Syllabus GGS379: Fall 2025 (Distance Learning)	
Course Information	GGS379: Remote Sensing Location: Asynchronous, distance learning
Instructor	Dr. Konrad Wessels Room: Exploratory Hall 2203 About Konrad Wessels COS (https://science.gmu.edu/directory/konrad-wessels). Also see Instructor Introduction video in Canvas Kwessel4@gmu.edu
Office Hours for this class	Tuesdays: 5:30pm – 6pm on Zoom (meeting links in Canvas) Room: Exploratory Hall 2203 By appointment request via email. Kwessel4@gmu.edu
Teaching Assistant	Dante Groccia dgroccia@gmu.edu Email her with any queries with ENVI and Assignments
Course Description	The world is currently experiencing a proliferation in image data from satellites, aircraft and UAV's. These images have to be processed to produce geospatial information to inform natural resource management, urban planning, defense intelligence and business decisions. This course will introduce the foundations of remote sensing, as well as the processing and analyses of imagery for diverse applications using ENVI. The course will introduce key concepts in electromagnetic radiation, passive (multi-spectral) and active (Lidar) sensor systems, and methods for image processing, classification and geospatial information extraction. The course is required as a prerequisite for most other remote sensing courses.
Course Learning Outcomes	Upon completion of the course, students will be able to: 1. Understand and explain the key theories of remote sensing and image analysis. 2. Use image processing tools to process imagery to geospatial products. 3. Gain fundamental insight into the use of remote sensing for multiple, real-world applications.
Course Methodology	**This distance learning course will provide on-line material on CANVAS.** The class format will combine reading, lectures videos, and hands-on processing of satellite imagery in ENVI. **Go to "Start Here: Welcome" in Canvas for Course instructions.**

Required textbook(s) and/or materials	Required Textbook: **Relevant chapters are available made available by the library as pdf under " Textbook" at the bottom of the main menu of this course's Canvas page** "Remote Sensing and Image Interpretation" by Lillesand, Kiefer and Chipman (7th edition, John Wiley & Sons). https://www.wiley.com/en-us/Remote+Sensing+and+Image+Interpretation%2C+7th+Edition-p-9781118919477. Additional Textbook: In the lecture presentations I also use figures and Examples from "Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition" by J.R. Jensen. (4th edition, Pearson). https://www.pearson.com/us/higher-education/program/Jensen-Introductory-Digital-Image-Processing-A-Remote-Sensing-Perspective-4th-Edition/PGM30020.html
Computer Requirements	**ENVI has the following system requirements:** Operating systems: Windows 10 and 11 (Intel/AMD 64-bit) macOS 11.5 and 12 (M1 and Intel 64-bit)**(not recommended – ENVI on iOS is slow as it uses X-Windows. Rather use windows PC / Laptop)** An X-Windows manager is required for macOS. ENVI was tested using XQuartz 2.8.5. **Course-specific Software** You will have to install **ENVI** on your own computer. **Temporary student licenses have been provided for home installation by NV5 Geospatial**. https://www.nv5geospatialsoftware.com/Products/ENVI **Home installation instructions will be provided on Canvas page /Start Here/Welcome.**
Individuals with Disabilities	Students with documented disabilities should contact the Office of Disability Services (703) 993-2474) to learn more about accommodations that may be available to them. **Documentation for accommodations has to be provided to the instructor at the start of the semester.**

<table>
<tr><td>Course Grading & Evaluation</td><td>Grade Weights:
<table><tr><td>Assignments</td><td>45%</td></tr><tr><td>Midterm exam</td><td>20%</td></tr><tr><td>Quizzes and participation</td><td>15%</td></tr><tr><td>Final exam</td><td>20%</td></tr><tr><td>Total:</td><td>100%</td></tr></table>
Grades will be assigned as follows (updated Aug 2025):
<table><tr><th>Weighted average range</th><th>Letter grade</th></tr><tr><td>>98.0</td><td>A+</td></tr><tr><td>97.9 – 93.0</td><td>A</td></tr><tr><td>92.9 – 90.0</td><td>A</td></tr><tr><td>89.9 – 87.0</td><td>A-</td></tr><tr><td>86.9 – 83.0</td><td>B+</td></tr><tr><td>82.9 – 80.0</td><td>B</td></tr><tr><td>79.9 – 77.0</td><td>B-</td></tr><tr><td>76.9 – 73.0</td><td>C</td></tr><tr><td>72.9 – 70.0</td><td>C</td></tr><tr><td>69.9 – 60.0</td><td>D</td></tr><tr><td>< 59.9</td><td>F</td></tr></table></td></tr>
<tr><td>Assignments – weight 45%</td><td>Each week’s assignment has to be uploaded to Canvas by the due date and time. Assignments are due by Sunday, 11:59 PM, ET unless otherwise stated. Refer to the course schedule and weekly overviews for details. See further information on Assignments below. (see further instructions below)
DO NOT FALL BEHIND ON ASSIGNMENTS. Late assignments will incur a 10 % penalty per week.</td></tr>
<tr><td>Exams – weight 40%</td><td>Mid-term Exam 20%
Final Exam 20%
Exams will be taken on CANVAS, but in-person, open-book (text book and lecture slides).
Contact me in advance regarding conflicts with scheduled exams.</td></tr>
<tr><td>Academic Standards and cheating</td><td>Review the <u>Common Policies Addendum</u>. Also attached below to syllabus.</td></tr>
<tr><td>AI use policy</td><td>AI is a very useful tool, but can undermine original thinking and enable cheating. The following guidelines apply to this class:
1. You may use AI (e.g. large language models) for preparing class, studying and understanding the material.
2. You may use AI to help you search for sources and papers, but always double check the original source and cite the source by providing the full reference.
3. You may NOT use the text generated by AI in assignment answers. We need to your insights in your own words. Be warned that AI makes very obvious mistakes.
4. You may NOT use AI during quizzes and exams. Therefore all exams will be in-person to prevent cheating.</td></tr>
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	5. For further details on Mason AI policy see.

Assignment expectations and instructions:

- Expect to work **2-3 hours per week** on assignments for this course.
- Submission of assignment report should be done only **through the Canvas course website**. Reports should be neat and clearly indicate question number and answer. Insert cropped screen shots of processed satellite imagery at appropriate zoom level to respond to the question.
- Submit **pdf files** of assignment to Canvas, not Word documents.
- An example of good assignment report and further instructions are provided on CANVAS.
- Unless otherwise stated, all assignments are due by the end of the week in which they are assigned.
- For the purposes of this course, a week is defined as **beginning at 12:01 am each Monday EST**, and **ending at 11:59 pm on the following Sunday EST.**
- Each Assignment will have a **demo video** which explains all the steps you need to follow in ENVI - be sure the watch the video. ENVI's website also has outstanding instructions and additional information for each function in the software. If you have a specific question, email the LA/TA for help. If the question and answer is potentially useful to other students, the TA will post it on Discussion Board.

Spring 2025 Calendar

Week 1 **25 Aug (Monday)**	**Lesson 1:** Introduction Overview of Remote Sensing applications, Remote Sensing process, History, Electromagnetic Waves and Spectrum, Spectral signature, Energy Sources and Radiation	• Watch all videos • Start Reading textbook Chapter 1: Concepts and foundations of Remote Sensing • Review lecture notes • Set up ENVI license • Do ENVI tutorials
Week 2 **1 Sep**	**Lesson 2:** Energy Sources and Radiation, Energy Interactions, Atmospheric Scattering and Absorption, Interaction with earth surface (vegetation and water)	• Watch videos • Read textbook Chapter 1: Concepts and foundations of Remote Sensing (Page 1-30, 45-59) • Do Practical Exercise ENVI: Getting started • Start Assignment 1 in ENVI: Interpretation of WorldView image of GMU campus (due next Sunday by 11:59pm ET)
Week 3	**Lesson 3:**	• Watch videos • Read Textbook, p 25-35

8 Sep	Geometric influence on spectral response, Digital image acquisition, Four digital image resolutions: Radiometric resolution	• Complete and submit Assignment 1 (Due Sunday by 11:59pm ET before next week 4 starts) • prepare for Quiz1 next week
Week 4 **15 Sep**	**Lesson 4:** Spatial resolution, Types of multispectral sensors, Spectral resolution, Satellite orbits, Temporal resolution	• **Take Quiz 1 (on Lesson 2&3)** • Watch lecture videos • Watch External videos (they are awesome!!) • Textbook: 72-75, 290-293, 218-229, 219-224, 140-143, 286-290, 309-318, 359-367, 290-321 • Complete and submit Assignment 2: WorldView image interpretation of Washington DC (Due Sunday by 11:59pm ET)
Week 5 **22 Sep**	**Lesson 5:** Processing digital numbers to surface reflectance	• Watch lecture videos • Watch External videos • Read textbook: p 491-495 • Prepare for Quiz 2 next week
Week 6 **29 Sep**	**Lesson 6:** Geometric correction, Image enhancement, spatial filters	• Watch lecture videos • Watch ENVI Demo video on Image enhancement: Contrast stretch • Watch external video • Read text book: 495-499, 500-06, 507-512, 147-148 • Complete and submit Assignment 3 by Sunday at 11:59pm ET) • **Take Quiz 2 (Lesson 5)**
Week 7 **6 Oct**	**Lesson 7:** Spectral Indices, Vegetation indices time series	• View lecture videos • View external videos • Read text book: p 517-522 • Complete Lesson 7 Assignment 4 by Sunday at 11:59pm ET
Week 8 **13 Oct**	**Lesson 8:** Midterm Exam	• **Take Midterm exam 14-18 Oct (TBD)**

		• There are two parts to this exam. Complete both.
Week 9 **20 Oct**	**Lesson 9:** Data transforms, Image Classification - Supervised and Unsupervised	• View lecture videos • View external videos • Read text book: p529-530, 537-556 • Complete Lesson 9, Assignment 5 by Sunday at 11:59pm ET
Week 10 **27 Oct**	**Lesson 10:** Land Cover classification, Accuracy Assessment	• Review lecture video • View external videos • Complete and submit lesson 10 Assignment 6 by Sunday 11:59pm • Read textbook: 575-580, 611-618
Week 11 **3 Nov**	**Lesson 11:** Sub-pixel classification, Object-based Classification	• Review lecture video • Read Textbook: 562-567, 568-570, 570-573 • Study for Quiz 3 (Lesson 9-11)
Week 12 **10 Nov**	**Lesson 12:** Change Detection	• **Take Quiz 3 (on Lesson 9-11)** • Watch lecture videos • Complete and submit Assignment 7 by Sunday 11:59pm • Read textbook: 582-587
Week 13 **17 Nov**	**Lesson 13:** LiDAR remote sensing	• View lecture videos and external video • Read textbook sections: 471-482 • View demo video on LiDAR processing • Complete Assignment 8 by Sunday 11:59pm • Review lecture presentation
Week 14 **24 Nov**	**Lesson 14:** Hyperspectral and Thermal remote sensing and applications	• View lecture videos and external video • Read textbook sections: 271-281, 598-602, 245 – 269, • Complete all late Assignments • Review lecture presentation

Week 15 **10-17 Dec**	**Lesson 15:** Final Exam period	• o **Final exam date TBD** o Go to Blackboard / Lesson 15 o Part 1 and Part 1 of the final exam is in 2 separate Assessments / tests. Complete both o Time available? Part 1 = 120 min; Part 2 = 90 min o This is an "open-book" and "open-notes" exam o You may NOT Google information from other websites o You may NOT communicate with other students or anybody during the exam o Do NOT Copy/Paste from notes o Email me if you have any problems with the on-line test or questions: kwessels4@gmu.edu o Read questions carefully and answer all parts of the questions

Quizz and midterm dates:

Week 4	Quiz 1	15-Sep
Week 6	Quiz 2	29-Sep
Week 12	Quiz 3	10-Nov
Week 8	Midterm	13-18 Oct (TBD)
Week 15	Final Exam	10-17 Dec (TBD)

Assignment due dates

		Assignment	Due Date
Week 3	1		14-Sep
Week 4	2		21-Sep
Week 5	No Assignment		
Week 6	3		5-Oct
Week 7	4		12-Oct
Week 8	No Assignment		19-Oct
Week 9	5		26-Oct
Week 10	6		2-Nov
Week 11	No Assignment		
Week 12	7		16-Nov
Week 13	8		23-Nov
Week 14	No Assignment		
Week 15	Final Exam Period		10 -15 Dec

Common Policies Affecting All Courses at George Mason University

Updated August 2024

These four policies affect students in all courses at George Mason University. This Course Policy Addendum must be made available to students in all courses (see Catalog Policy AP.2.5).

Additional policies affecting this course, and additional resources or guidance regarding these policies, may be provided to students by the instructor.

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all**
non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone ***confidentially***, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.