

## Geography 487/9: Remote Sensing and Raster GIS & Laboratory Fall 2023 Syllabus

### Instructor:

Instructor: Dr. Anna Klene

Office: Stone Hall 216

Teaching Assistant: Carver Butterfield

Office: Stone Hall 304B

Email: [anna.klene@umontana.edu](mailto:anna.klene@umontana.edu)

Office hours: Wed. 3-5 pm on Zoom & by appt.

Email: [carver.butterfield@umconnect.umt.edu](mailto:carver.butterfield@umconnect.umt.edu)

Office hours: TBA

### Course objectives:

Covers physical laws and principles that a user of aerial photos or satellite imagery should know. Know what questions to ask when given or acquiring imagery for a particular study. Overview of applications and limitations of current imagery. **Lab is required.**

### Textbooks:

**Recommended:** Remote Sensing and Image Interpretation, 7<sup>th</sup> Edition, Wiley, NY. 2015. By: Lillesand, Kiefer, & Chipman. Note: the 6<sup>th</sup> Edition is similar & less cost, but section numbers are slightly different.

**Optional:** An Introduction to Contemporary Remote Sensing, McGraw-Hill, Weng, 2012.

---

### Tentative Course Outline:

<b>Week</b>	<b>Topic:</b>	<b>Reading:</b>
1:	History & Aerial Photography	Chapter 2.1-2 & 2.5-2.9
2/3:	Photogrammetry & Visual Interpretation	Ch. 3 & 1.12
4-5:	Remote Sensing Basics <b>Exam 1 &amp; Grad Student Paragraph Due</b>	1-1.11, 2.3-2.4, & 7.2 <b>Sept. 28</b>
6:	Remote Sensing Basics	1-1.11, 2.3-2.4, & 7.2
7/8:	Vegetation Classifications & Acc. Assess.	Ch. 8.2 & 7.7-7.16 & 7.17-7.20
9:	Optical Satellites	Ch. 5.1-5.11 & 5.14-5.21
10:	<b>Exam 2</b>	<b>Nov. 2</b>
11:	Map Algebra	Only Class Notes
12:	Thermal Systems	Ch. 4.8-4.13
13/14:	Radar & Lidar	Ch. 6.1-6.22, 6.23-6.25
15:	Hyperspectral & High Res. <b>Exam 3</b>	Ch. 5.12-5.13, 6.18 & 7.21 <b>Dec. 8</b>
Exam:	<b>All Labs &amp; Grad Student Project Due</b>	<b>Dec. 12</b>

---

### Grading Calculation:

	<u>Undergraduate</u>	<u>Graduate</u>
Lab Exercises	250-270 pts.	250-270 pts.
3 Exams	500 pts.	500 pts.
<u>Graduate Student Project</u>	<u>NA</u>	<u>100 pts.</u>
Total	750-770 pts.	850-870 pts.

**\*\*\* This syllabus may be modified as necessary during the course. Ask the instructor if you have any questions about when materials are due.**

## Geography 487/9: Remote Sensing and Raster GIS & Laboratory Fall 2023 Syllabus

### Important Dates:

Sept. 18: Last day to drop/add in Cyberbear with partial refund or change to “Audit”.

Oct. 30: Last day to drop with drop/add link in Cyberbear (w/ prof & advisor sigs), \$10 fee, and “W” grade.

Dec. 8: Last day to drop with drop/add link (w/ prof, advisor, & dean sigs), \$20 fee, and “WP” or “WF” grade.

### Required assignments and exams:

Reading Assignments – The required reading assignments are listed above. The text for this course is intended (a) to provide further explanation of concepts covered in lecture and (b) to supplement the lectures by presenting additional information. You are responsible for reading assignments on all exams.

Exams – All exams in this course will be comprehensive. Remote Sensing builds one concept upon another and therefore all tests must contain some previously covered material. However, the exams will be oriented toward the section of the course most recently presented. The exam format will be mainly objective (multiple choice and definitions) and will consist of (a) concepts covered in lecture and (b) concepts covered in the required course readings. There is no provision for make-up exams. Exceptions will be made only for documented family or medical emergencies.

Laboratory Exercises – The exercises are a vital component of this class. They account for at least 33% of the final grade. This course is graded as a 4-credit class, with the same grade assigned for all 4 credits. Missing a lab does not relieve you of responsibility for completing the assignment on time. The physical lab is open at other times for you to finish assignments and remote options are available. These policies will be covered in the first laboratory. ***Lab exercises are marked off 5% per calendar date late through the following week, and will not be accepted beyond Dec. 8<sup>th</sup>*** except by prior arrangement.

Class Attendance – Attendance is not taken. Incompletes will be given only for medical or family emergencies, but must be completed within 1 year: <https://catalog.umn.edu/academics/policies-procedures>).

### Illness:

All labs may be done in the physical lab or remotely. **Please do not come to class or lab if you do not feel well.** Recorded lecture from 2020 are available on the server. If you need lecture notes, have questions, or anything else, please email both of us and we can help you catch up as needed.

### Course guidelines and policies:

Student Conduct Code – UM’s student conduct code is clearly addressed at: <https://www.umn.edu/student-affairs/community-standards/default.php>. Students failing to follow the code will be reported to the proper offices and receive a failing grade for the course.

Disability modifications – UM assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office of Disability Equity (ODE). If you anticipate or experience barriers due to a disability, please contact them at: (406) 243-2243, [ode@umontana.edu](mailto:ode@umontana.edu), or <https://www.umn.edu/disability/>. I will work with you and them to provide appropriate modification, however, retroactive accommodation requests cannot be honored, so please do not delay.

Recording: – You may not record during class except with written permissions from the instructor.

Grading: – At the end of the course, the distribution will be examined and letter grades assigned at approximately: A=>90%, B=80-90%, C=70-80%, D=60-70%, etc. The “+/-” grading system will be used. ***There will be no extra credit of any kind.***

**\*\*\* This syllabus may be modified as necessary during the course. Ask the instructor if you have any questions about when materials are due.**

## Geography 487/9: Remote Sensing and Raster GIS & Laboratory Fall 2023 Syllabus

Lab 001: W 11:00-12:50 pm, 218 Stone

Lab 002: W 1:00-2:50 pm, 218 Stone

Lab Supplies: All materials will be digital, though we will have printed maps and photos available for you to see in lab. Please remember to back up your work as the laboratory PCs are regularly cleaned of extra files throughout the semester.

### Tentative Class Calendar:

Week	Tuesday Class	Wednesday Lab	Thursday Class
1	Aug. 29 – Intro	<i>Lab 1: Review Map Scale &amp; Coordinate Systems</i>	Sept. 1 – History of Aerial Photography
2	5 – Photogrammetry	<i>Lab 2: Aerial Photography</i>	7 – Photogrammetry
3	Sept. 12 – Photogrammetry/Color	<i>Lab 3: Photogrammetry</i>	14 – Color/ Aerial Photo Interpretation
4	19 – Electromagnetic Spectrum	<i>Lab 4: Interpretation of B&amp;W &amp; CIR Images</i>	21 – EMS continued
5	26 – Review	<i>Lab 5: ArcGIS Pro Tutorial</i>	28 – <b>Exam 1</b> <b>Grad Paragraphs Due</b>
6	Oct. 5 – EMS continued	<i>Lab 6: UAV Orthomosaics</i>	7 – History of Satellites
7	12 – Virtual Globes	<i>Lab 7: Registering, &amp; Image Interpretation</i>	14 – Supervised Classification
8	19 – Unsupervised & Fuzzy Classification	<i>Lab 8: Supervised &amp; Unsup. Veg. Classification</i>	21 – Accuracy Assessment & Smoothing
9	26 – Orbits, Sensors, Satellites, etc.	<i>Lab 9: Accuracy Assess. of Missoula NLCD</i>	28 – Vegetation Indices & Landsat
10	Oct. 31 – Review	<i>Lab 10: Resolution &amp; Indices</i>	2 – <b>Exam 2</b>
11	7 – Map Algebra & Modeling	<i>Lab 11: Map Algebra: Simple Habitat Model</i>	9 – Thermal Imagery
12	14 – Thermal Imagery	<i>Lab 12: Thermal &amp; Radar Imagery</i>	16 – Radar
13	21 – Radar & Microwave Imagery	<b>No Classes</b>	23 – <b>Thanksgiving Holiday</b>
14	28 – LIDAR	<i>Lab 13: Lidar</i>	Nov. 30 – Hyper & High Res. Imagery
15	5 – Review	Finishing Last Lab	7 – <b>Exam 3</b>
<b>Remaining Labs &amp; Grad Projects are due Friday, Dec. 8<sup>th</sup>, by midnight</b>			

\*\*\* This syllabus may be modified as necessary during the course. Ask the instructor if you have any questions about when materials are due.