

GEO837: Remote Sensing of the Biosphere

Syllabus

Fall 2016

M/W, 10:20 – 11:40 am

Geography Building Rm 219

Instructor

Dr. Kyla M. Dahlin,
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Contact

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Office Location & Hours

Geography Building Rm 122
Office hours:
Weds 11:40 am – 1 pm
or by appointment

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. We will primarily discuss vegetated terrestrial ecosystems, but there will be some coverage of urban and unvegetated landscapes and aquatic applications of RS. This class will meet in a computer lab and each day we will spend some time on lecture and discussion and some time working on the computers. Students will be exposed to a number of 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 new techniques like image processing in R (an open source statistical programming language) and new data types like LiDAR, imaging spectroscopy, and UAV-derived imagery. This course will also emphasize essential 'soft' skills: reading and understanding the primary literature, 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.

Evaluation: Students will be evaluated by a research project, several short homework assignments, one midterm exam, and in-class presentations.

On D2L: FS16-GEO-837-001-Remote Sensing Biosphere

2 Course Materials

2.1 Required Reading

Peer Reviewed Literature: posted on D2L, order listed in section 4, readings may be added or changed as necessary.

2.2 Recommended Reading

Jones, HG & RA Vaughan (2010) *Remote Sensing of Vegetation: Principles, Techniques, and Applications*. Oxford University Press. pp. 384

Lillesand, Kiefer & Chipman (2008) *Remote Sensing and Image Interpretation*. 6th Ed. Wiley. 804 pp.

(1 copy of each on reserve at the Main Library, or online)

These books are not assigned, but if you're relatively new to remote sensing it's HIGHLY recommended that you take a look at one of them to provide more background on the topics discussed in class. Lillesand et al (2008) is what we use in GEO 424, though there's also a newer version that the library should have soon!

3 Course Policies

3.1 Email

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 "GEO837" in the subject line of your email for a faster response.

3.2 Sending Attachments

Homework assignments in this class will often involve uploading a document to D2L via a Dropbox. If, for some reason, this doesn't work for you, email Kyla and please include "GEO837" in the subject line of the email and your name in the body of the attachment and in the filename itself. Ideally the file name would look like: GEO837_yourname_assignment#_YYYYMMDD.docx. Assignments should be sent or uploaded as MS Word documents (.docx), PDFs (.pdf), or, if all else fails, raw text documents (.txt) with images attached separately in a non-proprietary format (.jpg, .tif, .bmp). 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 the assignment 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 reserves the right to ask you to look up concepts/definitions and share them with the class as relevant.

We will be using Geography Department computers for the bulk of this course - using these computers appropriately and maintaining off site access (if necessary) is your responsibility.

3.4 Academic Honesty

Article 2.3.3 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, Dr. Dahlin adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide) Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests 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 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 your instructor 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 me 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, please let me 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. Finally, remember to keep confidential all issues of a personal or professional nature that are discussed in class.

3.7 Attendance & Participation

Students are expected to attend the majority of class 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, this is a small class, so your absence will be noticed. Five of the 10 participation points listed under grading will be awarded based on the above criteria. The other 5 will be awarded if you simply come to my office hours once throughout the semester **BEFORE THANKSGIVING**.

Students whose names do not appear on the official class list for this course may not attend this class without permission of the instructor. 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 the instructor 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 be directed to the Grief Absence Request Form found on the RO home page (<https://reg.msu.edu/>) under 'Student Services - 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 will not be accepted.**

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, computer code, and

exams should represent your own independent work. If you need help on an assignment, contact the instructor, not your fellow classmates.

3.9 Social Media

Yep, I'm on twitter (@bristleweed & @ERSAM_Lab), LinkedIn, ResearchGate, and a few other social media type things. You're welcome to follow me, of course (I tweet 90% work/science related stuff), but with very few exceptions I will not follow/friend/link back to you. Please do not take this personally, I just don't want to know what you had for dinner, how hard your other classes are, or whatever other personal stuff is going on in your life that isn't related to plants or geography.

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 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.

All written assignments are due 15 minutes BEFORE class on the due date.

Wk	Date	Topic	Reading (by this date)	Assignment Due
1	31-Aug	Introductions & GoogleEarth		
2	7-Sep	Review of RS & outside?	Wulder et al 2012 RSE	
3	12-Sep	More RS review & Projects	Becknell et al 2015 BioSci	
3	14-Sep	RS Applications & Readings	Hammerling et al 2012 JGR:Atm	
4	19-Sep	Cluster Analysis	Carlson et al 2012 Nature CC	Project location description due
4	21-Sep	Unsupervised Image Classification	Silva et al 2013 ERL	Paper summary due (1)
5	26-Sep	Accuracy Assessment	Foody 2002 RSE	
5	28-Sep	More Image Classification	Zhang et al 2005 EMA	Paper summary due (2)
6	3-Oct	PCA and other transforms	Baig et al 2014 RSL	
6	5-Oct	Land cover & 2 min presentations	Kim et al 2014 RSE	2 minute presentations due (5 slides max)
7	10-Oct	Land cover change	Tewkesbury et al 2015 RSE	Paper summary due (3)
7	12-Oct	Land cover change & why code?	rforcats.net	
8	17-Oct	Intro to R	Hijmans et al 2016 Raster	

Wk	Date	Topic	Reading (by this date)	Assignment Due
8	19-Oct	More R & Raster package	Xin et al 2015 RSE	Paper summary due (4)
9	24-Oct	MODIS in R, exam review	Friedl et al 2010 RSE	
9	26-Oct	MIDTERM EXAM		
10	31-Oct	MODIS data	Bradley & Mustard 2005 RSE	
10	2-Nov	Global biogeography	Kottek et al 2006	Paper summary due (5)
11	7-Nov	Time series analysis (in R)	Olson et al 2001	
11	9-Nov	Intro to HPCC	Hurt et al 2011	
12	14-Nov	Habitat suitability mapping	Franklin et al 2013 GCB	Paper summary due (6)
12	16-Nov	New RS Technologies	Yu & Gong 2012 IJRS	
13	21-Nov	Hyperspectral RS	Asner & Martin 2008 Frontiers	Project draft due (optional)
13	23-Nov	NO CLASS	Ustin et al 2004 Bioscience	Paper summary due (7)
14	28-Nov	LiDAR RS	Thomas et al 2013 Ecology	
14	30-Nov	Hyperspectral/LiDAR fusion	Dahlin et al 2013 PNAS	Paper summary due (8)
15	5-Dec	In class presentations		In class presentation due!
15	7-Dec	Evaluations & Final discussion		
16	14-Dec	Final Papers Due		

5 Evaluation

5.1 Midterm Exam

There is only one exam in this course. Questions may come from lectures, class discussions, and readings, though the focus will be on understanding concepts, not memorizing facts and statistics. The exam will primarily use short-answer and graphical questions, but some other question types may be incorporated.

5.2 Class Project

Students are required to complete a research project that will culminate in a 10-20 page (double spaced, 12 pt font, references and figures do not count towards the page requirement) paper about a particular part of the world. The idea behind this project is that if you are doing research in a particular part of the world, having some idea of the spatial and/or temporal context of your site could be helpful (this could even be the start of a chapter of your dissertation!). More details will be provided in class, but the general idea will be to produce a short research paper similar in structure to many of the papers we will be reading throughout the course. You have the *option* of turning in a

draft of your paper early to get feedback before submitting the final draft, however this is not graded and not required.

5.3 Reading Summaries

A fraction of the assigned reading will involve a reading summary. Each summary should include (1) a 3-5 sentence summary of the paper you read (can be any of the ones listed up to that date); (2) a description of the coolest figure in the paper, in your opinion; and (3) two or three questions that you were left with at the end of the paper, either about the work itself or the broader field. You'll notice that there are eight places where reading summaries are assigned on the course schedule, but only five listed under "Grading" - this means you can either skip any three of the assigned readings, or do them to earn extra credit. Reading summaries will not be accepted late, however (i.e. if you're 2 points away from a higher grade at the end of the semester you can't add a summary to up your grade then. So think ahead!)

5.4 Presentations

Each student will give a short (< 2 min) presentation describing their research topic at the beginning of the semester, and a longer presentation of their research project at the end of the semester. The length of the longer presentations will depend on the number of students enrolled, but they will likely be 8-10 minutes long plus time for questions.

6 Grading

Assignment	Points	Final Grade Scale	
Participation	10	450 - 500	4.0
Project Location Description	40	420-449	3.5
Short presentation	20	390-419	3.0
Reading Summaries (5 x 10 pts)	50	350 - 389	2.5
Midterm Exam	100	320 - 349	2.0
Final project	200	290 - 319	1.5
Final presentation	80	260 - 289	1.0
TOTAL	500	< 260	0