FORS351 **ENVIRONMENTAL REMOTE SENSING**
SPRING 2021

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Class Times:

Friday	1000-1150
Friday	1200-1350

Note regarding class times:
Most weeks we will use our time as "lecture," and will intermix hands-on lab exercises, seminars and discussions as we progress through the semester. Plan to be flexible about the format of our class in any given week. Things to be aware of:

- We will not have 4 hours of "screen time" each and every week
- We will mix the format of class to present and discuss each scheduled topic effectively but efficiently
- Virtual classes will be recorded and posted for your reference
- We will be using UM Box as the clearinghouse for class materials

Office Hours: At our first meeting (Zoom) we will have a discussion about how we can be most available to you. We will present options for handling office hours and ask you for ideas about ensuring access to us.

Reference Text: Lillesand, Kiefer and Chipman. *Remote Sensing and Image Interpretation*.
John Wiley and Sons, Inc. New York. (Any edition after ed. 5 is acceptable)
We encourage this text be used as the primary reference for our class.

Course Introduction:

Remote sensing is the science and art of collecting and interpreting information about the earth's surface through non-contact methods. Most natural resources remote sensing utilizes camera, electro-optical, or electronic scanning devices carried on aircraft, UAS, or satellite platforms to collect data about earth surface features.

FORS351 is designed to provide students with a working knowledge of the principles of obtaining information that describes natural resources and their condition from remotely sensed data. The student will gain familiarity with the acquisition, interpretation, and measurement of remotely sensed imagery. Lectures will be supplemented by exercises providing hands-on experience working with and imagery and other geospatial data. Photographic, multispectral, thermal, airborne, UAS and satellite techniques, and their application to resource assessment, are introduced. The course provides a survey of the history, theory, concepts, and techniques of remote sensing and image analysis. Applications of remote sensing will also be presented in seminar format.

Course Objectives:

- Consider both energy-based and data-oriented perspectives on *remote sensing as a system*
- Gain knowledge of image geometry and key image points; how to make images behave like maps
- Develop a basic understanding of the electromagnetic spectrum
- Learning about energy matter interactions as drivers of image usefulness
- How radiometric and geometric pre-processing improve image performance and utility
- How to conduct Image mapping and classification
- Exposure to a series of applications of remote imagery for natural resource assessment

Study units:

- The physical basis of remote sensing (Unit Exam)
- Digital image processing (Unit Exam)
- Image interpretation and photogrammetry (Experiential Learning: engage, explore and evaluate)
- Applications of remote sensing (Experiential)

Grading:

Grades will be determined based on student performance on three unit exams, lab exercises, and two class assignments. A curving strategy is used to normalize student group performance; point totals from the assignments are added together, weighted, and graphed as a density function. Natural breaks and overall class GPA are then used to assign letter grades of A-F. Weights for individual assignments are:

Unit Exams (three)	60%
Lab Exercises	30%
Class Assignments (two)	10%

See the Lab Syllabus for details on Lab Exercises. Both the labs and the assignments are intended as experiential learning opportunities—less so at assessing student performance. We will provide details on each element as they arise throughout the semester.

Planned Schedule:

WEEK	DATE	TOPIC
1	1.15	Course Overview and Remote Sensing as a System
2	1.22	Fundamentals of Remote Sensing Physics
3	1.29	Energy Matter Interactions
4	2.5	Introduction to Digital Remote Sensing
5	2.12	Raster Image Preprocessing
6	2.19	Raster Image Classification and Accuracy Assessment
		First Unit Exam
7	2.26	Aerial Imagery and Interpretation
8	3.5	Unmanned Aerial Systems: Overview and Applications
9	3.12	Applied Photogrammetry and Phodar Techniques
10	3.19	Vegetation Indices and Derivatives
11	3.26	Burn Area assessment and Fire Severity
		Second Unit Exam
12	4.2	Student Break – no class
13	4.9	Thermal Infrared Imaging
14	4.16	Active remote sensing- LiDAR
15	4.23	Applications and Course Wrap-up
16	4.27	**Final Unit Exam** **1010-1210**

Lessons Learned about remote delivery and the pandemic:

- Surveys of both students and faculty at UM show significant levels of stress.
- Separation and isolation can be amplified when we go “remote” noting that it takes extra effort to stay connected.
- Surveys confirm that students need increased flexibility; around workloads, deadlines, and access to each other and to instructors.
- Last spring we learned that some of our traditional class objectives were simply not achievable; so we have modified our objectives, our assignments, our schedule, and our grading strategy to make sure that we use time effectively, that we fully learn the foundational principles and applications of remote sensing, and that we fairly and objectively assess student performance and progress.

Students with Disabilities Statement

If you are a student with a disability and wish to request reasonable accommodations for this course, contact us privately to discuss the specific modifications. Please be advised, we may request that you provide a verification letter from Disability Services for Students. If you have not yet registered with Disability Services, located in Lommasson Center 154, please do so in order to coordinate your reasonable modifications. For more information, visit the Disability Services website at www.umt.edu/disability.

Student Conduct Code Statement

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

Grading Option Statement

This class is offered for traditional letter grade only, it is not offered under the credit/no credit option.

Class Attendance Policies and Late Assignments/Missed Exam Dates

Please refer to guidance as found:

http://catalog.umt.edu/academics/policies-procedures/

Students are expected to attend all class meetings and complete all assignments for courses in which they are enrolled. Instructors are encouraged to notify advisors or the appropriate administrators regarding students with excessive unexcused absences. Instructors may excuse brief and occasional absences for reasons of illness, injury, family emergency, religious observance, cultural or ceremonial events, or participation in a University sponsored activity.

Assignments are due by 1700h on the date noted; unexcused late assignments will not be accepted.

We will make every effort to accommodate necessary changes to our exam schedule; no make-up exams will be offered for unexcused absences on examinations. If missed there are no points scored for that assignment.