Department of Geography and Geoinformation Science

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GGS 379 – Remote Sensing
Spring 2020

1. General Information

Instructor:	Dr. Konrad Wessels, kwessel4@gmu.edu
Teaching Assistant:	TBD
Location:	Exploratory Hall 2312
When:	Tuesdays 1:30-4:10 pm.
Course website:	Blackboard
Credits:	3.0
Prerequisites:	None
Instructor's Office Hours:	Tuesdays and Wednesday 10:00am - 11:00am, or by appointment (Office: Exploratory Hall 2203, the Fairfax Campus).
TA's Office Hours:	TBD (EXPL 1102-H)
Contact method	Instructor will make every effort to respond to emails within 24-48 hrs, Monday to Friday during regular business hours.

2. Course Objectives

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 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.

3. Learning Outcomes

By the end of the course each student will be able to:
  A. Understand and explain the key theories of remote sensing and image analysis.
  B. Use image processing tools to process imagery to geospatial products.
  C. Gain fundamental insight into the use of remote sensing for multiple, real-world applications.

4. Delivery Method

The course will be taught as a combination of lectures, tutorials, hands-on image processing, class discussion and assignments.

5. Textbooks

The primary textbook is "Remote Sensing and Image Interpretation" by Lillesand, Kiefer and Chipman (7th edition, John Wiley & Sons).

6. Course outline (tentative)

In this course we will cover the following topics (subjected to change at the discretion of the instructor):

- Introductory Concepts
    1. Energy Sources and Radiation

  2. Energy Interactions
  3. Remotely Sensed Data/Imagery
  4. Remote Sensing Systems

- Multispectral Remote Sensing/Thermal Imaging
  1. Physical principles of sensors
  2. Optical sensor systems (Landsat, Sentinel2, WorldView)
  3. Thermal imaging
  4. Hyperspectral sensing

- Digital Image Processing:
  1. Preprocessing of Images
  2. Radiometric and atmospheric correction
  3. Geometric correction
  4. Image Enhancement
  5. Image Manipulation (filters, ratio's, indices, transforms)
  6. Supervised Classification
  7. Unsupervised Classification
  8. Classification of mixed pixels
  9. Object-based classification
  10. Classification Accuracy Assessment
  11. Change detection
  12. Land cover mapping

- LiDAR Sensing:
  1. Physical principles
  2. Systems and sensors
  3. Information extraction; Applications

7. **Grading**

Assignments and mini project	50%
Midterm exam	20%
Pop Quizzes	10%
Final exam	20%
Total:	**100%**

Note that that final grades are based on following, slightly revised score ranges:

Weighted average range[1]	**Letter grade**
≥ 98.0	A+
97.9 – 93.0	A
92.9 – 90.0	A
89.9 – 87.0	A-
86.9 – 83.0	B+
82.9 – 80.0	B+
79.9 – 77.0	B
76.9 – 73.0	B-
72.9 – 70.0	C
69.9 – 60.0	D
≤ 59.9	F

Note: Final letter grades may be adjusted upwards at the discretion of the instructor.

8. **Assignments:**
    Submission of assignments should be done only **through the Blackboard course website**. Submit pdf files and not Word documents. Assignments that are submitted late will be penalized.

9. **Course website:**
    The course has a Blackboard website. This website will provide you a single portal through which you may obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special announcements. You are required to visit the course website **regularly**.

10. **Electronic Communication:**
    All course related email correspondence should be made through @gmu.edu addresses.

11. **USB drive for image processing:**

    We shall be processing all satellite imagery directly on USB3 flash drives in the class. This allows you to do the processing on any machine with ENVI.
    Please ensure you buy a drive that is USB3, preferably, one of the following:
    https://www.amazon.com/SanDisk-Ultra-Flair-Flash-Drive/dp/B015CH1GTO/ref=sr_1_fkmr3_1?keywords=10GB+usb+3.0+sandisk&qid=1555626129&s=gateway&sr=8-1-fkmr3

    https://www.amazon.com/Kingston-Digital-16GB-Traveler-Flash/dp/B00G9WHN12/ref=sr_1_fkmrnull_2_sspa?keywords=10GB%2Busb%2B3.0%2Bsandisk&qid=1555625994&s=gateway&sr=8-2-fkmrnull-spons&th=1

Note: Recording of any kind (audio, video), reuse of course materials, and further dissemination of the course contents is not permitted unless prior written consent of the professor and George Mason University has been given or if recording is part of an approved accommodation plan.