

Syllabus
The Earth from Space: Remote Sensing of the Environment
Geography 3110 – Fall 2019

Instructor: Tim Edgar, M.S., Assistant Professor (Lecturer)

Contact Information: tim.edgar@geog.utah.edu, GC 4842

Office Hours: Mondays & Wednesdays 12:00 PM - 1:30 PM, or by appointment

Lecture: Mondays & Wednesdays, 3:00 PM-4:20 PM, GC 4680

Lab: Select Mondays & Wednesdays during the semester in GC 1825

Prerequisite: None

Course Fulfills: Physical/Life Science Exploration (SF) and Sustainability – Limited (SUSL) requirements

Credit Hours

GEOG 3110 is a three credit hour course. At the University of Utah it is assumed that there is at least one hour in class and two hours outside of class per week or the equivalent combination connected to every credit hour.

Course Description

Continued advancements in remote sensing technologies have resulted in an extraordinary increase in the availability of remotely sensed images of Earth. The explosion in the availability of remote sensing data has coincided with a growing number of remote sensing applications. Remote sensing data are now used in anthropology, civil engineering, environmental sciences, geography, geology, hydrology, natural resource assessment, meteorology, environmental monitoring, and urban planning. In this course, we will examine remote sensing science, techniques, and applications. We will learn about the physical basis for remote sensing and explore remote sensing technologies that use sunlight, infrared radiation, radar, and lasers. Five lab exercises provide “hands-on” experience with real remote sensing data and software.

Learning Outcomes

- Identify and describe the components of a remote sensing system, including principals of electromagnetic radiation.
- Interpret common visual themes in remotely sensed imagery, and associate these themes with remote sensing concepts.
- Summarize interactions between electromagnetic radiation and matter that govern remote sensing within different wavelength regions.
- Demonstrate effective use of remote sensing software, including the ability to solve common analysis problems.
- Explain uses of remote sensing for multiple application areas.

Optional Textbook

All of the content needed to succeed in this course is provided in lecture and labs. Students who benefit from having a textbook to accompany lecture and lab materials may wish to use one of the following texts. Lectures and labs will not directly follow the organization of these texts, and will include material that goes beyond what is provided in these texts. You are responsible for the material presented in lecture and labs, regardless of whether you choose to use a textbook or not.

1. *Remote Sensing of the Environment: An Earth Resource Perspective, 2nd edition*, John R. Jensen (2007) Prentice Hall, ISBN 9780131889507.

Jensen is an older text, but the class more closely follows the organization of this text. Chapters corresponding to lectures are listed in the course schedule.

2. *Fundamentals of Satellite Remote Sensing: An Environmental Approach, Second Edition*, Emilio Chuvieco (2016) CRC Press, ISBN 9781498728058

Chuvieco is a recent text, and contains a much better perspective on the current state of remote sensing.

Course Fee

There is a \$25 course fee associated with this class. This fee covers part of the licensing cost for remote sensing software.

Important dates

Last day to add, drop (delete), elect CR/NC, or audit classes

Friday, 30 August

Last day to withdraw from classes

Friday, 18 October

Evaluation

The following weights will be assigned to labs and exams to determine grades for the course:

Percentage Points:

Lab Assignments	35 %
Midterm 1	18 %
Midterm 2	20 %
Final	27 %
Total	100 %

Grade Scale:

A	93-100%
A-	90-93%
B+	87-90%
B	83-87%
B-	80-83%
C+	77-80%
C	73-77%
C-	70-73%
D+	67-70%
D	63-67%
D-	60-63%
E	<60%

Table of Grades

Grades	Points	Explanation
A	(4.0 points)	Excellent performance, superior achievement
A-	(3.7 points)	
B+	(3.3 points)	Good performance, substantial achievement
B	(3.0 points)	
B-	(2.7 points)	
C+	(2.3 points)	Standard performance and achievement
C	(2.0 points)	
C-	(1.7 points)	
D+	(1.3 points)	Substandard performance, marginal achievement
D	(1.0 points)	
D-	(0.7 points)	
E	(0.0 points)	Unsatisfactory performance and achievement

Labs

There will be five labs held in GC 1825 on dates specified in the course schedule below.

You are expected to do your own work on the labs. Labs are to be submitted to Canvas by 2:45 PM on their due date. Labs are expected to be well formatted and free of spelling and grammatical errors. Poorly formatted assignments will not be graded; assignments will lose points for poor spelling and/or grammar. Labs turned in late (after 2:45 PM) will lose 10% of their value each day they are late.

Exams

There are three exams in this course, consisting of two midterms and a final. Exams include multiple choice, fill in the blank, and short answer questions. The final exam is cumulative. Exams cannot be made up unless the instructor is contacted prior to an absence. If a make-up exam is offered, it may take any form, at the discretion of the instructor. Make-up exams will be taken at Exam Services in the Marriott Library. A fee is charged by Exam Services for administration of exams.

The final exam will be held on Thursday, 12 December from 3:30 PM-5:30 PM. Early final exams will not be given.

Extra Credit

There are NO extra credit options for this course.

Academic Misconduct Statement

As stated in the [Student Code](#); “Academic misconduct’ includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined further below. It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”

- “‘Cheating’ involves the unauthorized possession or use of information, materials, notes, study aids, or other devices in any academic exercise, or the unauthorized communication with another person during such an exercise.”
- “‘Misrepresenting one's work includes, but is not limited to, representing material prepared by another as one's own work, or submitting the same work in more than one course without prior permission of both faculty members.’”
- “‘Plagiarism’ means the intentional unacknowledged use or incorporation of any other person's work in, or as a basis for, one's own work offered for academic consideration or credit or for public presentation. Plagiarism includes, but is not limited to, representing as one's own, without attribution, any other individual's words, phrasing, ideas, sequence of ideas, information or any other mode or content of expression.”
- “‘Fabrication’ or ‘falsification’ includes reporting experiments or measurements or statistical analyses never performed; manipulating or altering data or other manifestations of research to achieve a desired result; falsifying or misrepresenting background information, credentials or other academically relevant information; or selective reporting, including the deliberate suppression of conflicting or unwanted data. It does not include honest error or honest differences in interpretations or judgments of data and/or results.’”

This course has a zero tolerance policy for academic misconduct. Students will be required to meet with the instructor and Department of Geography’s academic advisor (or the academic advisor of their respective department) to discuss any potential instance of academic misconduct. The resulting academic sanction will be a score of zero for any coursework in which it is demonstrated that a student engaged in academic misconduct. Additionally, an account of the student’s academic misconduct will be entered into the U of U database for misconduct tracking. See the Student Code for additional information on academic sanctions.

Disabilities Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the course, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020 (V/TDD). CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

Course Schedule

Date	Topics	Jensen Chapter
Mon 19 Aug	Course Introduction	
Wed 21 Aug	Remote Sensing System	1
Mon 26 Aug	History of Remote Sensing	3
Wed 28 Aug	Remote Sensing and the Electromagnetic Spectrum	2
Mon 2 Sep	Labor Day Holiday (No Class)	
Wed 4 Sep	Remote Sensing and the Electromagnetic Spectrum	
Mon 9 Sep	Aerial Imagery	4
Wed 11 Sep	Image Interpretation	5
Mon 16 Sep	Image Interpretation and Photogrammetry	6
Wed 18 Sep	Lab 1 (GC 1825)	
Mon 23 Sep	Photogrammetry	
Wed 25 Sep	MIDTERM 1, Lab 1 Due	
Mon 30 Sep	Multispectral Remote Sensing	7
Wed 2 Oct	Multispectral Remote Sensing	
Mon 7 Oct	Fall Break (No Class)	
Wed 9 Oct	Fall Break (No Class)	
Mon 14 Oct	Lab 2 (GC 1825)	8
Wed 16 Oct	Thermal Remote Sensing	
Mon 21 Oct	Thermal/Passive Microwave Remote Sensing, Lab 2 Due	9 (Pg. 330-332)
Wed 23 Oct	Lab 3 (GC 1825)	
Mon 28 Oct	Active Microwave Remote Sensing	9 (Pg. 291-330)
Wed 30 Oct	Active Microwave Remote Sensing, Lab 3 Due	
Mon 4 Nov	Active Microwave Remote Sensing	
Wed 6 Nov	MIDTERM 2	
Mon 11 Nov	Lidar	10
Wed 13 Nov	Lab 4 (GC 1825)	
Mon 18 Nov	Remote Sensing of Vegetation	11
Wed 20 Nov	Remote Sensing of Vegetation, Lab 4 Due	
Mon 25 Nov	Remote Sensing of Water	12
Wed 27 Nov	Lab 5 (GC 1825)	
Mon 2 Dec	Remote Sensing of Soils & Arid Landscapes	14
Wed 4 Dec	Remote Sensing of Urban Landscapes, Lab 5 Due	13
Thur 12 Dec	Final, 3:30 PM-5:30 PM, GC 4680	

Note: The syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification, particularly when the modification is done to rectify an error that would disadvantage the student.

General Computer Guidelines

CSBS Accounts

ENVI software for completing the lab assignments is available only on computers in the CSBS computing network. Students need a CSBS user account to access the CSBS network. To get a new CSBS user account go to <https://support.csbs.utah.edu/newuser> and fill out an account request. A CSBS user account enables your U card to access CSBS computing facilities on campus and provides access to the CSBS network.

Network Drives

All data necessary to complete the labs will be available on the network Z: Drive. To map the Z: Drive, click on the Windows icon in the lower left hand corner of the screen. In the box with the text "*Search programs and files*" type "run" and hit enter. This will open a "Run" window.

In the "Open:" box type (or copy and paste) the following:

[\\fs.csbs.utah.edu\courses\geog3110\mapit.bat](https://fs.csbs.utah.edu/courses/geog3110/mapit.bat)

An "Open File-Security Warning" window will open. Click "Run" in this window. Next, a black command window will open, hit the spacebar on the keyboard to continue.

Students have the responsibility to save and keep track of their own work. Students can save their work on their personal CSBS network drive (N: Drive). These drives are only accessible on CSBS computers.

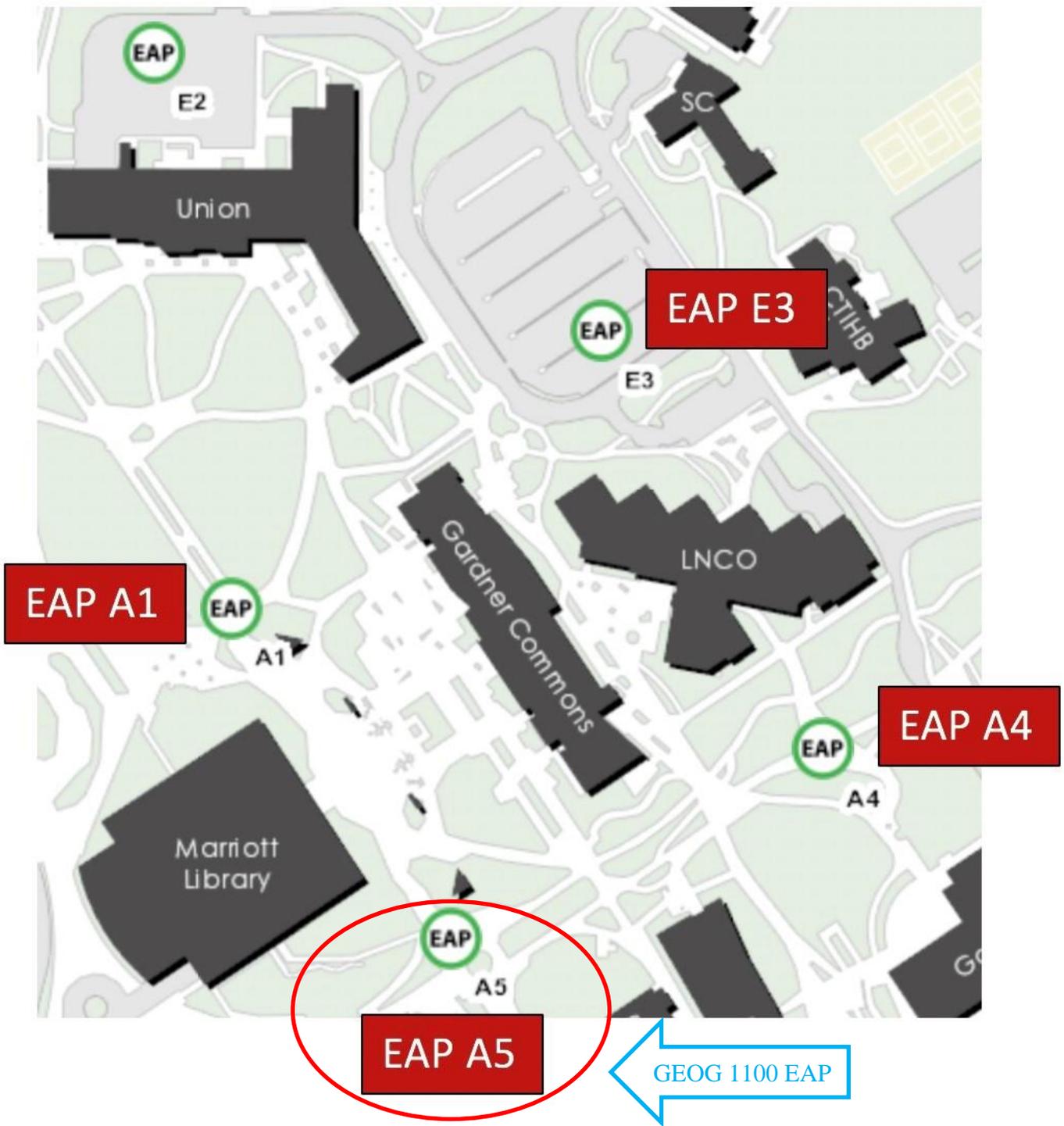
Data Storage

It is highly recommended that you backup your work on an external storage device such as a dedicated flash drive (16 GB or more) or portable hard drive to store remotely sensed data for the lab assignments and final project. Your N: Drive may not have enough storage space to support multiple labs between multiple courses. Network drives have minimal available space and have failed in the past, resulting in lost data; **such an occurrence will not be an acceptable excuse for turning work in late. Saving often and backing up is very important!** Keep in mind, when saving to your N: Drive that CSBS computing has implemented data storage limits of 20 GB for student accounts. When you near your storage limit, you will receive a warning message. If you go over your limit, you may be locked out of the system. This will not be an acceptable excuse for turning work in late, so please be aware of your disk space! Some of you may be enrolled in several lab-based courses. If you find that you are continually running up against storage limits, you can request additional disk space from CSBS Computing. Questions about disk space quotas can be addressed to the helpdesk at:

<http://support.csbs.utah.edu>.

Many different students use the CSBS computer labs. Please protect your accounts by making sure you log off every time you finish using the computer, and DO NOT share your CSBS account log-on information.

Gardner Commons Emergency Assembly Point



Safety & Wellness

Your safety is our top priority. In an emergency, dial 911 or seek a nearby emergency phone (throughout campus). Report any crimes or suspicious people to 801-585-COPS; this number will get you to a dispatch officer at the University of Utah Department of Public Safety (DPS; dps.utah.edu). If at any time, you would like to be escorted by a security officer to or from areas on campus, DPS will help — just give a call. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

The University of Utah seeks to provide a safe and healthy experience for students, employees, and others who make use of campus facilities. In support of this goal, the University has established confidential resources and support services to assist students who may have been affected by harassment, abusive relationships, or sexual misconduct. A detailed listing of University Resources for campus safety can be found at <https://registrar.utah.edu/handbook/campussafety.php>

Your well-being is key to your personal safety. If you are in crisis, call 801-587-3000; help is close. The university has additional excellent resources to promote emotional and physical wellness, including the Counseling Center (<https://counselingcenter.utah.edu>), the Wellness Center (<https://wellness.utah.edu>), and the Women's Resource Center (<https://womenscenter.utah.edu>). Counselors and advocates in these centers can help guide you to other resources to address a range of issues, including substance abuse and addiction.