San José State University
College of Social Sciences Department of Geography & Global Studies
Geog 181, Remote Sensing: Basic Theory and Image Interpretation
Spring 2018

Course and Contact Information

Instructor: Eric Waller, PhD

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Office Hours: Thursday, 12:45-2:45 pm

Class Days/Time: Lecture: Th, 3:00-4:45pm; Lab: Th, 5:00-7:45pm

Classroom: Lecture: WSQ 111; Lab: WSQ 113

Prerequisites: Geog 170 or instructor consent

Course Format

This class includes both a lecture and laboratory component. Active participation by all students in both sections is essential to passing this course. Course laboratory exercises (of 9 lab assignments, 8 best * 5% each = 40%), two exams (2*20%=40%), and a final project (20%) will contribute to the final grade. Lecture slides and laboratory assignments will be available on and submitted to the Canvas website.

MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Canvas Leaning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu to learn of any updates.

Course Description

Acquisition, interpretation and applications of imagery obtained from both airborne and satellite platforms. Cursory review of air photo interpretation and photogrammetry along with a greater focus on the automated analysis of digital images, such as those collected by Landsat and MODIS sensors, using ERDAS Imagine software. Other more advanced data sources such as hyperspectral and thermal imagery, as well as RADAR and LIDAR, will also be briefly explored. A major focus overall is on the use of remotely-sensed imagery as a source for mapping and geographic information systems (GIS).

Course Goals

Based on the Department Program Learning Objectives (PLOs), students will be able to:

PLO1 Demonstrate understanding of and ability to analyze spatial relationships.

PLO2 Analyze and critique human and environment interactions.

PLO3 Define and use basic geography tools and techniques.

Course Learning Outcomes (CLO)

Students will get fundamental training in remote sensing to understand the power and limitations of satellite data. They will gain hands-on experience with remotely sensed data and learn how to turn that data into actionable information, such as a classified map that could be used with GIS software. In combination with the 170/171 series, students will be well prepared for complex spatial analysis and modeling in a variety of fields.

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

- Understand the foundations, applications, and challenges of remote sensing satellite data
- Acquire, use, and analyze different types of remote sensing data and instruments
- Determine and use appropriate technologies for environmental question/project of interest

Required Texts/Readings

Textbook

This class will use a textbook available as an on-line PDF (this can be downloaded to your computer): https://www.itc.nl/library/papers_2009/general/principlesremotesensing.pdf

There are many other great on-line resources that can be used to supplement the material in the on-line textbook. For example, Penn State University has a nice "Chapter" on remote sensing with many useful sections: https://www.e-education.psu.edu/natureofgeoinfo/node/1879

Other Readings

Additional readings to supplement the on-line text will be placed on the Canvas website.

Other technology requirements / equipment / material

- USB flash drive and/or cloud storage (cannot save to the local hard drive on lab computers)
- Computer internet access is essential for accessing materials and uploading assignments on Canvas. All assignments must be submitted and uploaded to Canvas as PDFs or Word docs.

Library Liaison

The Geography liaison at Martin Luther King, Jr. Library is Nyle Monday. He can be reached at nyle.monday@sjsu.edu.

Course Requirements and Assignments

SJSU policy suggests that students should spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week) for study, lecture, laboratory, and assignments. For this 3 unit course, that translates to 9 hours per week, including 4.5 in class and lab. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf

University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Methods

The course will involve a combination of lectures, discussions, and participation, two exams (midterm and final), near weekly laboratory assignments, and a final project for grade determination. You should read the assigned sections of the textbook and/or readings before the lecture in which they are discussed. The lectures and labs will expand on the materials from the readings. You will not be tested on material that is not covered in the lecture or labs. Laboratory assignments will cover a variety of remote sensing techniques and applications, mostly involving the use of ERDAS Imagine software available on the laboratory computers. This software and your analyses should complement analyses in ArcGIS, if you are taking the GIS course this semester.

Laboratory Exercises

Nine exercises involving the use of software on computers in the lab (mostly ERDAS Imagine) will be assigned for the laboratory section and the total (your 8 best will be used to compute your total) is worth 40% of your grade (200 points). Most exercises will be due (on Canvas) before the 3 PM lecture on Thursday the following week.

Examinations

There will be a midterm and final exam, each worth 20% of your final grade (100 points each). These will be roughly 1.5 hour long in-class exams, although you will be allotted the use of the full final period. These exams will only cover material covered in class lecture or the laboratory assignments.

Final Examination or Evaluation

Our final exam is scheduled for Friday, May 18th at 2:45 PM.
(We are Group II in the finals schedule: http://info.sjsu.edu/static/catalog/final-exam-schedule-spring.html)
We have until 5 PM for the exam. Given that the final has the same weight (and similar length/difficulty) as the midterm, you will likely not require the full time period, but it will be available.

Final Project

A big part of this class is your final project, using your choice of data and techniques. The project, including a paper and presentation, is worth 20% of your final grade (100 points). The final project will involve obtaining remotely sensed data on-line, and generating a useful mapped product(s) or analysis, such as a land cover change detection over time. Your final project (develop a proposal no longer than one page) must be approved prior to commencing and should relate to topics covered in class. The paper portion will be submitted as if it were a compact scientific paper (~4-5 pages of text, excluding figures), with separate sections of: Introduction, Methods, Results including figures, Discussion, and Conclusion (worth 75% of the final project, equivalent to 15% of your final class grade). All students will give a 10-15 minute presentation of their completed project to the class during the final laboratory session (worth 25% of the final project, equivalent to 5% of your final class grade). The final project paper will be due the following week (May 17th).

Grading Information

This course must be passed with a C or better as a Geography department graduation requirement.

There will be 9 laboratory assignments, of which your 8 best will contribute to your final grade. All asssignments should be submitted digitally as Microsoft Word files or Adobe PDF. Laboratory assignments must be named as follows: Last name first initial_course number_assignment number (e.g.,

wallere_G181_L1.docx for my first lab). Late assignments will lose 20%, with an additional 20% after a week. Assignments will not be accepted more than 2 weeks late. Late final projects will not be accepted.

Determination of Grades

Your final grade will be determined according to percentage of a 500 point total. Two exams (midterm and final) are each worth 100 points, the final project is worth 100 points, and lab assignments total 200 points, with 8 (best 8 out of 9) assignments, each worth 25 points. Late assignments will lose 20%, with an additional 20% after a week. Assignments will not be accepted more than 2 weeks late. Grades landing right on the fence (e.g., 93.00) will be swayed by a class participation evaluation.

Letter Grade	Percent Range	Points Range	Letter Grade	Percent Range	Points Range
A+	97:100	485:500	C+	77:80	385:400
A	93:97	465:485	C	73:77	365:385
A-	90:93	450:465	C-	70:73	350:365
B+	87:90	435:450	D+	67:70	335:350
B	83:87	415:435	D	63:67	315:335
B-	80:83	400:415	D-	60:63	300:315
			F	< 60	< 300

Classroom Protocol

I expect students to come prepared to class, having read the suggested readings for the week's lecture. I encourage questions about any of the material, whether in class, office hours, or via email. Students should be actively involved in class activities, refraining from recreational use of lab computers and mobile devices, and using class time efficiently.

Please refer to the Student Rights and Responsibilities Academic Policy at www.sjsu.edu/senate/docs/S16-15.pdf

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. are available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo

Geography Technology Laboratory Policies and Procedures

Eating and drinking are prohibited in WSQ 113. Eating and drinking are allowed in WSQ 111. Given that the lab is communal and there are a limited number of computers, priority is for students who are assigned for their specific lab time. Please be courteous to other students and lab instructors while in the lab.

Keep your work on your flash drive and do not manipulate the system in any inappropriate manner (e.g. changing backgrounds, viewing inappropriate websites, downloading or installing applications without permission, changing passwords, etc.). Please inform the lab instructor of any computer-related problems – do not try to fix the problems yourself. Printing documents should be done judiciously and sparingly.

Geog 181 / Remote Sensing, Spring 2018

Course Schedule

This course schedule is subject to change with fair notice and notifications will be sent out via Canvas or classroom postings.

Course Schedule

Week	Date	Topics	Readings	Laboratory Assignments & Deadlines
1	Jan 25	Introduction(s), course overview, history of remote sensing, air photo interpretation	Chapter 1 (skim)	Lab 1: Internet resources, Google Earth for simple image analysis
2	Feb 1	Electromagnetic spectrum, atmospheric effects, spectral response patterns (signatures)	Chapter 2	Lab 2: Electromagnetic spectrum; *Lab 1 due (3 PM)*
3	Feb 8	Sensors, platforms, cameras, photogrammetry, image characteristics	Chapter 4 (skip 4.3), Chapter 3 (skim)	Lab 3: Photogrammetry, Data math, color display *Lab 2 due*
4	Feb 15	Spectral/Optical data and satellites; Data pre-processing: IFOV, MTFs, resampling	Chapter 5 (but just skim 5.2)	Lab 4: Landsat in ERDAS Imagine image processing software; *Lab 3 due*
5	Feb 22	Spectral data analysis; Atmospheric correction	Chapter 6 (skip 6.4)	Lab 5: Imagine: Spectral data analysis; *Lab 4 due*;
6	Mar 1	Spectral and spatial data transformation	Readings on Canvas	Lab 6 Imagine: Spectral and Spatial data analysis *Lab 5 due*;
7	Mar 8	Visual image interpretation and digital image classification (supervised, unsupervised)	Chapter 7, Chapter 8.1-8.3	Lab 7: Imagine Classifier Tool; *Lab 6 due*
8	Mar 15	Integration of GIS and remote sensing / sensor fusion. Ancillary data; reference data; accuracy assessment	Chapter 8.4, Readings on Canvas	Lab 8: Imagine "Spectral Analysis" tool (note: not due until after Spring Break); *Lab 7 due*
9	Mar 22	Exam	(Through Week 7 lectures and labs)	Lab final projects: discussion and proposal development

Week	Date	Topics	Readings	Laboratory Assignments & Deadlines
10	Mar 29	Spring Break		
11	Apr 5	Object-based Image Analysis: Spectral/spatial segmentation	Chapter 8.5	Lab 9: Imagine "Objective"; *Lab 8 due; Project proposal (1 page or less) also due.*
12	Apr 12	Thermal sensing	Chapter 12	Explorations of thermal data (no assignment); Work on final project. *Lab 9 due*
13	Apr 19	Active sensors: RADAR, LIDAR	Chapter 10	Work on final project
14	Apr 26	Hyperspectral analyses	Chapter 13	*Sharing and preliminary evaluation of final project.*
15	May 3	Multitemporal analyses Time series analyses: land cover change detection.	Canvas readings	Finishing lab final project.
16	May 10	Global-Scale Remote Sensing, Cloud Computing (Google Earth Engine), UAVs, Crowd-sourcing	http://earthenginepartners.appspot.com/science-2013-global-forest	*Project presentations*
Final Exam	May 18	2:45 PM to 5:00 PM		