Remote Sensing

GEOG 49230 | 59230 | 79230 & GEOL 42030 | 52030 | 72030
Spring 2021 | Online (remote, synchronous) – Zoom Room | T/R 12:30-1:45

Instructor
Dr. Timothy Assal (he/him)
Office: 437 McGilvrey Hall
Email: tassal@kent.edu (*best way to contact me)*
Phone: 330-672-2046

Office Hours
T & R 1:45 pm – 3:15 pm
M 3 - 5 pm
Class Zoom Room
Password: "geog"

Course Description

Remote sensing is the retrieval of information about an object without being in contact with that object. The objects we are interested in are all Earth objects and materials: water, rock, vegetation, anthropogenic surfaces, snow and ice. This course is designed to provide students with a working knowledge of the principles and applications of remote sensing. It provides a survey of the concepts and techniques of remote sensing and image analysis for mapping and monitoring a variety of the planet's spheres.

Course Learning Outcomes and Goals: *Understand…*

- Concepts and principles of remote sensing and electromagnetic energy
- Methods and techniques of remote sensing
- Advantages and limitations of remote sensing
- Applications of remote sensing to resource inventory, monitoring and analysis
- Remote sensing data, analysis approaches, and their relationship to applications
- Interface between remote sensing and other geospatial technologies
- How to plan and develop a remote sensing project proposal
- Computer file management and virtual desktop infrastructure

Course Materials

Required Textbook (available as an eBook through the KSU Main Library):

- James B. Campbell and Randolph H. Wynne*: Introduction to Remote Sensing, 5th Edition (ISBN 978-1-60918-176-5)*

Recommended Textbooks (both books are on reserve in the Map Library):

- Timothy A. Warner, David J. Campagna and Florencia Sangermano, *Remote Sensing with TerrSet/IDRISI A Beginners' Guide* (*ISBN 978-962822629-0)*
- John R. Jensen: *Introductory Digital Image Processing, A remote sensing perspective, 4th Edition* (*ISBN 978-0-13-405816-0*)

Software

- *TerrSet Geospatial Monitoring and Modeling System.* ***Students are not required to purchase the software, but you may want to own a copy for use on a personal laptop or desktop (PC only).*** As a student you are eligible for a $49, one-year, student starter license or the $99 permanent student license. The starter license is good for one year,

then terminates. The student license is a permanent license. If you decide to purchase a personal software license, you can do so online at www.clarklabs.org.

- *ArcGIS Desktop.* We will be using this software to create maps from processed satellite imagery. Students are eligible for a personal license at no charge through the Map Library (PC only).
- Please note, both TerrSet and ArcGIS require some minimal space on your personal computer to be useable. The Department of Geography maintains two computer labs with the required software (4h floor of McGilvrey Hall).
- ***Students are not required to purchase any of this software.*** We have set up a series of virtual machines (VMs) using virtual desktop infrastructure. Students will download the Microsoft Remote Desktop App (for Mac or PC) and use it to connect to a unique VM (each student will have the same VM for the duration of the semester) to access the required software. This is a challenge posed by COVID-19 and remote courses; however, it is advantageous to use this type of infrastructure as it is become increasingly common in many fields.

Hardware

- A USB Flash Drive (at least 16 GB size) or external hard drive is highly suggested to store your assignment work if you plan to use the software on your personal computer.
- However, if you use a VM, you will not be able to use a hard drive, but instead encouraged to use university supplied cloud storage.
- Success in the lab will depend in large part on managing your data properly. We will discuss this in the lab, but your ability to learn proper data management will be key to your success in this class (and beyond).

Zoom & Blackboard

- All class meetings will be held in the Zoom Room (password is 'geog'). In an effort to emulate an in-person class experience, I expect all students to have their video cameras turned on to maximize engagement with the instructor and other students.
- The course instructor will deliver course materials and additional materials via Blackboard. Links to pdf slides of the lectures will be posted *after* class. This is a synchronous course - there will be no voice over slides or recordings of lectures. You are expected to attend scheduled classes and labs, just as you are in a traditional face-to-face course.

Course Structure

Generally, we will have lecture on Tuesday and lab on Thursday (with a few exceptions).

Lecture Exams: Two lecture exams will be completed in class and will consist of a mix of multiple choice and short answer questions that reflect the information covered during that period of the course. Exams will be administered remotely during class time.

Lab Practical Exam: One lab exam will be completed in class and will consist of a mix of multiple choice and short answer questions. The practical examswill be administered remotely during class time.

Labs: Much of your success in this class will depend on gaining hands on experience with digital analysis of satellite images. The major purpose of these labs is to give you the skills and practice you need to learn the methods and to complete the final project. There will be 9 labs in total (15 points/each). Although one class is set aside for each lab you are expected to complete each lab on your own time. Each lab is due by the start of the next lab (typically one week later, unless otherwise noted) and must be submitted via the assignment dropbox in Blackboard Learn. You can discuss the labs with classmates, but each student must turn in their own lab, with written responses in their own words. Each lab is due by the start of the next lab (typically one week later). You are expected to write in complete sentences using proper grammar/spelling.

Participation: Attendance and participation is expected. I will do my best to emulate a face-to-face lecture/lab experience; I expect the same from all of you. Be present, be inquisitive, be conscientious. Please remember, this is a ***synchronous*** course. I will be visible on your screen, and I expect all of you to be visible to me and each other each class period. COVID-19 is a challenge to everyone and affects everyone in different ways. If you find yourself struggling this semester, please reach out. Communication with the instructor is key.

Final Project

In lieu of a project analysis and report to satisfy the cumulative final exam requirement for the class you will be required to write a project proposal. The project proposal (80 points) is a hypothetical project you dream up - one feasible of being carried out by you during a semester long independent study course, yet steeped in the scientific literature. The aim of this project is to conceptualize a remote sensing application to a real-world problem, learn how to write a basic proposal, be exposed to the scientific literature and think creatively. For graduate students, it is my hope that this will form your research plan. It will be an opportunity for all students to hone their writing and communication skills. I will provide a word document template to make your lives easier.

There will be two parts:

1. Project Proposal Concept (5 points): Approximately six weeks before the proposal is due, you will submit a brief (one or two paragraphs) synopsis of your project concept in Blackboard, which I will comment on and return to you. This will help to make sure you're on the right track.
2. Project Proposal (75 points): the proposal document will be the final deliverable for this project. The paper for the project should be a minimum of 1500 words (max 1800 words) for undergraduates (plus images and tables) and in the neighborhood of 2000 words (max 2500 words) for graduate students (plus images and tables). It should include the following sections: project summary, problem statement, proposed activities, anticipated results and benefits, references, and figures.

There will be an opportunity for peer review of your problem statement and proposed activities during class time. I also encourage all students to schedule a session at the KSU Writing Commons. This semester you can schedule a video session, chat session or email session to work with a writing tutor and obtain feedback and pointers on your chronicle. ***Anyone who works with a tutor at the Writing Commons for this report will receive additional points on the assignment.***

Course Assessment

Category	Points per item	Total Points in Category	Percentage of class grade
Lab Assignments	15	150	~38%
Lecture Exams	30	60	17%
Lab Practical Exam	60	60	17%
Final Project	80	80	23%
Participation	15	15	~5%
Total		**350**	**100%**

Final Grade Scale

A 92.5 - 100	B+ 86.5 - 89.4	C+ 76.5 - 79.4	D+ 66.5 - 69.4
A- 89.5 - 92.4	B 82.5 - 86.4	C 72.5 - 76.4	D 59.5 - 66.4
	B- 79.5 - 82.4	C- 69.5 - 72.4	F < 59.4

HOW TO SUCCEED IN THIS CLASS - "*Tell me and I forget, teach me and I may remember, involve me and I learn."* B. Franklin

• ***Time commitment*** –As a rule, for each hour of class, you should be willing to spend an hour of your own time reading and doing class assignments. If you stick with this rule you should not become overwhelmed with material covered in class.
• ***Collegiality and professionalism*** – Respect your instructors, peers and colleagues. Communication with the instructor must be conducted in a professional manner. Do not talk in class unless asking or answering class related questions; turn off the ringers on your phones. Do not text or use your phone in class, except for class related purposes. Use your computers only for activities related to class, not social media.
• ***Participation and attendance*** – participating in class discussions will increase your awareness of the material and issues; take notes of key points. Only "legitimate" reasons for an excuse are accepted – let the instructor know if you will miss class.
• ***Always ask questions*** – if there is something that you do not understand do not be afraid to ask questions, even if this means interrupting the class. Engage!
• ***Persevere*** –Technical courses such as this one tend to be challenging in a remote environment. Things will go wrong (e.g. connectivity issues, software issues, etc.), let's recognize that. However, with challenges come opportunities ~ *no problem leaves you where you found it!*
• ***Late work*** – Late submissions will be docked 20% of the allocated points. No labs or projects will be accepted after five days past the deadline. All work will be submitted via Blackboard Learn. It will be tagged as late, if it comes in after the deadline, and there will be no mechanism to submit after 5 days (to the hour) past the deadline.

University and Course Policies

Important Dates

The official registration deadline for this course is January 25th; the last day to drop this class is February 1st. University policy requires all students to be officially registered in each class they are attending. Students who are not officially registered for a course by published deadlines should not be attending classes and will not receive credit or a grade for the course. Each student must confirm enrollment by checking his/her class schedule (using Student Tools in FlashLine) prior to the deadline indicated. Registration errors must be corrected prior to the deadline. The course withdrawal deadline is March 29th.

Academic Dishonesty

University policy 3-01.8 deals with the problem of academic dishonesty, cheating, and plagiarism. None of these will be tolerated in this class. The sanctions provided in this policy will be used to deal with any violations. If you have any questions, please read the policy at http://www.kent.edu/policyreg/administrative-policy-regarding-student-cheating-and-plagiarism

Accommodations

Kent State University is committed to inclusive and accessible educational experiences for all students. University Policy 3342-3-01.3 requires that students with disabilities be provided reasonable accommodations to ensure equal access to course content. Students with disabilities are encouraged to connect with Student Accessibility Services as early as possible to establish accommodations. If you anticipate or experience academic barriers based on a disability (including mental health, chronic medical conditions, or injuries), please let me know. If you have a documented disability and require accommodations, please contact the instructor at the beginning of the semester to make arrangements for necessary classroom adjustments. Please note, you must first verify your eligibility for these through Student Accessibility Services (contact 330-672-3391 or visit www.kent.edu/sas for more information on registration procedures).

Survey of Instructor

The Student Survey of Instruction (SSI) is now online. We will dedicate a portion of a class period later in the semester for students to complete this survey.

Respect for Diversity

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Course Schedule

Week	Date	Day	Topic	Reading
1	19-Jan	T	Course Introduction and History of Remote Sensing	Ch. 1
	21-Jan	Th	The Electromagnetic Spectrum and Remote Sensing	Ch. 2
2	26-Jan	T	Image Acquisition	Ch. 3-4
	28-Jan	Th	Lab 1: Intro to TerrSet & VM Setup	Software help
3	2-Feb	T	Image Interpretation	Ch. 5
	4-Feb	Th	Lab 2: Visual image interpretation	
4	9-Feb	T	Digital Imagery and Color Theory	Ch. 3-4
	11-Feb	Th	Lab 3: Data access and download	Ch. 10
5	16-Feb	T	Exam 1	
	18-Feb	Th	Lab 4: ArcGIS and map making	Software help
6	23-Feb	T	Land Observation Satellites	Ch. 6
	25-Feb	Th	Lab 5: Georeferencing and data stitching	Software help
7	2-Mar	T	Image Classification	Ch. 12-13
	4-Mar	Th	Lab 6: Unsupervised classification	Ch. 12
8	9-Mar	T	Remote Sensing of Vegetation	Ch. 17
	11-Mar	Th	Lab 7: Supervised classification	Ch. 12-13
9	16-Mar	T	Remote Sensing of Rocks, Soil and Water	Ch. 18-19
	18-Mar	Th	Project Discussion	
10	23-Mar	T	Applications in Archaeology (Lidar & Hyperspectral)	Ch. 8, 15
	25-Mar	Th	Exam 2	
11	30-Mar	T	Change Detection - *Submit Project Proposal Concept*	Ch. 16
	1-Apr	Th	Lab 8: Change Detection	Ch. 16
12	6-Apr	T	Project Work & Peer Review	Literature Review
	8-Apr	Th	Project Work & Peer Review	Literature Review
13	13-Apr	T	Spring Recess - No Class	
	15-Apr	Th	Spring Recess - No Class	
14	20-Apr	T	Applications in Natural Resource Management	Ch. 20
	22-Apr	Th	Lab 9: Applied Remote Sensing: building algorithms	Ch. 11
15	27-Apr	T	In class activity/Project Work	Literature Review
	29-Apr	Th	Lab Exam	
	11-May	Th	Final Exam Period - Tuesday May 11, 2021 Final Projects Due by 3 PM	