SJSU SAN JOSÉ STATE UNIVERSITY

College of Social Sciences
Department of Urban and Regional Planning   **Fall 2023**

GEOG 239 – Geographic Information Technology
URBP 179B – Advanced GIS for Urban Planning

- ❖ Instructor: Dr. Bo Yang (Bo.Yang02@sjsu.edu)
- ❖ Office Hours: Tuesdays 1:00 PM - 3:00 PM or by appointment
- ❖ Class Days/Time: Tuesday 3:00 PM – 5:45 PM
- ❖ Classroom: Washington Square Hall 113
- ❖ Office: Washington Square Hall 113A
- ❖ Prerequisites: Geog70 Intro GIS or Geog107 Mapping the world

COURSE DESCRIPTION

Geographic Information System (GIS) is a powerful tool for the management, visualization, and analysis of spatial and geographical data. This course delves deep into the nuances of GIS, exploring its concepts, theories, methodologies, and the myriad applications of GIS technologies. An amalgamation of insightful lectures and hands-on laboratory components, this course encapsulates the essence of spatial thinking and analysis, GIS programming, batch processing, model building, web GIS, the Google Earth Engine, and the application of GIS in urban planning. Students will culminate their learning by applying the right GIS methodologies and tools to address real-world challenges. Prerequisites for this course include Geog170 Intro GIS or Geog107 Mapping the World. However, waivers can be provided for students who have completed a different advanced level GIS class.

In today's digital era, geographic information systems and technologies are ubiquitous. From government agencies to corporate behemoths, GIS tools like the Google Maps platform, Microsoft's Virtual Earth, and GPS-based navigation are widely utilized. Moreover, our daily activities—be it using credit cards, mobile phones, or engaging on platforms like Twitter, YouTube, Facebook, and Flickr—continuously generate geotagged data. Such data can be easily harvested and utilized for a multitude of purposes.

Yet, as we immerse ourselves in this geospatial data-driven world, several thought-provoking questions arise:

- How does GIS influence and reshape the very society it aims to depict and benefit?
- Can GIS integrate non-traditional or non-geometric spatial representations?
- Is the application of GIS universally apt, or does it cater more effectively to specific cultures?
- How can GIS capture the intricacies and fluidity of social and physical spaces?
- Will the widespread use of GIS redefine governmental dynamics, both internally and in their interactions with the citizenry?
- Can GIS empower individuals with better governmental oversight, understanding of land rights, and foster increased public engagement in governance?

Drawing inspiration from the University Consortium for Geographic Information Science (UCGIS) (http://www.ucgis.org), this course seeks to address these pressing questions. We aim to enhance students' spatial reasoning in their respective fields of interest, with a special focus on Python programming. Designed as a blended seminar and lab module, the course encompasses weekly readings, assignments, and culminates in a research project.

Student learning outcomes

After successful completion of this course, the students will be able to:

1. Describe the basic principles and concepts underlying Geographic Information Systems (GIS). Identify and differentiate between various GIS data models, such as raster and vector. Perform basic spatial analyses using GIS software.
2. Understand the role of GIS and remote sensing in urban planning and development. Apply GIS tools to analyze urban growth patterns, land use, and environmental impacts.
3. Harness the Google Earth Engine platform to process and analyze large datasets. Integrate Earth Engine applications with other web and GIS tools for advanced spatial analyses.
4. Design and complete a GIS project collaborate effectively with peers and experts from various disciplines on spatial projects. (data acquisition, data management, data manipulation, spatial analysis, and result visualization and interpretation).

Textbook:

Below two textbooks are recommended. Relevant course material, reading, and programming demo will be posted on a weekly basis on the online canvas system.

Bolstad, Paul. GIS Fundamentals: A First Text on Geographic Information Systems - (Third Edition preferred).
Cloud-Based Remote Sensing with Google Earth Engine: Fundamentals and Applications ([Live document](#))

COURSE EVALUATION:

Regular Participation and Discussion: 6 points
This course involves both in-person interactions and extensive computer lab sessions.
Lectures and lab sessions are scheduled weekly, requiring in-person attendance.
Every unexcused absence will result in a deduction of 2 points.
Active participation in class discussions and intellectual engagement is not only encouraged but expected.

Lab Assignments: 40 points
- Lab assignments primarily focus on the utilization of computer software, such as ArcGIS and Google Earth Engine, to reinforce the methodologies discussed during lectures.
- While time is allocated during class for instruction and assignments, students may need to devote extra hours outside of scheduled classes to ensure successful completion of the course.

- Lab exercises are typically due 1-2 weeks from the assignment date unless stated otherwise by the instructor.
- Late submissions will face a penalty of 10 points per day, and assignments will no longer be accepted after a five-day delay.
- URBP students will be given an extra lab assignment focusing on GIS for urban planning to accommodate the additional unit.

Mid-term Literary Essay: 20 points
- Students are required to review the prescribed textbook and any supplemental reading materials provided during the course.
- Essays should delve deep into the content, identifying connections between ideas, the utility of certain sections, and the rationale behind the author's data and methods.
- Essays should be 2-3 pages (single-spaced) and aim to identify research gaps or areas of improvement in the current literature. Students should propose solutions to these gaps, detailing specific data acquisition methods and research approaches.

Final Project: 30 points
- As a capstone activity, each student will undertake a Final Project Research to be submitted by the end of the Final Exam period.
- Initial drafts (6 pages excluding images and figures) are to be submitted during the final week for feedback and subsequent revisions.
- During the final week, students are expected to present their research proposals, with presentations not exceeding 10 minutes.
- For undergraduate students you have an option to do a story map or programing for a customized Google Earth Engine App to replace the Final Project.
- Graduate Students' Final Project Format:
  - Abstract – 1 page (summary of problem, method, results, and conclusions)
  - Problem – 1 page (description of the issue, location, date, significance, and expected product impact)
  - Method – 2 page (including data, metadata, software, and processing details)
  - Results – 2 page (project-specific)
  - Discussion/Conclusions – 1 page (interpretation of results and their impact and relevance)
  - References – 1 page

Seminar and Event: 4 points
- The Spatial Analytics and Visualization (SAVI) Center at SJSU will host the Virtual Geospatial Technologies Colloquium throughout the semester (timing to be announced). This virtual seminar invites professionals from the GIS field to interact with students curious about GIS careers. Participation and reflection on one of these seminar events will account for 4 points of the course evaluation.

Evaluation Components

Evaluation Components	Percent Value
Mid-term literary essay	20%
Lab Assignments	40%

- Final Project   30%
- Class Participation and Discussion Board   6%
- Webinar and events   4%

Course Grade Scale:

based on the weighted-sum points from the different components

A+ (96.99-100), A (93-96.99), A- (90-92.99),

B+ (87-89.99), B (84-86.99), B- (80-83.99),

C+ (77-79.99), C (74-76.99), C- (70-73.99),

D+ (67-69.99), D (64-66.99), D- (60-63.99)

F (Below 60).

WEEKLY CLASS SCHEDULE, READING AND LABS

Week 1:
- Introduction to the course and discussion – Syllabus and course expectations
- Discuss guiding values for the course
- Reading: Bolstad Chapter 1, 2; Sheppard 1995
- **Warm-up exercise: Setup the ArcGIS environment**

Week 2:
- Lecture - *Spatial thinking and common geospatial analyses*
- Reading: Bolstad Chapter 2-3; Lake 1993
- **Lab 1 assignment – Intro to ArcGIS Pro**

Week 3:
- Lecture - *Geospatial data, ethics, and privacy*
- Reading: Bolstad Chapter 8; GIS Code of Ethics; Li & Goodchild 2013
- Extra reading materials
- In-class demonstration/mini-fieldwork: use Garmin Handheld GPS to collect GIS data
- **Lab 2 assignment – Thematic Mapping**

Week 4:
- Lecture - *Working with vector data*
- Lab 1 Due on February 5
- Extra reading materials, Bolstad Chapter 9
- In-class demonstration: use Garmin Handheld GPS to collect GIS data

Week 5:
- Lecture - *Raster data and remote sensing*
- Extra reading materials
- **Lab 3 assignment – Attribute Table**

Week 6:
- Lecture – *Remote Sensing data collection*
- Reading: Bolstad Chapter 10
- In-class demonstration/mini-fieldwork: use DJI Unoccupied aerial vehicle to collect GIS data

Week 7:
- Lecture - *Digital Terrain analysis*
- Reading: Bolstad Chapter 11
- **Lab 4 assignment – Vector Data Analysis**

Week 8:
- Lecture - *GIS Technology Landscape and FOSS,*
- Reading: Bolstad Chapter 15
- **Lab 5 assignment – Raster data analysis**

Week 9: Thanksgiving week:
- Self-study and review for the first half of the class
- Literature review and group discussion
- **Mid-term literary essay - Literature review and research gap filling**

Week 10:
- Lecture, *Python programming for GIS I*
- Extra reading materials
- **Lab 6 assignment - Google Earth Engine I Basic**

Week 11:
- Lecture- *Python programming for GIS II*
- Readings and discussion
- **Lab 7 assignment - Google Earth Engine I Advance**

Week 12:
- Lecture - *WebGIS - ArcGIS online and Google Earth Engine*
- **Lab 8 assignment – Google Earth Engine III Application**

Week 13:
- Guest Lecture (TBD): *Topics on GIS for socioeconomic applications*
- Extra reading materials

Week 14:
- Instructor help with final research proposal
- Readings and discussion
- **Final research proposal due on May 5**

Week 15:
- *Final project presentation I* - Students present the final project (15 minutes)

Week 16 (Exam Week):
- *Final project presentation II* - Students present the final project (15 minutes)

**NOTE: The Schedule of Activities is subject to change. Minor changes will be announced in class, major ones provided in writing.

CORE POLICY STATEMENTS:

Attendance and Participation
Attendance is the responsibility of the student. However, attendance itself may not be used as a criterion for grading. Students are expected to attend all meetings for their courses, as they are responsible for all

material covered, and active participation is frequently essential to ensure maximum benefit to all class members. Participation may be used as a criterion for grading when the parameters and their evaluation are clearly defined in the course syllabus and the percentage of the overall grade is stated. The full policy language can be found at University Policy F15-3 [pdf].

Academic Integrity
Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy F15-7 [pdf] requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. Visit the Student Conduct and Ethical Development website for more information.

Accommodations for Students with Disabilities
Presidential Directive 97-03 [pdf] requires that students with disabilities requesting accommodations register with the Accessible Education Center (AEC) to establish a record of their disability. AEC will contact the instructor with further details, if needed.
If special arrangements are needed in cases of emergency or if the building must be evacuated, please make arrangements with the instructor.

Consent for Recording of Class and Public Sharing of Instructor Material
University Policy S12-7 [pdf] requires students to obtain instructor's permission to record the course. The following criteria define expectations relating to recording a course.
- Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without approval. You may not publicly share or upload instructor generated material such as exam questions, lecture notes, or homework solutions without instructor consent. This prohibition includes sharing information with third parties and on websites.
- You must obtain the instructor's permission to make audio or video recordings in class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.
- Permission from the instructor, whether in writing or orally, may extend to either a single class or the entire semester.
- In classes where active participation of students or guests may be on the recording, permission of those students or guests must be obtained as well

Writing Center
The SJSU Writing Center offers a variety of free resources to help students become better writers. The center offers writing resources, workshops, and one-on-one and small-group tutoring sessions. Services support writing for students in all disciplines and at all levels. The SJSU Writing Center has two in-person locations, Clark Hall, Suite 126 and MLK Library, 2nd floor. Workshops and tutoring are also available through online platforms.
To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the Writing Center website at sjsu.edu/writingcenter.

Student Technology Resources
Computer labs and other resources for student use are available in:

- [Associated Students Print & Technology Center](as.sjsu.edu/asptc/index.jsp) at as.sjsu.edu/asptc/index.jsp on the Student Union (East Wing 2nd floor Suite 2600)
- [The Spartan Floor](library.sjsu.edu/services/services) at the MLK Library at library.sjsu.edu/services/services (Fourth floor)
- [Student Computing Services](library.sjsu.edu/student-computing-services/student-computing-services-center) at library.sjsu.edu/student-computing-services/student-computing-services-center
- [Computers at the Martin Luther King Library](www.sjpl.org/wireless) for public at large at www.sjpl.org/wireless
- Additional computer labs may be available in your department/college

A wide variety of audio-visual equipment is available for student checkout from [Collaboration & Academic Technology Services](#) located in IRC Building. These items include DV and HD digital camcorders; digital still cameras; video, slide and, overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens, and monitors.