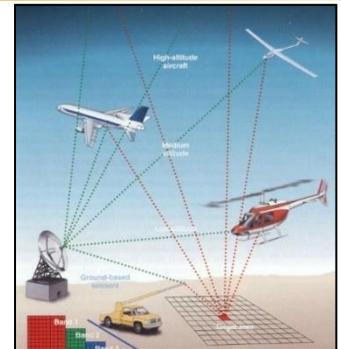# GEOG 173 – Advanced Geographic Techniques
URBP 279 – Advanced GIS for Urban Planning

- ❖ Instructor: Dr. Bo Yang (Bo.Yang02@sjsu.edu)
- ❖ Office Hours: Tuesdays 12:00 PM - 1:30 PM or by appointment
- ❖ Class Days/Time: Tuesday 1:30 PM – 4:15 PM
- ❖ Classroom: Washington Square Hall 113
- ❖ Office: Washington Square Hall 113A

Course Description

This course is a comprehensive introduction to the Geographical Information Systems (GIS) principles, techniques and applications of data collection methods with emphasize on drone technology in geosciences. It combines lectures with a substantial practical lab and fieldwork components. The lectures cover remote sensing and GIS principles, Drone mapping and satellite remote sensing data acquisition methods, geo-spatial analysis geographical fieldwork and *in situ* data collection, earth resources satellite systems (LANDSAT, SPOT, RADARSAT, ERS, MODIS, AVHRR, IKONOS, etc), spectral signature and visual image interpretation, and image processing and analysis techniques. The application examples focus on the analysis and interpretation of remotely sensed image data to measure metric and thematic properties of the Earth's surface for studying the key earth processes, impacts of human activities on environmental systems, and urban land use dynamics.

The practical component involves a series of step-by-step lab exercises. This will give students extensive hands-on practice in using remote sensing software to process, analyze, and interpret both airborne and spaceborne remote sensing data.

Learning Outcomes and Course Goals

Course Learning Objectives (CLO)

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

- **CLO 1** Explain the core concepts and technologies involved in GIS technology and data collection.
- **CLO 2** Know the commonly used remotely sensed datasets and their limitations.
- **CLO 3** Use ArcGIS desktop to process and analysis the geospatial data.
- **CLO 4** Learn UAV and Drone fly and operation, FAA regulation safety, and fly the collect data.
- **CLO 5** Process the self-collected data with georeferencing and correction, analyze and interpret data.

Text book

A traditional textbook is not required for this class. Readings are posted to the course Canvas webpage.

The instructor recommends two textbooks for students who want to systematically learning more GIS theory and applications:

Paul Bolstad
GIS fundamentals
ISBN: 978-1593995522

Lein, James K.,
Environmental Sensing, Analytical Techniques for Earth Observation,
ISBN 978-1-5614-0142-1, Springer, 334 pages.

Lab Software tools
Esri ArcGIS Pro, Esri Drone2Map, Google Earth Engine

Course Requirements and Policies
Class Participation
Lecture and lab attendance is mandatory. Students are expected to attend all the lectures and labs, and take lecture notes. Instructor will provide students with additional resources and opportunities to engage with the course material. Students' attendance and participation for this course will be recorded and accounted for 5% of the final grade. Missing a significant number of the lectures without making them up may result in a failure for this course.

Labs
The practical lab exercises provide a way to acquire skills in processing, analyzing and interpreting various digital geo-spatial data. ArcGIS available in WSQ Lab 113 will be used as the major software for lab assignments. A penalty of 5% per day will be deducted for late labs. Each lab assignment normally requires both written responses to questions and creation of images, figures, and maps. Write-ups for lab assignments must be typed; hand-written work will not be accepted for grading.

Mid-Term Exam:
There will be an in-class mid-term exam include a variety of question types such as multiple choice, true or false, short answer, and essay questions. The purpose of a mid-term exam is to evaluate students' understanding and mastery of the material covered in the course up to that point. Instructor will provide review sessions for students to review and practice the material before the exam.

Final Project:
This course includes an open final project that allows students to demonstrate their understanding of the concepts and skills that learned from the course. The final project assignment includes two components, 1) the final project presentation and 2) the final project report. Students are expected to prepare a 10 minutes presentation during the final week and present on the class with how GIS can be used to solve a real-world problem. The final report should be a minimum 8-page writing (exclude reference and figures) that summarizes the problem, data, methods, results, and conclusion of the project. The rubric of the final project is based on:
- Problem define (20%): The project should focus on a specific problem or question related to GIS, such as analyzing land use patterns, assessing the impact of a natural disaster, or identifying potential sites for a new business.
- Data acquisition (20%): The project should involve collecting and analyzing data using GIS software and tools. The data could be from various sources such as satellite imagery, census data, or field surveys.

- Presentation (20%): The project should include the creation of one or more maps that effectively communicate the results of the analysis.
- GIS processing (20%): The project should demonstrate an understanding of the technical aspects of GIS, such as data processing, spatial analysis, and map design.
- Creativity (20%): Encourage students to be creative and think outside the box in their approach to the project.

Grading:

Evaluation Components	Percent Value
• Lab Assignments	42%
• Mid-term exam	20%
• Final project	35%
• Class Participation	3%

Course Grade Scale: (based on the weighted-sum points from the different components)
>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).

All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades. In keeping with this policy, and to making grading responsive. All assignments are due as stated on the Course Schedule and Canvas. **Late work is not accepted.** Please save all your work until after you have checked your final course grade. Then if you have questions about your final grade, you can bring in past work, and if necessary, corrections can be made.

CORE POLICY STATEMENTS:

University Policies

Per University Policy S16-9 ,relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

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 at as.sjsu.edu/asptc/index.jsp on the Student Union (East Wing 2nd floor Suite 2600)
- The Spartan Floor at the MLK Library at library.sjsu.edu/services/services (Fourth floor)
- Student Computing Services at library.sjsu.edu/student-computing-services/student-computing-services-center
- Computers at the Martin Luther King Library 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.

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Course Schedule

Week	Date	Course content
1	Jan 31	Topic: Introduction to advanced GIS technology and data collection
2	Feb 7	Topic: Geospatial data, mapping, and spatial thinking _Lab 1: Intro to geospatial data_
3	Feb 14	Topic: Geographical coordinates and projection In-class demo 1, geographical instruments hands on and tutorial
4	Feb 21	Topic: Geo-referencing, Geometric, and Geocoding _Lab 2: Digitizing_
5	Feb 28	Topic: Digital Image Processing, raster data, and remote sensing Fieldwork 1, Ground data collection
6	Mar 7	Topic: Satellite platforms and data acquisition _Lab 3: Geo-referencing_
7	Mar 14	Topic: Remote sensing data interpretation _Lab 4: DEM and Terrain data analysis_
8	Mar 21	Midterm Exam
9	Mar 28	Spring Recess
10	April 4	Topic: UAV and drone fly, manipulation, and FAA regulation _Lab 5: Drone data processing, geo-referencing, and atmospheric correction_
11	April 11	Topic: UAV autonomous mapping and ground auxiliary data _In-class demo 2, multi-platform drone fly and operation_
12	April 18	Topic: Data collection and applications in DEM and urban planning _Lab 6: Image classification and interpretation_
13	April 25	Topic: Data collection and applications in forestry, agriculture and ecology Fieldwork 2, Arieal imagery data collection
14	May 2	Topic: Data collection and applications in marine science and oceanography _Final project proposal_
15	May 9	Guest lecture: Advanced Data Analysis
16	May 16	Final project presentations

Note: The instructor reserves the right to revise, alter or amend this syllabus as necessary. Students will be notified in writing/email of any such changes.