GES 4060/5060 - INTRODUCTION TO REMOTE SENSING - FALL 2010

Instructor: Brandon Vogt  Email: bvogt@uccs.edu  Office: Columbine 2018
Office hours: W 1:30 - 3:30  Course website: www.uccs.edu/bvogt/ges4060
Class meets: W 9:30 - 12:50 in Columbine Hall, rm. 329

Introduction: Broadly defined, remote sensing (RS) is 'The art and science of obtaining information about an object without being in direct contact with the object' (Jensen 2000). The upper-division geography course introduces RS from an earth surface land-use / land-cover perspective and focuses on electromagnetic radiation (EMR). The main purpose of this course is to teach students how to extract useful information from imagery. Most images encountered in class are overhead perspectives collected from orbital (satellite) and sub-orbital (aircraft) platforms and are compiled from visible as well as non-visible EMR. The course emphasizes RS theory; however, principles underlying RS technologies and practices are also covered.

Knowledge outcomes: By the end of the semester, students will:

- learn a few milestones in the history of photography and RS
- learn the properties of EMR: wavelength, frequency, amplitude
- learn about EMR wave and particle models, light, and how light is created
- learn about energy interactions in the atmosphere: scattering, refraction, reflectance, absorption, atmospheric windows
- learn about energy interactions with surfaces: reflection, absorptance, transmittance, fluorescence
- learn about cameras (focal plane, focal length, aperture f/stop, exposure time), film, and filters
- learn and practice techniques of photogrammetry
- acquire knowledge of the nature, reception, recording, processing, and analysis of EMR in the visible, near-infrared, middle-infrared, thermal infrared, and microwave spectrums
- understand how EMR interacts with various earth materials such as vegetation, soils, rock, water, urban
- explore multispectral scanners, hyperspectral instruments, LiDAR, RADAR, and in situ spectral reflectance measurement devices
- understand how EMR reflected or emitted from earth materials is recorded using measurement devices
- apply RS techniques to distinguish physical and biophysical characteristics of earth surfaces
- learn about multispectral RS
- explore applications of RS in areas of agriculture, hydrology, urban environments, geomorphology (soils, minerals), weather, and atmospheric hazards (lightning)
- analyze imagery (e.g., Digital Orthophoto Quadrangles (DOQs), Landsat Multispectral Scanner (MSS), Thematic Mapper (TM), Advanced Very High Resolution Radiometer (AVHRR), IKONOS, Thermal Infrared Multispectral Scanner (TIMS), and LiDAR) using RS software

This is not an easy course:  This is a technical and difficult course. To do well, students should not miss any classes; must be familiar with geospatial data, GIS, cartographic basics; and should possess background knowledge in basic algebra. The course requires that students absorb abstract concepts, esoteric terms, and perform image analysis tasks using IDRISI Taiga, a UCCS-licensed RS software environment.


Point distribution: (extra credit is not available)

- 60% exam grades (80% individual / 20% group)* (2 @ 30%)
- 25% computer-based lab exercises (5 @ 25%)
- 5% unannounced textbook readings quizzes (5 @ 1%) - At the beginning of 5 class periods, short, one-question mini-quizzes will be given to test whether or not students have read the required readings
- 5% in-class exercises (5 @ 1%) - Lecture will be supplemented with in-class group exercises
- 5% in-class participation - Students who actively participate in discussions and/or help other students with labs, etc., will earn these points. Students who text / sleep / miss class or otherwise distract the instructor and other students will not earn any in-class participation points.
**Attendance policy:** One absence without official documentation (dr. or supervisor note or jury duty documentation) is allowed. Official notification is required for additional absences. *Students cannot earn higher than a C in the class if more than 3 classes are missed for any reason. Attendance is taken regularly.*

**Exam/lab policy:** No make-up exams are given. Without two weeks notification and/or official documentation, a missed exam counts as a zero. A maximum of 1/2 credit is given for labs turned in late.

**Academic expectations:** Plagiarizing, using sources without documentation, cheating, fabrication and falsification, multiple submission, and misuse of academic materials represent intellectual theft and violate UCCS’s Academic Honor Code. Students are encouraged to work together and talk through issues, but all final written work should belong to each individual student. If a student is caught cheating on an exam (Dr. Vogt's call), embarrassment will occur and the student's grade will suffer. For more information, see UCCS’ student policies on academic principles and academic dishonesty.

**Students with disabilities:** Students with disabilities who qualify for academic accommodations must provide a letter from Disability Services (DS) and discuss specific needs with their instructor during the first two weeks of class. The DS office is in Main Hall # 105, (719) 255-3354.

**Classroom code of conduct:** UCCS has established a code of conduct and classroom behavior policy to maintain the general welfare of the University community. The University strives to make the campus community a place of study, work, and residence where people are treated with civility, respect, and courtesy.

* Details on ‘Pyramid Exam’ format: *Information below extracted from Dr. Barbara Munn’s testing ideas [here](#).* A primary objective of the pyramid exam format is to allow students to understand the answers to the exam questions by the time they leave the room at the end of the test. While taking the exam in groups, argue… debate… be forceful. Do whatever it takes to convince group members that you know the correct answer.

Exam grades are calculated as follows: \((\text{Part A individual points earned} / \text{total exam points}) \times 0.80 + (\text{Part B group points earned} / \text{total exam points}) \times 0.20\)

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Remote sensing as art. A 16,000 km² section of southeast and south-central Colorado, bound by 37.00 to 37.90°N and 103.90 to 105.75°W, showing flash density for negative polarity cloud-to-ground lightning with peak currents ranging from -20 to -119 kiloamps. Strike location data collected between February, 2005 and May, 2009.