

San José State University
School of Environment, Planning, and Policy
GEOG 171, Advanced Geographic Information Systems
Spring 2025

Instructor: Pietro Calogero
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Office Hours: Fridays, 12-2pm on Zoom, via link on Canvas, or by appointment.
Class Day & Time: Wednesdays, 12:00-2:45pm
Classroom: Washington Square 208

Course Catalog Description

Maps as tools of geographic expression and research. Introduction to spatial analysis through geographic information systems. Data collection and description; measuring absolute and relative location, patterns, interaction and association.

Prerequisites: GEOG 70 or instructor consent.

Course Description

This course covers more advanced techniques in geospatial research, analysis, and visual presentation. Students are expected to already understand attribute tables, basic data cleaning, table joins, basic projections, choropleths, buffers, and boolean operations. Here, students are expected to engage in more independent identification and evaluation of data sources and independent problem-solving in designing geospatial analysis. The primary objective of this course is to equip you with the skills to become a proficient and independent GIS analyst. In this course we will introduce the use of QGIS and R statistical language for GIS. Students must then choose which software to use to complete assignments for the course, most of which could be completed with ArcGIS, QGIS, or possibly R.

Course Format and Software

This course meets in-person for lectures on Wednesdays, 12-2:25pm. Lecture attendance is mandatory. In addition, the course has informal lab time in WSQ 208, and the instructor will be available via Zoom on Fridays from 12-2pm. The course is technology-intensive. Students are expected to either own or check out a laptop that can run QGIS and R software. That means the laptop must be able to run Windows, or Mac OS, or Linux. QGIS does not run on Chrome OS, so a Chromebook is not sufficient.

To **install QGIS software**, go to: <https://qgis.org/download/> In this course we will use the current Long Term version 3.34 (LTR), because it has the highest probability of stable, updated plugins.

To install R Studio: **first install R itself** from: <https://cran.rstudio.com/> In this course we are using generation 4; currently this is version 4.4.2. You need to download the “binary,” which is programmer-speak for the compiled software (what most of us now call a “program” or “app”). This is in contrast to downloading the source code, which will not run as software until it is compiled into a binary (machine-language) program.

Then install R Studio Desktop for your OS from: <https://posit.co/download/rstudio-desktop/> For this semester, we will use version 2024.12.0 or later. Note: in programmer-speak, R Studio is called an “integrated development environment” or IDE. For my purposes, the most relevant aspect R Studio is that it is a “graphic front end” for the R statistical language.

Also, install Notepad ++ for Windows: <https://notepad-plus-plus.org/downloads/> (I really like their version-release nicknames too). The native TextEdit on Mac OS may suffice, and on Linux I recommend Kate, but there are many options.

Course Learning Objectives (CLOs):

This course advances Geographic Information Systems knowledge through analysis of geographic relationships. Spatial distributions and phenomena will be examined through spatial analytics, and maps will be network and field representations of actual physical and environmental processes. While most techniques have a geographic origin, we will address all geospatially relevant methods, including geophysical, landscape ecological, econometric, epidemiological, and regional science approaches. On the practical side, you will be introduced to five different software and coding packages. Geoprocessing workflows are equally important at this level and is independent information system development.

- CLO 1. Critically interpret maps and GIS displays.
- CLO 2. Measure, model and analyze spatial data.
- CLO3. Apply locational insights to solve simulated real-world analytical problems and make choices among alternatives.
- CLO4. Integrate theory/science with technology to design, implement and present a GIS project.

Textbooks and Learning Sources

QGIS. 2018. *A Gentle Introduction to GIS*:

https://docs.qgis.org/testing/en/docs/gentle_gis_introduction/index.html

Geocomputation with R.(Optional) This book is open source and available on:

<https://geocompr.robinlovelace.net/>

<https://github.com/Robinlovelace/geocompr#geocomputation-with-r>

Supplemental readings and tutorial videos will be posted to Canvas modules.

NOTE: in this course we will focus on data analysis in central and southern California. Therefore we will only be using the California State Plane projection, Zones III (Bay Area) through VII (Los Angeles specific). More explanation can be found at: <https://www.conservation.ca.gov/cgs/rgm/state-plane-coordinate-system>. This projection is in Imperial units (feet), whereas GIS for the rest of the world is done in SI (meters), typically using the Universal Transverse Mercator projections.

Expected Workload

You are expected to spend three hours per unit per week in courses at SJSU. For this 4-unit course, this means 12 hours per week on this course. This includes class, reading, and writing time.

Grading of the course

Grading is based on a total of 100 possible points, so they are equivalent to percentage points. Letter grades will be according to the following distribution:

A+ = 100 to 96	B+ = 89 to 87	C+ = 80 to 78	D+ = 69 to 67	F = 59 points or lower
A = 95 to 93	B = 86 to 84	C = 77 to 73	D = 66 to 63	
A- = 92 to 90	B- = 83 to 81	C- = 72 to 70	D- = 62 to 60	

University Policies

Per University Policy S16-9 (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), policies for all courses are listed on the Syllabus Information Page: <https://www.sjsu.edu/curriculum/courses/syllabus-info.php>

Here are direct links to the various policies listed on that page:

[General Expectations, Rights and Responsibilities of the Student](#)

[Academic Integrity](#)

[Accommodation to Students' Religious Holidays](#)

[Adding and Dropping Classes](#)

[Attendance and Participation](#)

[Accommodations for Students with Disabilities](#)

[Accommodations for Students with Disabilities](#)

[Consent for Recording of Class and Public Sharing of Instructor Material](#)

[Timely Feedback on Class Assignments](#)

[Workload and Credit Hour Requirements](#)

Furthermore, the page contains links to critical campus resources:

[Counseling at the Wellness Center](#)

[Mentoring and tutoring through Peer Connections](#)

[Food, shelter and safety at SJSU Cares](#)

[Computers, printing, and more at Student Technology Resources](#)

[Writing assistance at the Writing Center](#)

Course Schedule

In a table, list together the Week | Date | Topics, Readings, Assignments, Deadlines | CLO(s)

Week	Topic	Due Date	CLOs Covered
1	Introduction; installation of QGIS and R Studio		
2	First run of QGIS. Intro to data-sets <u>Reading:</u> Chapters 1 & 2 of <i>A Gentle Introduction</i>		2,3
3	How to output graphics in QGIS, and graphics principles <u>Reading:</u> Chapters 3 & 4 of <i>A Gentle Introduction</i> Task 1: Visualization 1: choropleth map with all elements (10 points)	Feb 14	1,4
4	Visualization: colors, contrast, transparency, fonts Task 2: Refine the same map for symbology (10 points)	Feb 21	1,4
5	Raster and point data; geocoding text files		
6	Task 3: Interpolation of point files into a surface (15 points)	March 7	1,3,4
7	First run of R Studio. Importing and analyzing data.		
8	Task 4: First map output from R Studio (10 points)	March 21	1,4
9	Task 5: Second R Studio map: probability heatmap (10 points)	March 28	1,2,3,4
	SJSU SPRING BREAK, March 29-April 6		
10	Drone imagery in GIS		
11	Task 6: create map from drone imagery (15 points)	April 18	1,4

12	Introduction to Leaflet		
13	Task 7: Creation of basic Leaflet map (10 points)	May 2	1,2,3,4
14	In-Class Presentation of individual GIS Project (20 points)	May 7	1,2,3,4
15	Final Examination		

Muwekma Ohlone SJSU Area Land Acknowledgement

The San José State University community recognizes that the present-day [Muwekma Ohlone Tribe](#), with an enrolled Bureau of Indian Affairs documented membership of over 550, is comprised of all of the known surviving American Indian lineages aboriginal to the San Francisco Bay region who trace their ancestry through the Missions Santa Clara, San José, and Dolores, during the advent of the Hispano-European empire into Alta California; and who are the successors and living members of the sovereign, historic, previously Federally Recognized Verona Band of Alameda County.



Furthermore, the San José State University community recognizes that the university is established within the Thámien Ohlone-speaking tribal ethnohistoric territory, which based upon the unratified federal treaties of 1851-1852, includes the unceded ancestral lands of the Muwekma Ohlone Tribe of the San Francisco Bay Area. Some of the enrolled Muwekma lineages are descended from direct ancestors from the Thámien Ohlone tribal territory whose ancestors had affiliation with Mission Santa Clara.

The San José State University community also recognizes the importance of this land to the indigenous Muwekma Ohlone people of this region, and consistent with our principles of community and diversity strives to be good stewards on behalf of the Muwekma Ohlone Tribe whose land we occupy.

This Land Acknowledgement was generously given to SJSU by the Muwekma Ohlone Tribe for SJSU use. Tribe Chairwoman Charlene Nijmeh gives a powerful detailed accounting of the specific steps and history of the disenfranchisement of the Muwekma Ohlone peoples, as well as the strength and presence of their community today. Tribe Vice Chairwoman Monica V. Arellano gives a detailed context to understand our presence on the ancestral lands of the Muwekma Ohlone, land on which our institution and the city of San Jose occupy. Their leadership reminds us of how much further we have to go, and that this Land Acknowledgement is a very small step towards further action.

We are grateful for Charlene Nijmeh and Monica V. Arellano of the [Muwekma Ohlone Tribal Council](#) for providing SJSU with a Land Acknowledgement and Greeting.

We encourage you to use the Land Acknowledgment in its entirety out of respect for the process and words given us by the Muwekma Ohlone.

[Download a PDF version](#) of this Land Acknowledgment

[Link to shareable Google Slides document](#) with this Land Acknowledgment specifically for SJSU events and meetings

[Download a PDF of the Muwekma Ohlone greeting](#) to Learn More about the Tribe and its History
[Pronunciation Guide](#) for this Land Acknowledgment