

GEOG 155/255: GIS Data Acquisition & Management

Days/Time: TR from 12-2:05p

Location: TSC 5027 (if Zoom, see Canvas)

Instructor: Anna Klimaszewski-Patterson

Office: Sequoia 330 & Zoom

Office Hours: 9-10:30a MW & by appt

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Course Description:

This course focuses on acquisition & management of geospatial datasets and addresses the interpretation of a variety of data formats available in global information systems (GIS). It explores concepts of geospatial data management strategies, primary GIS data creation, secondary data acquisitions, and leveraging leading-edge geospatial data deployments. **Prerequisites:** GEOG 109 or 209 or instructor permission. You are expected to have basic skills & an understanding of GIS and geospatial data. **Units:** 3 **Dept:** Geography **College:** NSM

Course Learning Outcomes:

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

1. Clearly document standard operating procedures in GIS data acquisition and management processes
2. Demonstrate development and use of structured naming conventions and file management systems
3. Identify the fundamentals of database systems, design techniques, and their use in organizations
4. Create and alter databases using standard relational database management systems (DBMS) and geodatabase structures
5. Develop entity-relationship diagrams, relational schemas, and data dictionaries given a set of business rules
6. Define, design, and implement attribute domains
7. Write database queries using Structured Query Language (SQL) for a variety of data definition and data manipulation scenarios
8. Define and identify differences between data and file types
9. Describe what metadata is, why it's important, and applicable standards for capturing and documenting metadata
10. Acquire primary geospatial data using GPS and visualize using geospatial software
11. Identify strategies to, and then acquire, secondary geospatial data (ex: Census, DEMs, imagery, boundaries) and visualize using geospatial software
12. Work with teammates to establish group expectations (ex: goals, timelines, individual and collaborative tasks); elicit, listen to, and incorporate ideas from teammates with different perspective and backgrounds; critique others work/ideas constructively & respectfully

Additional Graduate Learning Outcomes:

13. Clearly communicate geospatial techniques, rationale, limitations, and considerations to technical and non-technical audiences in a professional manner
14. Synthesize and evaluate data to reveal insightful patterns, differences, or similarities related to a geospatial problem, and discuss relevant, supported limitations and implications of the analysis
15. Understand and apply ethical and legal considerations related to GIS, including privacy, data security, and the responsible use of geospatial technologies
16. Compare strengths and limitations of designs/solutions; identify methodological problems and how to troubleshoot study design

Baccalaureate Learning Goals for the 21st Century:

- **Competence in the Disciplines:** The ability to demonstrate the competencies and values listed below in at least one major field of study and to demonstrate informed understandings of other fields
- **Knowledge of Human Cultures and the Physical and Natural World** through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts. Focused by engagement with big questions, contemporary and enduring.
- **Intellectual and Practical Skills**, including: inquiry and analysis, critical, philosophical, and creative thinking, written and oral communication, quantitative literacy, information literacy, teamwork and problem solving.
- **Personal and Social Responsibility**, including: civic knowledge and engagement—local and global, intercultural knowledge and competence¹, ethical reasoning and action, foundations and skills for lifelong learning
- **Integrative Learning**², including: synthesis and advanced accomplishment across general and specialized studies.

Is this course for me?

This course is designed to provide you with an overview of how to acquire and manage data, with particular emphasis on geospatial datasets and authentic experiences. Data acquisition and management is critical both in advanced courses and the workforce. To benefit from this course:

- you should have basic familiarity with computers and GIS;
- be ok with the fact that there can be many correct answers, not always just one right answer; and
- have a growth mindset and be willing to engage in an Authentic Learning Experience (ALE)

An Authentic Learning Experience (ALE) Course?

This authentic learning experience course will provide you hands-on experience with real-world problems and datasets. This course is focused on preparing you for a job using GIS, which means figuring out what extra information and/or data you need to solve the problem. As GIS practitioners, you often work with other domain specialists (ex: ecology, archaeology, real estate, public policy, etc) & need to know how to communicate in oral & written forms -- you'll be working with fellow classmates as teamwork/communication are valued by employers.

¹ Understanding of and respect for those who are different from oneself and the ability to work collaboratively with those who come from diverse cultural backgrounds.

² Interdisciplinary learning, learning communities, capstone or senior studies in the General Education program and/or in the major connecting learning goals with the content and practices of the educational programs including GE, departmental majors, the co-curriculum and assessments.

ALE Learning Outcomes:

1. **Information Literacy:** Distinguish between different types of information sources and develop skills for searching for geospatial data
2. **Problem Formulation:** formulate criteria and constraints to guide brainstorming of possible solutions to initially defined problem(s)
3. **Study Design:** Compare strengths/limitations of designs/solutions; identify methodological problems and success how to troubleshoot
4. **Communication:** Use appropriate language and style to communicate geospatial concepts to target audience(s); Use a variety of modes to communicate concepts (oral, written, visual)
5. **Identity:** Develop confidence that you can understand & do geospatial work; understand how geospatial professionals work on real problems, and that the work is done in diverse teams; Develop tolerance for obstacles faces in the design/implementation process
6. **Metacognition:** Know and use a variety of problem-solving strategies; demonstrate willingness to seek help from others; embrace a growth mindset with respect to intelligence and ability
7. **Community:** Work with teammates to establish and update group plans and expectations (ex: goals, timelines, individual and collaborative tasks); elicit, listen to, and incorporate ideas from teammates with different perspective and backgrounds; critique (not criticize) and review others' work constructively & respectfully

Access to technology*Hardware*

- A GPS-enabled smartphone or tablet will be needed when working on GPS-related assignments. If you do not have access, please let me know so I can bring devices for these assignments
- Internet access when working on assignments related to ArcGIS Online
- Access to a Windows OS computer with the software listed below (Microsoft Access and ArcGIS Pro are not available on a Mac)

Software

- Windows: Esri ArcGIS Pro v 3.5, Microsoft Access, Microsoft Excel
- Mobile apps: Esri Survey123 and Esri Field Maps
- Global Protect (VPN) if working off campus

Course Policies

Attendance It is your responsibility to attend class and complete coursework to be successful in the class. Please make every effort to be present, especially during the lecture/interactive portions. If your need to be absent (ex: illness), e-mail ASAP so I can try to accommodate.

Classroom Conduct Please be on time, focused, respectful, & willing to be curious. During lectures, I encourage you to ask questions and participate in discussions rather than passively absorbing information. During group collaboration, please stay on-task, respectful, and keep volumes reasonable so to distract other groups.

Generative AI: Unless otherwise noted, all assignments should be fully completed by you, the student. While AI can be a useful tool for brainstorming, its responses are typically shallow in comprehension and often wrong, misleading, or “fluff”. Developing strong competencies in the critical thinking skills associated with this course will prepare you for success in your degree, and ultimately, a competitive career. Using any AI to complete assignments when you're learning new skills **undercuts your ability to development competence, to think critically and independently, and your ability to form reasoned opinions/approaches. Using AI tools is strongly discouraged.**

Plagiarism is taking someone else's words/ideas and presenting them as your own -- this includes AI! **Cheating** is using someone else's or an AI's product (answers, SOP, map, code, database, etc) as your own work. Even in GIS there are ways I can identify if you use someone else's work. If plagiarism is deemed intentional, or you cheat, you will receive a 0 on the assignment and be referred to Academic Integrity. Three strikes (academic integrity referrals) and you'll receive an F in the course.

University Policies

Time Commitment: Per Sac State's Credit Hour Policy, “each credit hour in lecture will typically require 50 minutes (one classroom hour) of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for each week of a fifteen week semester (for a total of 45 hours **per unit** per semester).” This class is 2 units for lecture and 1 unit for lab (2 hours in-class, 1 hour out of class). Therefore, you are expected to spend at least 5 additional hours (3 units) per week on this course (135 for the semester).

Academic Honesty: Review University policy to avoid inadvertent dishonesty. <https://sacramentostate.policystat.com/policy/11300038/latest>

Important Campus Dates: <https://www.csus.edu/student-life/records-transcripts/spotlight/spotlight-two.html>

University Add, Drop, Withdrawal: Info and deadlines at: <https://catalog.csus.edu/financial-registration-information/registration/>

Student support services

Disability Access Center (DAC): Sacramento State is committed to ensuring an accessible learning environment. See more at: <https://www.csus.edu/student-affairs/centers-programs/services-students-disabilities/>

Student Health and Counseling Services (SHCS): Your physical & mental health are critical in succeeding as a college student. SHCS (in The WELL) offers medical, counseling, & wellness services. More: <https://www.csus.edu/student-life/health-counseling/>

Crisis Assistance and Resource Education Support (CARES): If you are facing challenges with food, housing, financial, etc that impact your education, help is available. More: <https://www.csus.edu/student-affairs/crisis-assistance-resource-education-support/>

ASI Food Pantry: The ASI Food Pantry provides food & basic necessities to students with financial hardships & food insecurity, at no cost. See more: <https://asi.csus.edu/asi-food-pantry>

Coursework

Exercises: In-class activities or bonus assignments

Quizzes: Weekly quizzes covering the week's material are due before the next lecture period.

Labs: Weekly labs are due by 11:59p the day before class, unless otherwise noted in Canvas. Lab work should be clearly documented and follow instructions in the lab. I **strongly discourage using AI** for the documentation process, as you're learning and it will "bite you" later. The more comprehensive & thorough your SOPs the better you'll be able to complete the pop assignments and practicals in time. Labs that have a QA/QC component can be resubmitted by the next class period to allow you to incorporate feedback. Print out your SOP for QA/QC review.

QA/QC Reviews: Quality Assurance/Quality Control (QA/QC) reviews will occur in-class. You will receive another student's lab assignment submission. You will then have 20 minutes to complete the lab assignment using **ONLY** their SOP (interpret the documentation literally – do not infer any directions or use your own knowledge unless I specify otherwise). You will then provide (1) how far you got using only their documentation and (2) useful feedback on the documentation (or also a product review if I specify). This is to help them improve their work for Pop Assignments & Practical, and provides you practice in written/oral communication and evaluating your and others' work.

Pop Minis: I will give unscheduled pop (mini) practicals to be completed within a given time period in class. These can test any previously covered materials, including those from the pre-requisite course. You **must** be in class to participate.

Practicals: Practical Exams (Practicals) are work-like assignments you can reasonably expect to be given by an employer with 1 hour allocated to complete-- typical allocation for billable work (hours billed to a given project). You can use your SOPs to complete the practical. As you can see, the more comprehensive your SOPs the more likely you'll be to complete within the this timeframe.

Portfolio: A digital portfolio of work you completed is due per the schedule below (see Canvas). Additional instructions will be provided after Spring Break.

Grading

Grades are assigned based on points earned. The more points you earn, the higher your grade. Because life happens, extra credit is built-in. While there are at least **434** points available, **400 points = 100%**; therefore, there are a minimum of 34 extra points above 100%. You are welcome to turn work in early, but I do not accept late work.

Onboarding (4 @ variable)	10 points
Exercises (6 @ variable)	11 points
Quizzes (10 @ 5 pts ea)	50 points
Labs (12 @ 5 pts ea)	60 points
QA/QC Reviews (10 @ 3 pts ea)	30 points
Pop Minis (4 @ 15 pts ea)	60 points
Practicals (2 @ 50 pts ea)	100 points
Practical Reflections (2 @ 10 pts)	20 points
Portfolio	18 points
Final Practical	75 points

Grades determined as follows:

A ≥ 376 A- ≥ 360 B+ ≥ 348 B ≥ 336 B- ≥ 320 C+ ≥ 308 C ≥ 296 C- ≥ 280 D+ ≥ 268 D ≥ 256 D- ≥ 240 F <240

Class Schedule

Week of	Description	Due
1 01/26	Course Intro; 1. Standard operating procedures, file management, & structured naming conventions	
2 02/02	CONFERENCE -- no class this week	
3 02/09	2. Working with spreadsheets	Lab 1
4 02/16	3. Fundamentals of database systems and design; Structured Query Language (SQL); Entity-relationship diagrams and relational schema	Lab 2
5 02/23	4. Relational databases: MS Access vs. ArcGIS geodatabases; joins and relates; Attribute domains and data dictionaries; Practical Exam #1 (Thursday)	Lab 3
6 03/02	5. ArcGIS Online and ArcGIS Field Maps; Primary GPS data collection	Lab 4
7 03/09	6. ArcGIS Survey123 (data collection and report generation)	Lab 5
8 03/16	7. Strategies in acquiring and visualizing secondary geospatial data	Lab 6
9 03/23	SPRING BREAK (campus closed)	
10 03/30	<i>Release Final Portfolio assignment; 3/31 (Tue) HOLIDAY</i> (campus closed); 8. Expanded strategies acquiring secondary geospatial data; Data security, privacy, ethical and legal concerns	Lab 7
11 04/06	Practical Exam #2 ; ...cont...; 9. Converting CAD files	Lab 8
12 04/13	... cont ...; 10. Google Earth and Keystone Markup Language	Lab 9
13 04/20	... cont ...; 11. Digitizing and Georeferencing	Lab 10
14 04/27	...cont...; 12. Putting into practice	Lab 11
15 05/04	...cont...	Lab 12;
16 05/11	Work on Final Portfolio	Portfolio
17 05/18	FINAL Practical (Tuesday 05/19 12:45-2:45p) ← note different time	

Note: This syllabus is subject to change. The latest version and supplemental information are available on Canvas

If at any time you're getting overwhelmed PLEASE communicate with me (email, Canvas, Zoom, etc)! I want you to be successful while maintaining your physical and mental health (TBH part of the college experience is learning how to deal with competing deadlines and stress, similar to the workplace).