Geography (GEOG) 456: Remote Sensing Applications
(3 Credit Hours)

Spring 2019

Instructor: Aaron E. Maxwell, PhD, GISP
Class Time: TTH 1:00-2:15 PM
Class Location: Brooks Hall 419

Office: Brooks Hall 141
Hours: MW 12:30-2:20 PM
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Professor Maxwell's Website:

http://maxwellae.wix.com/maxwell-geospatial.

Course Contributors:

Several people helped me develop this course by providing advice, data, or lab exercises. Specifically, I would like to acknowledge the contributions of Dr. Tim Warner, Dr. Nektaria Adaktylou, Mr. Jarlath O'Neil-Dunne, Dr. Nicholas Clinton, and Dr. David Saah.

Prerequisite:

Geography 455/655: Introduction to Remote Sensing or instructor's permission.

Course Rationale: Survey of remote sensing applications, focusing on the type of information obtained and methods used. This course will investigate a wide range of applications of remote sensing including: landscape change/urbanization, geomorphology, hydrology, geology, forestry, soil science, and agriculture. We will critically evaluate the use of remote sensing technologies and methods to investigate a wide variety of applications. Key concepts will be discussed and hands-on applications will be explored.

Course Outcomes:

After completing this course the student will:

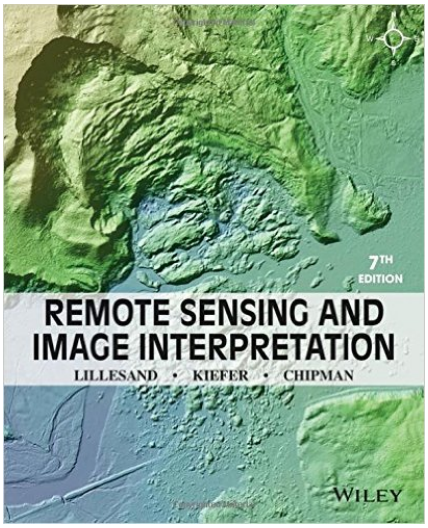
1. be able to critically evaluate remote sensing technologies and methods for investigating a variety of questions.
2. be able to find and prepare data for use in an analysis.
3. be able to undertake a remote sensing analysis and report on the results in a variety of formats.
4. have gained an advanced level of knowledge relating to the use of software packages for analyzing remotely sensed data, including Erdas Imagine and ArcGIS.

Course Structure/Philosophy

The course outcomes for this class will be met using a combination of lectures, class discussions, demonstrations, laboratory exercises, and projects. I firmly believe that students learn via engagement and by doing. As a result, this will not be a purely lecture-based course. Large portions of the class time will be set aside for class discussion and laboratory exercises. **It is important that you engage yourself during this class**. I will do my best to help you learn; however, it is imperative that you take ownership of your own education.

Textbook:

Remote Sensing and Image Interpretation by Lillesand et al. (doesn't matter which edition), ISBN-10: 111834328X, ISBN-13: 978-1118343289. Note that this is the same text that is used in Geog 455/655.



Additional readings will be assigned as pertinent to helping students achieve the outcomes of this course.

Lab material will be provided by the instructor.

Grading:

Grading for this course will consist of 11 lab exercises and 5 lab projects.

A total of 11 lab exercises will be assigned throughout the semester. It is important that all labs be completed in a timely manner. Some bonus lab exercises may be provided. **Labs exercises that are not turned in by the due date can be turned in up to 2 days late with a 20% penalty. Labs will not be accepted after this 2-day period. Labs are due at the end of the schedule lab period.** The following labs will be completed:

Lab 1: Pre-Processing Landsat 5 TM Data
Lab 2: Processing Landsat 8 Temperature Data
Lab 3: Supervised Classification in ArcGIS Pro
Lab 4: Error Matrices and Accuracy Assessment
Lab 5: Calculating Landscape Metrics in FragStats
Lab 6: Assessing Fire Using a Normalized Burn Ratio and Image Differencing Change Detection
Lab 7: Mapping Changes in Glaciers using Landsat Thematic Mapper (TM) Data
Lab 8: Lab 8: LiDAR Processing with Erdas Imagine
Lab 9: Working with LiDAR in ArcGIS Pro
Lab 10: Surfaced Hydrologic Analysis with TauDEM
Lab 11: GEOBIA with eCognition

You will also complete short projects in this course relating to the topics discussed and the labs completed. Projects will be less guided than lab exercises. Each project will require a different deliverable. **Projects that are not turned in by the due date can be turned in up to 2 days late with a 20% penalty. Projects will not be accepted after this 2-day period. Labs are due at the end of the schedule lab period.** The following projects will be completed:

Project 1: Urban Impervious Classification
Project 2: Differentiating Natric and Gypsic Soils using Band Ratios and Landsat Data
Project 3: LiDAR and TauDEM Project
Project 4: Commenting Google Earth Engine Code Labs
Project 5: Supervised Machine Learning Classification in Google Earth Engine

Grade Point Distribution:

Labs	20 Points Each, 220 Points Total
Project 1	75 Points
Project 2	75 Points
Project 3	75 Points
Project 4	60 Points
Project 5	100 Points
Total	**605 Points**

Grade Scale:

90%-100%	A	>544.5 Points
80%-90%	B	>484 Points
70%-80%	C	>423.5 Points
60%-70%	D	>363 Points
0%-60%	F	<363 Points

Late Assignments:

Labs exercises that are not turned in by the due date can be turned in up to 2 days late with a 20% penalty. Labs will not be accepted after this 2-day period. Labs are due at the end of the schedule lab period.

Projects that are not turned in by the due date can be turned in up to 2 days late with a 20% penalty. Projects will not be accepted after this 2-day period. Labs are due at the end of the schedule lab period.

Cellphone, Tablets, and Computers:

Cell phone use of any kind will not be tolerated. I reserve the right to take your phone or remove you from the class permanently. If you are removed from the class, you will receive a zero in the course.

If I see your phone out during an assessment, I will assume you are cheating and you will receive a zero on the assessment.

Disruption:

Talking over the instructor or other students will not be tolerated. I reserve the right to remove you from the class permanently. If you are removed from the class, you will receive a zero in the course.

Tardiness:

Class will begin promptly, so please show up on time. If you are more than 10 minutes late for an exam or final, it will not be completed and you will receive a grade of zero on the examination.

Attendance Policy:

At West Virginia University, class attendance contributes significantly to academic success. Students who attend classes regularly tend to earn higher grades and have higher passing rates in courses. Excessive absences may jeopardize students' grades or even their ability to continue in their courses. There is a strong correlation between regular class attendance and academic success. Faculty are strongly encouraged to require attendance in all 100-level classes.
http://catalog.wvu.edu/undergraduate/enrollmentandregistration/#enrollmenttext

Final Time:

Final times cannot be rescheduled. You are expected to take the final at the time specified.

Feedback Response Time

I generally reply to email and discussion posts within 48 hours, except during holidays. Often I will reply much more quickly, but you should not count on a same-day reply. Please plan accordingly so that you don't miss deadlines! I generally return assignments within one week of when a discussion or assignment closes. If you would like to get help on an assignment ahead of the deadline, please email me! I'm happy to give preliminary feedback or answer questions.

Academic Integrity:

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Catalog at http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/#academicintegritytext. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

Cheating will result in a zero on the assignment.

If I see your phone out during an assessment (e.g. tests or quizzes), I will assume you are cheating and you will receive a zero on the assessment.

Adverse Weather Commitment:

In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact me as soon as possible. We can work something out.

Similarly, if I am unable to reach our class location, I will notify you of any cancellation or change as soon as possible (by 8:00 AM the morning of class or earlier), using MIX and eCampus to prevent you from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, I will make allowances relative to required attendance policies, as well as any scheduled tests, quizzes, or other assessments.

Inclusivity Statement:

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.

Incomplete Grades

Students who want to be considered for an Incomplete must apply to their instructor prior to the end of the term. If the instructor agrees, the instructor and the student must negotiate the conditions under which the grade of I will be changed to a letter grade and sign a contract. The date to submit the incomplete work should not be set beyond the last day of class of the following semester. If the student does not complete the terms of contract then the instructor should submit a grade of F. All incomplete contracts must be filed with the department and Dean's Office. See the policy at:

http://catalog.wvu.edu/undergraduate/enrollmentandregistration/#gradestext

Sexual Misconduct Statement:

West Virginia University (WVU) does not tolerate sexual misconduct, including harassment, stalking, sexual assault, sexual exploitation, or relationship violence [BOG Policy 44]. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to a member of university administration, faculty, or staff, but keep in mind that they have an obligation to report the incident to the Title IX Coordinator. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Carruth Center, 304-293-9355 or 304-293-4431 (24-hour hotline), and locally within the community at the Rape and Domestic Violence Information Center (RDVIC), 304- 292-5100 or 304-292-4431 (24-hour hotline).

For students at WVU-Tech, contact the Women's Resource Center at 304-255-1585 (toll free at 1-888-825-7836) or REACH at 304-340-3676. For students at Potomac State, contact the PSC Psychological Services Office at 304-788-6976, and locally in Keyser, the Family Crisis Center, 304-788-6061 or 1-800-698-1240 (24-hour hotline).

For more information please consult WVU policies at http://titleix.wvu.edu.

Student Evaluation of Instruction

Effective teaching is a primary mission of West Virginia University. Student evaluation of instruction provides the university and the instructor with feedback about your experiences in the course for review and course improvement. Your participation in the evaluation of course instruction is both strongly encouraged and highly valued. Results are strictly confidential, anonymous, and not available to the instructor until after final grades are released by Admissions and Records. Information about how you can complete this evaluation will be provided later.

Sale of Course Material Statement:

All course materials, including lectures, class notes, quizzes, exams, handouts, presentations, and other materials provided to students for this course are protected intellectual property. As such, the unauthorized purchase or sale of these materials may result in disciplinary sanctions under the Campus Student Code.

Tips for Succeeding in this Course

1. Get help early on if you are having difficulties. Come to my office if you need to. If my office hours don't work for you, we can work something out.
2. Get to know others in the class. Help each other out.
3. I often set class time aside for review prior to an exam. Make the most of these review sessions.
4. If I give bonus opportunities, take advantage of them.
5. If I give study guides, take advantage of them.
6. If a book is required, get the book and us it.
7. Your goal should not be to pass; shoot for an A.
8. If I give a writing assignment, it will have a rubric attached. Use this rubric because this is what I'm looking for.
9. If I give a writing assignment, don't hesitate to get help.
10. Be open-minded. I understand that this class may not be within your subject of interest, but that doesn't mean you can't take interest. It's easier to learn something you have an interest in.

Note: This schedule is subject to change based on the needs and pacing of the class.

Week	Tuesday	Thursday	Lab Due Dates	Project Due Dates
Jan. 7-11	Introductions, Syllabus, Software, Data	Pre-Processing Lecture		
Jan. 14-18	Landsat Pre-Processing Lab	Landsat Temperature Processing Lab	Landsat Pre-Processing Lab due by end of class time on Tuesday Landsat Temperature Lab due by end of class time on Tuesday	
Jan. 21-25	Image Classification Lecture	Supervised Classification in ArcGIS Pro Lab	Classification Lab due by end of class time on Thursday	
Jan. 28-Feb. 1	Accuracy Assessment Lecture	Accuracy Assessment Lab	Accuracy Assessment Lab due by end of class time on Thursday	
Feb. 4-8	FragStats Lecture	FragStats Lab	FragStats Lab due by end of class time on Thursday	Project 1 due by beginning of class time on Thursday
Feb. 11-15	Band Ratios Lecture	Burn Ratio Lab	Burn Ratio Lab Due by end of class time on Thursday	
Feb. 18-22	Glacier Change Lab	LiDAR Lecture	Glacier Change Lab due by end of class time on Tuessday	
Feb. 25-March 1	LiDAR Erdas Imagine Lab	LiDAR ArcGIS Pro Lab	LiDAR Erdas Imagine Lab due by end of class time on Tuesday LidAR ArcGIS Pro Lab due by end of class time on Thursday	
March 4-8	TauDEM Lecture	TauDEM Lab	TauDEM lab du by end of class time on Thursday	Project 2 due by beginning of class time on Thursday
March 11-15	Spring Recess			
March 18-22	eCognition Lecture	eCognition Lab	eCognition Lab due by end of class time on Thursday	
March 25-29	Prof. Maxwell Out of Town	Prof. Maxwell Out of Town		
April 1-5	Getting Started with JavaScript	Getting Started with Google Earth Engine		Project 3 due by beginning of class time on Thursday
April 8-12	Intro to GEE Lab	Data Characteristics GEE Lab		
April 15-19	Image Processing GEE Lab	Spectral Indices GEE Lab		
April 22-26	Classification and Regression GEE Lab	Time Series GEE Lab		
April 29-May 3	Projects 4 and 5 due by end of scheduled final time: Friday May 3rd by 1 PM			

	Monday	Tuesday	Wednesday	Thursday	Friday
8:30-9:00					
9:00-9:30					
9:30-10:00					
10:00-10:30					
10:30-11:00					
11:00-11:30					
11:30-12:00					
12:00-12:30					
12:30-1:00	Office Hours		Office Hours		
1:00-1:30	Office Hours	RS App	Office Hours	RS App	
1:30-2:00	Office Hours	RS App	Office Hours	RS App	
2:00-2:30	Office Hours	RS App	Office Hours	RS App	
2:30-3:00	Digital Earth	Digital Cart	Digital Earth	Digital Cart	Digital Earth
3:00-3:30	Digital Earth	Digital Cart	Digital Earth	Digital Cart	Digital Earth
3:30-4:00	GIScience	Digital Cart	GIScience	Digital Cart	
4:00-4:30	GIScience		GIScience		
4:30-5:00	GIScience		GIScience		
5:00-5:30					
5:30-6:00					

Important Academic Dates

Thursday, January 3: New Student Orientation

Friday, January 4: General Registration

Monday, January 7: On Campus First Day of Classes

Friday, January 11: Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit

Monday, January 21: Martin Luther King Jr. Day Recess: University Closed

Friday, March 1 by noon: Mid-Semester Grades Due

Saturday, March 9 through Sunday, March 17: Spring Recess

Friday, March 22: Last Day to Drop a Class

Friday, April 19: Spring Holiday: University Closed

Thursday, April 25: Last Day to Withdraw from the University

Friday, April 26: Last Day of Classes

Monday, April 29 through Friday, May 3: Final Exam Week

Saturday, May 4: Summer Recess Begins

Friday, Saturday, and Sunday, May 10, May 11, and May 12: Commencement