

GEO324: Remote Sensing of Environment Syllabus

Fall 2019 (4 credits)

Class for all MW 10:20 – 11:10 am

Lab 001: MW 12:40-2:30 pm | Lab 002: TTh 10:20 am – 12:10 pm

Geography Building Rm 126

Lab, Geography Rm 219

Instructors	Contact	Office Location & Hours
Dr. Kyla Dahlin, Department of Geography, Environment, & Spatial Sciences	kdahlin@msu.edu 517.353.9739	Geography Building Rm 121-A <i>Office hours:</i> Tues 12:30 – 2:30 pm or by appointment
TA: Nafiseh Haghtalab Department of Geography, Environment, & Spatial Sciences	haghtala@msu.edu	Geography Building Rm 1B <i>Office hours:</i> Weds 2:30 – 4:30 pm or by appointment

1 General Information

1.1 Description

GEO 324 is a technical course designed to teach the basic knowledge and skills expected of entry level employees by various mapping, planning, and natural resource agencies that make extensive use of remotely sensed aircraft or satellite images. This course also prepares students to go on to take GEO 424 and other advanced remote sensing courses by developing their basic knowledge and image interpretation skills. GEO 324 covers a substantial amount of material and includes fairly rigorous testing of both technical knowledge and image interpretation skills.

1.1.1 Prerequisites: GEO 221. We will use basic math to calculate scale, distance, and area. Students should be prepared to use their mathematical skills.

1.1.2 Evaluation: Students will be evaluated by a syllabus quiz, laboratory exercises, D2L quizzes, participation, and three exams (including the final).

1.1.3 On D2L: FS19-GEO-324-ALL

2 Course Materials

2.1 Recommended Reading

Book: Lillesand, Kiefer, & Chipman (2015) *Remote sensing and image interpretation* (7th Edition*). Wiley & Sons, Inc. pp 720. - available at the bookstore or online

1 copy is on 24 hr reserve at the Main Library (available at the 1st floor circulation desk 24 hr/day Sunday @ 10 am – Friday 10 pm, Sat 10 am – 6 pm)

* Note, this book is not required, however, if you are planning on taking GEO 424, and think you might want a career in remote sensing, it is worth investing in this book now (it is also the recommended book for 424). It is a standard remote sensing text around the world, and used copies are now available for <\$50. No questions on the exams or quizzes will come from the book without also being referenced in lecture or lab.

2.2 Recommended Reading (other good books about remote sensing)

Green, Congalton, & Tukman (2017) *Imagery and GIS: Best practices for extracting information from imagery*. ESRI Press, Redlands, California. pp 437.

Chuvienco (2016) *Fundamentals of satellite remote sensing: An environmental approach* (2nd Edition) CRC Press, Boca Raton, Florida. pp 468.

Jensen (2006) *Remote sensing of the environment: An Earth resource perspective* (2nd Edition) Prentice Hall, pp 608.

3 Course Policies

3.1 Email

I will use D2L to email the class on a semi-regular basis. People have been having issues recently with D2L messages going to spam – please make sure to regularly check your spam folder and set your email to accept D2L emails as this could impact all of your classes.

If you have questions or issues, please contact me! Students should not expect immediate responses to email messages, however, if you don't receive a response within 48 hours please email again or talk to me before or after class. **Please include "GEO324" in the subject line of your email for a faster response.**

3.2 Sending Attachments

Homework assignments in this class will be handed in on paper at lab. If you have to miss a lab period and cannot turn in your work, email it to Dr. Dahlin and the TA by the due time. Completed assignments should be sent as MS Word documents (.docx), PDFs (.pdf), or, if all else fails, raw text documents (.txt). If files are received "corrupted" or with other issues, the onus is on you to correct this problem, and if it isn't dealt with promptly it will be considered late.

3.3 Electronics in Class

Laptops and cellphones are permitted in class, however, if they become a distraction to other students the instructor may ask you to put them away. If you are working on a laptop during class the instructor may ask you to look up concepts/ definitions and share them with the class.

3.4 Academic Honesty

The Spartan Code of Honor Academic Pledge is: "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."

Unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the www.allmsu.com web site or other similar to complete any course work in this course. Students who violate MSU academic integrity rules may receive a penalty grade, including a failing grade on the assignment or in the course. Contact Dr. Dahlin if you are unsure about the appropriateness of your course work. (See also the [Academic Integrity](#) webpage.)

3.5 Accommodations for Students with Disabilities

MSU 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 on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation ("VISA") form. Please present this form to Dr. Dahlin at the start of the term and/or two weeks prior to the accommodation date (test, project, etc.). Requests received after this date may not be honored.

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.

3.6 Diversity

In order to learn, we must be open to the views of people different than ourselves. Each and every voice in the classroom is important and brings with it a wealth of experiences, values and beliefs. In this time we share together over the semester, please honor the uniqueness of your fellow classmates and appreciate the opportunity we have to learn from each other. Please respect your fellow students' opinions and refrain from personal attacks or demeaning comments of any kind.

3.7 Attendance & Participation

Students are expected to attend the majority of class and lab meetings, to show up on time, and to contribute intellectually to the class by asking questions and sharing thoughts and opinions. While I won't take strict attendance in class, this is a small class, so your absence will be noticed. Lab attendance is an important part of this course. We *will* take attendance in the first lab for each section each week with a sign in/sign out sheet, and excessive absences (>3) or very short durations of attendance will result in a reduction in your 'participation' points. If you have a conflict with your lab time talk to Dr. Dahlin as soon as possible.

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. If you anticipate that you will have to miss class for any reason, please discuss this absence with me at least a week in advance. If you miss an exam you will be expected to provide proof of a legitimate emergency before a makeup is allowed. Students seeking a grief absence should go to the Grief Absence Request Form found on the RO home page (<https://reg.msu.edu/>) under 'Student Resources - Forms - Grief Absence Request Form' OR to StuInfo (<https://stuinfo.msu.edu/>) under 'Academics - Enrollment Information and Services - Grief Absence Request Form.' If a grief absence is approved, accommodations will be made. **Late assignments/missed quizzes will not be accepted without prior approval or evidence of an emergency.**

3.8 Collaboration

Collaboration **IN CLASS** outside of exams is encouraged. We will do a number of activities in class where your active participation and interaction with others will, in fact, be required. However, all work done outside of the classroom should be your own. Written assignments, quizzes, and exams should represent your own independent work. If you need help on an assignment, contact the instructor or TA, not your fellow classmates.

3.9 Social Media

Yep, Dr. Dahlin is on twitter (@bristleweed), LinkedIn, ResearchGate, and a few other social media type things. You're welcome to follow her, of course (she tweets 90% work/science related stuff), but with very few exceptions she will not follow/friend/link back to you. Please do not take this personally. Dr. Dahlin's Ecological Remote Sensing and Modeling Lab is online at www.ersamlab.com and on twitter (@ERSAM_Lab) and Instagram (@ERSAM.Lab).

3.10 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.

4 Other Resources & a Note

Being a university student comes with many opportunities and challenges. Just a reminder of some of the many great resources MSU has available to help you maximize the opportunities and address the challenges.

Spartan Life OnLine - <http://splife.studentlife.msu.edu/> - Lots of great info here.

Office of the University Ombudsperson - <http://ombud.msu.edu/> - If you have an issue (like with an advisor or professor) and do not feel comfortable trying to resolve it with the person/department, the Ombuds Office can offer you advice.

MSU Title IX Program - <http://www.titleix.msu.edu/> - If you have questions about gender discrimination or harassment, this is a good place to look for resources.

MSU Office of Institutional Equity - <https://oie.msu.edu/> - If you have questions about other forms of discrimination or harassment, this is a good place to look.

MSU Inclusion and Intercultural Initiatives - <http://www.inclusion.msu.edu/> - Differences are our strength! This is a good place to look for inclusion-related opportunities and support.

MSU Counseling & Psychiatric Services - <https://caps.msu.edu/> - Free! Just walk in or connect virtually via the website.

NOTE on Confidentiality: Students should be aware that MSU employees, including instructors, may not be able to maintain confidentiality when it conflicts with their responsibility to report certain issues based on external legal obligations or that relate to the health and safety of MSU community members and others. Dr. Dahlin must report the following information to other MSU offices if you share it:

- 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.

5 Evaluation

My philosophy on grading is that it is a necessary but not very fun part of being a student (or being a professor). As such, I have tried to set up our grading system to be fair but also to respect the fact that students have complicated lives with unexpected challenges. The keys to getting a good grade in this class are to show up, do the work, and study. If something goes awry, you will then have a cushion to fall back on with accumulated extra credit – you will notice in section 6 that if you add up all the points, you could accumulate up to 645 points, however, the total only goes to 600 (see *). This means if you can earn up to 45 points of extra credit simply by doing the assigned work well.

5.1 Syllabus Quiz

The syllabus is an important part of any class! It serves as a guiding document for the course, and I will likely refer you to it if any questions arise. On the first day of class we'll have a syllabus quiz to ensure that you all actually look at it carefully. This is the one assignment in this class that you can make up. If you miss the first day of class for some reason, please get in touch with me and I will schedule a time with you to take it. Syllabus quiz makeups must be completed by the end of the second week of class.

5.2 Labs

A key component of learning remote sensing is actually doing the work and exploring imagery on your own. The labs in this course are designed to walk you through the basics, but also to allow time for you to explore and think on your own. Please use the lab time to *EXPLORE AND LEARN* not just to click through the assignments as fast as possible. My expectation is that labs will take the full first lab period, but should not, generally, run into the second one. Labs should be turned in at the end of the first or second lab period, but they are officially due at the start of the following week's first lab day for your section. Labs turned in after this time will not be accepted. If a lab is expected to take longer, or if we face technical issues, you will be informed of the official due-date in person and via D2L message. **Labs will not be accepted late no matter what** (unless you have a grief absence excuse or other serious issue). Due to poor attendance in the lab in years past, we will have students sign in and sign out of their respective lab meetings for the first meeting day each week and this attendance will factor into the participation part of your grade. Even though I expect you to come to lab, you can also remotely access the Geography department computers – we will discuss how to do this on the first day of lab.

5.3 D2L Quizzes

We will have 12 D2L quizzes throughout the semester. These will help give you a sense of how I ask questions, in preparation for exams, and lets me know if there are topics that are causing confusion. The quizzes will be posted on Wednesday of a given week and be open until 11:59 pm on Friday of that week. Quizzes can be taken three times, and D2L will show you which questions you've gotten wrong after you take the quiz each time. **Quizzes cannot be made up no matter what** (with the usual exceptions).

5.4 Exams

Each of the three exams (including the final) will be cumulative (i.e. concepts from the first third of the class could be on the second exam), though focused on the material in the most recent section of

the class (since the previous exam). Exam questions may come from lectures, class discussions, and labs. Topics discussed in the book but not covered in class or lab WILL NOT be on the exams. Exams will primarily use multiple choice and short-answer questions, but some other question types may be incorporated.

5.5 Participation

Everyone starts the semester with 20 participation points. Students will lose points for excessive unexcused absences from class, chronic tardiness, > 3 absences from the first lab meeting each week, or very brief lab attendance based on the sign in/sign out sheet.

6 Grading

Assignment	Points	Final Grade Scale	
Syllabus quiz	10	552 - 600	4.0
Labs (13 x 15 pts)	195	522 - 551	3.5
D2L quizzes (12 x 10 pts)	120	492 - 521	3.0
Exam 1	100	462 - 491	2.5
Exam 2	100	438 - 461	2.0
Participation	20	402 - 437	1.5
Exam 3 (Final)	100	360 - 401	1.0
TOTAL	600*	< 360	0

7 Course Schedule

The following lecture schedule remains subject to change and last minute modifications. If significant changes do occur, students will be notified and an updated syllabus will be posted on D2L. LKC7 = Lillesand et al 7th Edition.

Lab assignments should be handed in at the end of the lab period. If you can't finish in that amount of time then they are officially due at the start of your following week's first lab period. D2L Quizzes will open on Wednesday before lab and close on Friday at 11:59 pm.

Wk	Lect.	Date	Topic	Reading	Due
1	0	8/28	Introductions + Syllabus Quiz		
			NO LAB/QUIZ THIS WEEK		
2	1	9/4	Image Classification & Review	LKC7 Ch. 1 & 8.1 & 8.2	
			NO LAB/QUIZ THIS WEEK		
3	2	9/9	What is color?	LKC7 Ch. 1	
	3	9/11	How do digital cameras work?	LKC7 Ch. 2	
		M/Tu	Lab 1 – color formation	D2L reading	
		W/Th	D2L Quiz 1		Quiz 1
4	4	9/16	What is photogrammetry?	LKC7 Ch. 3	
	5	9/18	What is the electromagnetic spectrum?	LKC7 Ch. 1	
		M/Tu	Lab 2 – stereoscopy	D2L reading	Lab 1
		W/Th	D2L Quiz 2		Quiz 2
5	6	9/23	Types of resolution	LKC7 Ch. 1	
	7	9/25	Exam Review / catch up		
		M/Tu	Lab 3 – EM spectrum	D2L reading	Lab 2
		W/Th	D2L Quiz 3		Quiz 3
6	EX1	9/30	EXAM 1		
	8	10/2	How big is stuff in pictures?	LKC7 Ch. 3	
		M/Tu	Lab 4 – resolution	D2L reading	Lab 3
		W/Th	D2L Quiz 4		Quiz 4
7	9	10/7	Sensors & Platforms	LKC7 Ch. 5	
	10	10/9	Sensors & Platforms + mid semester evaluation	LKC7 Ch. 5	
		M/Tu	Lab 5 – Measurement	D2L reading	Lab 4
		W/Th	D2L Quiz 5		Quiz 5
8	11	10/14	What do forests & grasslands look like from space?	LKC7 Ch. 8.5 & 8.6	
	12	10/16	More forests & grasslands		
		M/Tu	Lab 6 – Forests & Grasslands	D2L reading	Lab 5
		W/Th	D2L Quiz 6		Quiz 6
9	13	10/21	What do agriculture and urban areas look like from space?	LKC7 Ch. 8.4 & 8.9	
	14	10/23	More ag & urban		
		M/Tu	Lab 7 – Agriculture & Urban	D2L reading	Lab 6

Wk	Lect.	Date	Topic	Reading	Due
		W/Th	D2L Quiz 7		Quiz 7
10	EX2	10/28	EXAM 2		
		10/30	Movie – Corona Project		
		M/Tu	Lab 8 – Earth Explorer & Corona Project	D2L reading	Lab 7
		W/Th	D2L Quiz 8		Quiz 8
11	15	11/4	NIR + SWIR	LKC7 CH. 4	
	16	11/6	Band combinations & ratios		
		M/Tu	Lab 9 – band combinations	D2L reading	Lab 8
		W/Th	D2L Quiz 9		Quiz 9
12	17	11/11	Active RS – LiDAR	LKC7 Ch. 6	
	18	11/13	Active RS - RADAR	LKC7 Ch. 6	
		M/Tu	Lab 10 – LiDAR		Lab 9
		W/Th	D2L Quiz 10		Quiz 10
13	19	11/18	Image Classification	LKC7 Ch. 7	
	20	11/20	Image Classification	LKC7 Ch. 7	
		M/Tu	Lab 11 – Explore NLCD	D2L reading	Lab 10
		W/Th	D2L Quiz 11		Quiz 11
14	21	11/25	Applications	LKC7 Ch. 8	
		11/27	<i>CLASS CANCELLED (holiday)</i>		
		M/Tu	Lab 12 – Image Classification	D2L reading	Lab 11
		W/Th	<i>NO QUIZ</i>		
15	22	12/2	Applications	LKC7 Ch. 8	
		12/4	Review and Evaluations		
		M/Tu	Lab 13 – Souvenirs		Lab 12&13
		W/Th	D2L Quiz 12		Quiz 12
16	EX3	12/13	EXAM 3: 7:45 – 9:45 AM in GEO 126		