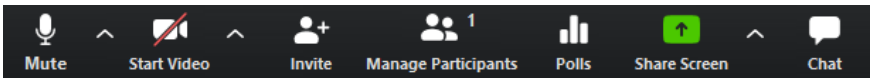
Communication:

Slack: We will utilize Slack as an open communication platform for the class. If there are any questions about lab work please post them there. This way everyone can read and respond and it may answer similar questions for other students as well as allow other students to help out. No question is too small for this. We recommend actively checking the Slack daily. If there are questions about lab grades or feedback once the lab is submitted please email TA directly.

Email: This is the quickest way to reach Luke. It may take him some time to reply on Slack so if there has not been a response for a day please send a reminder email. If you need an extension on a lab make sure to email by or on the due date to avoid late submission penalties.

Online Lab Session Communication: During the online lab sessions, you can use audio or chat on Zoom. TA will also monitor Slack and email as well.

1. Log on to Canvas (https://canvas.pdx.edu/). Select 'Zoom" from the navigation bar on the left.
2. Follow the prompted instructions to install the Zoom application the first time you use the Zoom Meetings feature on your computer.
3. Start Zoom and go to the dashboard. Join the meeting and wait for the TA to admit you to the live audio/video call. You can use the Zoom main panel to share your computer screen if necessary. See the Zoom Support page (https://support.zoom.us/) for software instructions.



ODIN Account and Access Badges: In order to participate in class, you need to have an ODIN account. In the lobby of Fariborz Maseeh Hall (FMH) is the PSU IT User Support Services (aka IT Helpdesk). They can help you set up your account. You could use VSC B1-08 during lab's reservation time or when it's not used. You can also use your PSU badge to access VSC B1-13 24/7.

Grading: Maps and answers to questions contribute equally to the total score. The total lab score for the term will account for 30% of students' final grades. Labs must be submitted by the listed due dates (or earlier) on Canvas (see instructions below).

How to submit an assignment: Lab instructions are available on Canvas, under the module for the week each one is assigned. Please submit your completed labs to the Assignment in Canvas as PDF file(s). All answer sheets and maps must be submitted to Canvas by their respective due dates (before midnight). Lab grades will usually be posted on Canvas within a week of the due date (although this is subject to change).

Late work: Each lab is due according to the date it is assigned below. Labs are not considered complete until they have been submitted on Canvas.
This course moves quickly, and you will get the most out of it by staying on top of your work and turning in assignments on time. Unless prior arrangements have been made with the TA, late labs will be docked 10% for each week that has passed since the due date.
Please speak with the TA if you are having trouble finishing your lab due to difficult life circumstances. If you know you will need an extension on a lab make sure to email by or on the due date to avoid late submission penalties.

Due dates of labs:

Lab 1: Raster Analysis Tools (147 points)	Due by 04/10 (11:59P)
Lab 2: ArcGIS Online Web Maps and Map Applications (50 points)	Due by 04/17 (11:59P)
Lab 3A&B: ArcGIS ModelBuilder (A: 10 points; B: 72 points)	Due by A: 04/22, B: 04/24 (11:59P)
Lab 4: Dasymetric Mapping (78 points)	Due by 05/01 (11:59P)
Lab 5: Network Analysis (71 points)	Due by 05/08 (11:59P)
Lab 6: Spatial Pattern Analysis (121 points)	Due by 05/15 (11:59P)

Academic honesty: All answers on lab assignments must be your own. This means that you must use your own words and make your own maps. Cut-and-paste answers from the book (or a lab partner) will not be given credit. Feel free to work together in labs and help out your classmates but understand that duplicate answers or maps will be considered as cheating, and these will receive no credit. PSU policies toward academic honesty and integrity apply.

GIS II Lab Work Expectations

Data management: Proper data management is always important. Create folders with descriptive names to save your lab files and reports, and to back up your data. Pay attention to file structure and names. Organization can save a lot of time and trouble. *ArcGIS Pro does not like spaces or non-alphanumeric symbols in the file or path name. Just use letters, numbers and/or underscores only.* It will make your life easier.

Lab reports: You will be held to a higher standard than in GIS I for format and content. Proper grammar is mandatory, and concise explanations are imperative. Make sure to describe the operations you are performing. By now you should be familiar with basic GIS terminology, so you are expected to use it in your lab answers. When answers to questions are not placed directly on the maps, please include the answers with the questions. For conceptual questions, consider definition, example, and detail. Generate your maps as indicated in the instructions. Proper page formatting and layout are expected.

Maps:

1. Maps should be properly labeled with their corresponding exercise number. It is better to embed maps in your lab report rather than including them all at the end. However, I will need to be able to read them. Take this into consideration with print size (especially for labels).
1. **Map layouts should always stand alone as single page and include the basic elements: title & exercise number, name & date, data source(s), legend (and/or appropriate labels), scale bar, north arrow unless specified in the exercise. Any map missing any one of these elements will lose points. Make sure to include them!** Please note that "Geog. 492," "PSU," and "I drive" are NOT data sources.
2. While this is not a course in cartography, maps are the most common communication tool you will employ as a GIS practitioner to report your analyses. To communicate effectively, symbology must be properly designed. The default symbology of many GIS programs is not always the best one. Consider the number of levels, units and significant digits. A "metadata" text box including author, date, data sources for each exercise, and information about the analysis will lend credibility to your maps and is required on each map layout.
3. Maps will be graded on legibility, not by aesthetic taste. If text, symbols, or any other map components are not displayed so that an ordinary person can read them, points may be deducted from your map.
4. Make sure that your layout page is set up correctly to avoid any cutoffs when you export your maps. You will be deducted points for cutoffs. This extends to visible area of maps. Make sure maps are zoomed to the correct areas and all areas of interest are included and cut off or too small to read.
5. Avoid using decimals in your map scales. Adjust your scale so that all the numbers are integers. Make sure units in scale match reported units in lab question.

Answering Questions:

1. Always use complete sentences. Partial sentences will receive partial credit. One-word answers are not acceptable.
2. Do not copy answers from the book, internet, or a classmate. If your answers are not your own, written in your own words, you will not receive credit.
3. When answers to questions are not placed directly on the maps, please include the answers with the questions. Differentiate your answers from the questions - this can be by using bolding, italics, or underlining. Using a different font color is okay, but please use a dark color (avoid a bright one) for readability.
4. Please export your maps in PDF format, 150 dpi. If an exercise asks to save the maps as images, then the output image should be a PNG file. If you are having a problem exporting a file then a screenshot may be suitable but please email before submission. Please submit your answer sheets and map layouts in PDF format. These can be one PDF document with map layouts at the end or the worksheet and map layouts can be submitted as separate files. If submitting as one PDF file please make sure that map layouts are each an individual stand alone page with no header or footer.

Tips for Earning Maximum Credit:

1. Make sure all required map layout elements are present. These can be anywhere from 1-2 points each and may be 6 to 12 points *per layout* if you miss them. These are easy points and can add up to a significant amount of points missed per lab.
2. Always follow the directions. Example: Sometimes you are asked for specific info or symbols in your legends. If directions are not followed, full credit will not be given.
3. Try to answer the question according to the amount of points it is worth. Example: A 6-point question answered with one brief statement will rarely receive full credit.
4. If you are having trouble with a lab, please ask your TA for help. (That's why I am here.)
5. Look at your Canvas Assignment submission for TA lab feedback. Learn from earlier mistakes.