

GEO837: Applications of Terrestrial Remote Sensing Syllabus

Spring 2025
T/Th 2:40 – 4 pm
GEO 126

Instructor

Dr. Kyla M. Dahlin,
Department of Geography,
Environment, & Spatial Sciences

Contact

kdahlin@msu.edu

Office Location & Hours

Mondays 1-3 pm
*sign up for a time slot via calendly
online (link on D2L)*

1 General Information

1.1 Description

GEO837 is a graduate level applied remote sensing (**RS**) course with a focus on building skills for quantitative environmental remote sensing using freely available data sources and software. We will primarily discuss vegetated terrestrial ecosystems. Students will learn several common image analysis techniques and will have the opportunity to develop these skills further with an independent project. This course will build on skills developed in previous RS courses, and we will introduce more advanced techniques like image processing in Google Earth Engine. This course will also emphasize essential 'soft' skills: reading and understanding the primary literature, leading discussions, finding and analyzing data, writing clearly and concisely, and presenting one's work in a clear and engaging manner.

Prerequisites: GEO 424, *or* approval of Department. Everyone in the class should have some background in GIS and RS.

Evaluation: Students will be evaluated by a research project, several short homework assignments associated with the project(s), in-class presentations, and short reading summaries.

On D2L: SS25-GEO-837-001 – Applications of Terrestrial Remote Sensing

1.2 Course Objectives

- Produce publication-quality maps and figures using open-source software
- Analyze imagery to assess change over time in Google Earth Engine
- Explain, synthesize, and evaluate analyses presented in the peer-reviewed literature
- Write succinctly and revise writing about remote sensing methods and applications
- Practice advanced remote sensing techniques
- Design and test independent research questions

2 Course Materials

2.1 Required Reading

Peer Reviewed Literature: posted on D2L, readings may be added or changed as necessary.

2.2 Recommended Reading

Green K, Congalton RG, & M Tukman (2017) *Imagery and GIS: Best practices for extracting information from imagery*. ESRI Press. pp. 436 (\$65 online)

Lillesand T, Kiefer RW, & J Chipman (2015) *Remote Sensing and Image Interpretation*. 7th Ed. Wiley. 804 pp. (\$110 online)

Campbell JB, Wynne RH, & Thomas VA (2022) *Introduction to Remote Sensing*. 6th Ed. Guilford Press. 634 pp. (\$105 online)

These books are not assigned, but if you are relatively new to remote sensing it is recommended that you look at one of them to provide more background on the topics discussed in class.

2.3 Other Tools & Materials needed

Students are expected to have a working laptop that can connect to the internet in class. We will use D2L and OneDrive for most communication, assignments, and materials distribution.

2.3 Recommended Computer Space Set Up

If at all possible, make sure that your home computer set up is comfortable for you (see <http://www.msuergonomics.com/> for more info) and, if possible, consider a second monitor for your computer. Even a small and relatively inexpensive one (they are available for <\$100) will dramatically improve your ability to work in this and all your classes.

3 Course Policies

3.1 Life happens.

When life gets in the way, let Dr Dahlin know. I will do everything I can to work with you. I cannot be of assistance unless you reach out, though. Know that we faculty are not here to judge you or to evaluate your reasons for needing assistance. We are on the same team, and we are committed to helping you be successful. The ability to ask for help is a strength that will benefit you throughout life.

3.2 Essential needs

We acknowledge that it is difficult to thrive and learn when your basic needs – such as affordable housing, healthy food, and access to hygiene – are not met. If you need assistance with any basic needs, you can let Dr Dahlin know, and she will connect you to relevant resources. You can also check out <https://socialwork.msu.edu/students/student-advocates-for-essential-needs-security.html> or contact Monaca Eaton, advisor for the Student Advocates for Essential Needs Security, directly at eatonmon@msu.edu.

3.3 Inclusive environment

MSU is committed to creating and maintaining an inclusive community in which students, faculty, and staff can work together in an atmosphere free from all forms of discrimination. The Office for Civil Rights and Title IX Education and Compliance (OCR) reviews concerns related to discrimination and harassment based on sex, gender, gender identity, race, national origin, religion, disability status, and any other protected categories under the University Anti-Discrimination Policy

(https://msu.public.na2.doctract.com/doctract/documentportal/08DC8FCBBBEF7442AC7BA_A37AB09F817) and Policy on Relationship Violence and Sexual Misconduct

(<https://u.policies.msu.edu/doctract/documentportal/08DB66BCB5863CD76D160F733DB5317B>). If you experience or witness acts of bias, discrimination, or harassment, please report these to OCR: <https://civilrights.msu.edu/response-and-investigations/index.html>

Here are specific ways students are expected to behave:

1. **Giving voice.** Allow the instructor and other students to share their thoughts and ask questions without disruption, interjection, criticism, or dismissiveness. The classroom is a space for us all to learn and grow. It is fully acceptable to make mistakes - indeed, that is how we learn.

2. **Pronouns.** We will refer to each other by the pronouns we identify with. When introducing yourself to others, you may offer your preferred pronouns (e.g., he/him/his, she/her/hers, they/them/their, etc). For more information, please visit: <https://gscs.msu.edu/education/pronouns.html>
3. **Assuming positive intent.** In a diverse world, we are confronted with thoughts, opinions, and behaviors that differ from our own. When these differences intersect with our personal values, we may feel the need to judge, criticize, or attack. It is important in this course (and in life) that we assume positive intent in others. Assuming positive intent doesn't mean we need to agree with the other person, but it pushes us to ask questions to better understand how a person's background, prior experiences, and reasoning shapes their thoughts.

3.4 MSU Resources

MSU provides numerous resources, both in-person and online, that students may not be aware of. The list below represents a sample of those resources. If you do not see what you are looking for, please let us know.

- Writing Center: <https://writing.msu.edu/>
- Health Services: <https://olin.msu.edu/>
- Counseling and Psychiatric Services: <https://caps.msu.edu/>
- University Ombudsperson: <https://ombud.msu.edu/>
- Office of Cultural and Academic Transitions: <http://ocat.msu.edu/>
- Gender and Sexuality Campus Center: <https://gscs.msu.edu/>
- FAME (for foster care alumni and students who have experienced homelessness): <https://fame.socialwork.msu.edu/>
- English Language Center: <https://elc.msu.edu/>

3.5 Communication

If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let Dr Dahlin know as early as possible. As you will find, building rapport and effective relationships are key to becoming an effective professional. Make sure that you are proactive in informing your instructors when difficulties arise during the semester so that we can help you find a solution.

If you have a question about the course schedule, the grading scheme, or other course policies, please attempt to find the answer on the syllabus, D2L, or a MSU website before contacting us. I also encourage you to join me during our office hours or make an appointment to meet at another time, especially when you have a complicated question that may require a complicated answer.

To contact me via email, please use your MSU email (rather than another email account, such as Gmail). **Put "GEO 837" in the subject line as this helps me to prioritize student questions and comments.** I make every effort during the week to go through emails daily and try to respond promptly, but sometimes it may take up to 48 hours to respond to you. I rarely respond to emails over the weekend (in an effort to achieve meaningful work-life balance).

3.6 Course Platforms & Structure

Most communications and materials for this course will be shared via D2L. This course will include twice a week meetings that will be hybrid in person and on zoom. My expectation is

that most students will regularly attend these meetings and participate in person. Because I am planning on this course being fairly interactive, I am not planning on recording meetings. Most of the work in this class will be done via online platforms like Google Earth Engine and OneDrive or using free software like R, RStudio, and QGIS. If you have trouble accessing any of these please let Dr. Dahlin know as soon as possible.

3.7 Academic Honesty

Academic honesty is expected in this course. Assignments, essays, responses, and projects must be the work of the student submitting them unless otherwise specified. When you use the words or ideas of others, you are required to explicitly acknowledge the source using appropriate citations.

If you are not familiar with citation methods, including in-text citations and works cited pages, please visit this website for information: https://owl.purdue.edu/owl/purdue_owl.html If necessary, Dr Dahlin may use iThenticate (<https://tech.msu.edu/service-catalog/teaching/tools/ithenticate/>) to check written work for plagiarism. If you are in the habit of copy-pasting text from publications into your early drafts (which is not a good habit!) you can request an account and use iThenticate yourself, too.

Also familiarize yourself with MSU's policy on the Integrity of Scholarship and Grades, which governs academic misconduct. Students who violate these policies may receive an automatic zero on an assignment and/or a failing grade in the course. For more information:

<https://ombud.msu.edu/resources-self-help/academic-integrity>

The Spartan Code of Honor Academic Pledge – “As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor in ownership is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.”

3.8 Artificial Intelligence and Large Language Models

Large language models (LLMs) like Chat-GPT are transforming how academics read, write, and learn. For this class, LLMs and other AI platforms are permitted for checking your own writing or understanding only. They should not be used for reading discussion assignments other than to check grammar. For the written assignments they can be used to check grammar and clean up writing, but not to write new text. And of course, be aware that any references provided by an LLM should be double checked as they may or may not exist.

3.9 Accommodations for Students with Disabilities

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or <https://www.rcpd.msu.edu/>

If you have an Accommodations Letter from RCPD, present this form to me at the start of the term or two weeks prior to the accommodation date (test, project, etc.). Requests received after this date will be honored whenever possible.

If you have any challenges or issues related to your ability to succeed in this class, regardless of their status with RCPD, please let Dr. Dahlin know as soon as possible.

3.10 Attendance & Participation

3.10.1 Attendance in Class

Students whose names do not appear on the official class list for this course may not attend this class without permission. Students who fail to attend the first four class sessions or class by the fifth day of the semester, whichever occurs first, may be dropped from the course.

Students are expected to attend most class meetings preferably in person, to show up on time, and to contribute intellectually to the class by asking questions and sharing thoughts and opinions.

3.10.2 Assignments

Keeping up with assignments is an important part of academic success. For the reading discussions, these need to be turned in on time to help the leader prepare for their discussion, and so will receive no credit if they are turned in late. For the main project writing assignments, these assignments build on each other and are meant to be iterative, so late assignments can be turned in for half-credit. I will generally try to grade these the day after they are turned in, so if they are not there then, they will be considered late. Since presentations are the day before spring break and on our finals day, these can not be turned in late.

These are the course policies, however, exceptions do sometimes arise, so if something comes up that is not covered here but impacts your ability to participate in the course, please contact Dr. Dahlin as soon as possible.

3.11 Emergencies

In the event of an emergency, our primary goal will be to stay safe. There is a wide variety of situations we could potentially face as a class, so please be prepared to stay calm, and never hesitate to interrupt the instructor if something seems awry.

3.12 Confidentiality

Written work and other materials submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees, including instructors, may not be able to maintain confidentiality when it conflicts with their responsibility to report certain issues to protect the health and safety of MSU community members and others. As the instructors, we must report the following information to other University offices (including the Department of Police and Public Safety) if you share it with us:

- Suspected child abuse/neglect, even if this maltreatment happened when you were a child,
- Allegations of sexual assault or sexual harassment when they involve MSU students, faculty, or staff, and
- Credible threats of harm to oneself or to others.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In almost all cases, it will be your decision whether you wish to speak with that individual. If you would like to talk about these events in a more confidential setting you are encouraged to make an appointment with MSU Counseling and Psychiatric Services: <https://caps.msu.edu/>

3.13 Student Perceptions of Learning Survey (SPLS)

Michigan State University takes seriously the opinion of students in evaluating and enhancing

the quality of instruction and has implemented the SPLS process to gather student feedback. You will receive an email in the last five calendar days of class asking you to complete the SPLS at your convenience. We will also have time to fill out SPLS on the last day of class. You have the option to decline to participate in the survey by not responding to any of the questions. We hope students are willing to provide frank and constructive feedback so the information can be used to enhance the quality of teaching in the future. MSU protects student confidentiality by reporting SPLS responses as an aggregated summary after the window closes for instructors to submit grades and responses are not reported when fewer than five students respond. More information about the SPLS is available at <https://spls.msu.edu/>

4 Evaluation

4.1 Main Project

The core goal for this class is to produce the beginnings of a publication-quality paper focused on a geographic area of interest to you. Each student will pick a location (ideally <100 km²) and in the first half of the semester we will conduct a series of analyses to understand that location from a satellite remote sensing perspective. In the second half of the semester you will be expected to perform two additional analyses of your choosing and write these up. Dr Dahlin will give more guidance in class, but in general these will be “turned in” as additions to a MS Word document on OneDrive. Dr Dahlin will evaluate each submission on its own as well as a revised draft at the end of the semester. Each student will give a short presentation on their topic before spring break and a slightly longer presentation during our final exam time.

4.2 Reading Discussions

Almost every week (10 times total) we will read and discuss peer reviewed articles from the remote sensing literature. There will be two papers assigned per discussion day, and two students selected to lead the discussions. Students will post comments/questions/thoughts about the papers online via the D2L discussion tool and then come to class ready to discuss in a group. The class will be divided into two groups so each discussion leader will lead the same discussion twice (practice!)

4.3 Second Half of the Semester

The topics to be covered in the second half of the semester are currently “to be determined.” In the week prior to spring break we will discuss possible topics and use ranked-choice voting to determine what we cover. Dr Dahlin will develop two small assignments/deliverables associated with whatever topics we cover.

6 Grading

Assignment	Points	Final Grade Scale	
Reading Discussions (20 x 5)	100	> 465	4.0
Reading Discussion Lead	50	440 - 465	3.5
Project Components (20 x 7)	140	415 - 439	3.0
Short Project Presentation	20	390 - 414	2.5
Part 2 Deliverables (60 x 2)	60	365 - 389	2.0
Final Paper	100	340 - 364	1.5
Final Presentation	30	300 - 339	1.0
TOTAL	500	< 300	0

You may notice that if you add up all the points in the “Points” column there are actually 520. This means that there are essentially 20 points of extra credit in the course already, so if you lose points for some reason, you have a buffer built in.

7 Course Schedule

The following lecture schedule remains subject to modifications. If significant changes do occur, students will be notified and an updated syllabus will be posted on D2L.

All assignments are due at noon (12 pm) on the due date.

Wk	Da y	Date	Topic(s)	Assignment Due	Readings to Discuss
1	T	14-Jan	Intros, course review, start intro lecture		
1	Th	16-Jan	How to lead a paper discussion, finish intro lecture	Get to know you “quiz” (no points)	
2	T	21-Jan	Pick a site - QGIS & GEE		
2	Th	23-Jan	Paper Discussion 1	D2L Paper Discussions	Chen et al 2023, Wanyama et al 2021
3	T	28-Jan	NDVI Timeseries - GEE & R	Site description	
3	Th	30-Jan	Paper Discussion 2	D2L Paper Discussions	Gorelick et al 2017, Tucker et al 1985
4	T	4-Feb	Temp & Precip Timeseries - GEE & R	NDVI time series	
4	Th	6-Feb	Land Cover & Change 1		
5	T	11-Feb	Paper Discussion 3	D2L Paper Discussions	Dahlin & Ault 2018, Cooper et al 2017
5	Th	13-Feb	NO CLASS		
6	T	18-Feb	LCC 2	Temp & Precip Analysis	
6	Th	20-Feb	Paper Discussion 4	D2L Paper Discussions	Bradley & Mustard 2005, Friedl et al 2010
7	T	25-Feb	Discuss topics for second half	LCC	
7	Th	27-Feb	3 min presentations	Presentation slide	
	T	4-Mar	SPRING		
	Th	6-Mar	BREAK		
8	T	11-Mar	??? 1		
8	Th	13-Mar	Paper Discussion 5	D2L Paper Discussions	???
9	T	18-Mar	??? 2	Methods + Figure + Results	
9	Th	20-Mar	Paper Discussion 6	D2L Paper Discussions	???
10	T	25-Mar	??? 3	Part 2 Deliverable	

Wk	Da y	Date	Topic(s)	Assignment Due	Readings to Discuss
10	Th	27-Mar	Paper Discussion 7	D2L Paper Discussions	???
11	T	1-Apr	???	Methods + Figure + Results	
11	Th	3-Apr	Paper Discussion 8	D2L Paper Discussions	???
12	T	8-Apr	???	Part 2 Deliverable	
12	Th	10-Apr	Paper Discussion 9	D2L Paper Discussions	???
13	T	15-Apr	???	Intro Paragraph and Data Sources Description	
13	Th	17-Apr	Paper Discussion 10	D2L Paper Discussions	???
14	T	22-Apr	???		
14	Th	24-Apr	Wrap up discussion & evaluations	Final Paper Due	
15	Th	1-May	FINAL EXAM - 5 min presentations	Final Presentation Due	