Syllabus: Earth System Remote Sensing (GEOG 185)

Instructor: Prof. Jeff Chambers **GSI:** Javiera Canales

Semester: Spring 2023

Class hours: Friday 9-10 (145 McCone), Lab1 10-noon, Lab2 1-3p (CAGE lab 535 McCone)

Office hours: Jeff: Weds 2-3p or by appointment; Javi Tues 3-4p or by appointment:

Final Exam: 3 hour timed online exam during finals week

Welcome to GEOG 185 Earth System Remote Sensing! To remain enrolled you must attend the first lab and sign in, and continue to attend lab and sign in each week. There are only 30 workstations in the lab, with two labs, so enrollment is limited to 60 students. There are many students on the waitlist each year. Your seat will be given to a waitlisted student if you don't attend lab.

Course format: The course combines lecture and lab, one local field trip, and weekly problem set assignments.

Total hours per week: Two hours of in-class lecture, with four hours of additional readings and problem assignments outside of class. One hour of lab in class, and two additional lab hours outside of class to complete lab work and independent study assignments.

Course description: (3 units; 2 lecture, 1 lab). This lecture-lab course is focused on Earth system remote sensing applications, including a survey of methods and an accompanying lab. This first part of the course will cover general principles, image acquisition and interpretation, and analytical approaches. The second part will cover global change remote sensing applications that will include terrestrial ecosystems, Earth sciences, the hydrosphere, and ` land-use.

Goal of the course: The course focuses on developing an understanding of how to use remote sensing approaches to address Earth system questions for both natural and human-impacted environments. The course covers a survey of methods and analysis techniques, and case studies to demonstrate how specific questions have been addressed using a variety of sensors and approaches. Instruction will emphasize remote sensing applications to address specific global change problems, with less emphasis on developing detailed remote sensing technical skills. The course is structured as a lecture-lab, with material covered in class being more fully developed with readings and assignments conducted outside of class.

Concise outline of topics covered:

Week 1, Jan 20: Introduction and History
(textbook Chapter: 1)
Lab 1: Mastering the basics
Week 2, Jan 27: Electromagnetic Radiation and Digital Imagery
(Chs: 2 & 4)
Lab 1: Data types and display concepts
Week 3, Feb 3: Survey of Remote Sensing Platforms (Problem Set#1 due)
(Chs: 3, 6, 7, 8, & 9)
Lab 2: Burn severity and ecological risk assessment

Week 4, Feb 10: Image Interpretation and Resolution (PS#2 due)
(Chs: 5 & 10)
Lab 3: WorldView-2 and SWIR data
Week 5, Feb 17: Analysis I (PS#3 due)
(Chs: 11, 12 & 13)
Lab 4: Thematic change in agriculture
Week 6, Feb 24: Analysis II (PS#4 due)
(Chs: 14, 15 & 16)
Lab 5: Hyperspectral data lab

Applications

Week 7, Mar 3: Midterm exam week
Week 8, Mar 10: Terrestrial Ecosystems (PS#5 due)
(Ch: 17)
Lab 6: Google's Earth Engine Introduction-1
Week 9, Mar 17: Earth Sciences (PS#6 due)
(Ch: 18)
Lab 7: Earth Engine: Introduction-2
Week 10, Mar 24: The Hydrosphere (PS#7due)
(Ch: 19)
Lab 8: Earth Engine: Classification
Week 10, Mar 31: Spring Recess
Week 12, Apr 7: Land Use and Land Cover Change (PS#8 due)
(Ch: 20)
Lab 9: Earth Engine: Change Detection
Week 13, Apr 14: Global Change (PS#9 due)
(Ch: 21)
Lab 10: Earth Engine: Advanced Methods
Week 14, Apr 21: Remotely Piloted Aircraft (RPA) Field Trip – location: Cesar Chavez Park. Two field labs, 9-11 and 11-1p, bring water and snack/lunch
Week 15, Apr 28: Next Generation Approaches (PS#10 due)
Lab 11: RPA mapping Lab

Course materials: Textbook: *Introduction to Remote Sensing* (Campbell and Wynne, Fifth Edition, 2011). Additional readings will be assigned to further develop principles and applications from the text, and to support lab assignments.

Course requirements: Weekly problem sets are completed outside of class hours, which include lab activities to further develop skills learned in class, and weekly lecture quizzes given on bCourses, constituting 50% of your final grade. Late problem sets are not accepted. Attendance will count for 10% of your grade, and will be logged with a sign in sheet in the lab. A midterm exam in Week 7 will test material covering the first half of the course and will constitute 20% of your grade. A final exam will cover material from the entire semester (but not including ENVI labs) and will count 20% of your grade.