

**REMOTE SENSING OF THE ENVIRONMENT**  
***GEOG/GEOL 4093 – Fall, 2011***

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***Lecture:*** CLUB 13, Tuesday & Thursday, 2:00-3:15 pm

***Lab:*** GUGG 6 (KESDA Lab), Friday 9:00 - 10:50 am

***Office hours:*** CIRES Ekeley S236, Tuesday & Thursday, 3:30-4:30 pm and by appointment

***Teaching Assistant and Office hours:***

**SARAH HART**

GUGG 312

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***Office hours,*** GUGG 312, Tues 1:00 - 2:00 pm and Fri 11:00 - 12:00 am and by appointment

***Required Text:*** Remote Sensing of the Environment: An Earth Resource perspective, John R. Jensen, Prentice Hall Series in Geographic Information Science, 2nd edition, Year published 2007, (ISBN 0-13-188950-8).

Additional reading material will be assigned throughout the course.

***Grading:*** Midterm (30%), 13 October, 2011; Final (30%), 8 December, 2011, Lab (40%), to be returned following week during lab.

***Course Summary:*** Global environmental change is one of the most pressing international issues of this century. There is a need to monitor the earth's vital signs from atmospheric ozone to sea level change. Satellite data sets are critical for monitoring regional and global changes, determining natural variability of the Earth System, and addressing fundamental global change issues. The course is designed to introduce students to the techniques of remote sensing measurements of environmental parameters from aircraft and satellite platforms. The course is based on the application of simple physical principles of electromagnetic radiation. Different sensing systems such as electro-optical systems, passive microwave systems, ranging systems and scattering techniques will be discussed with applications for the atmosphere, cryosphere, lithosphere and biosphere.

## Course Outline

Week Topic

- 1 1 General concepts
  - 1.1 Definitions
  - 1.2 The need for remote sensing
  - 1.3 Classification of RS systems
  
- 2 2 Physical Principles
  - 2.1 Electromagnetic radiation
  - 2.2 Basic laws
  - 2.3 Interaction of radiation
  
- 3 3 Platforms
  - 3.1 Ground
  - 3.2 Aircraft
  - 3.3 Satellite
  - 3.4 Orbits
  
- 4 4 Aerial and Space Photography
  - 4.1 Cameras and Camera optics
  - 4.2 Films
  - 4.3 Interpretation of Remote Sensing Images
  
- 5,6 5 Imaging systems: Passive Sensors
  - 5.1 Landsat
  - 5.2 Spot
  - 5.3 HCMM
  - 5.4 Aircraft
  - 5.5 NOAA
  - 5.6 DMSP
  - 5.7 ERS-1 ATSR
  - 5.8 SeaWIFS
  - 5.9 GOES, METEOSAT
  - 5.10 Passive microwave
  - 5.11 Commercial imagery
  
- 7 6 Imaging Systems: Active Sensors
  - 6.1 Introduction
  - 6.2 Scatterometer
  - 6.3 SLAR and SAR
  
- 8 **MIDTERM (October 13)**
  
- 9 7 Non-Imaging Systems
  - 7.1 Altimeter
  - 7.2 Lidar

- 9,10 8 Earth Observing System
  - 8.1 Objectives
  - 8.2 Satellites
  - 8.3 EOS Data processing and distribution
  - 8.4 Future Missions
  
- 10 9 Remote Sensing and GIS
  - 9.1 Geo-informatics
  - 9.2 Integration of Satellite Image and GIS
  
- 10,11 10 Application: Atmosphere
  - 10.1 Radiation Budget
  - 10.2 Atmospheric Temperature structure
  - 10.3 Cloud classification
  - 10.4 Detection of hurricanes
  - 10.5 Antarctic ozone hole
  
- 12 11 Application: Cryosphere
  - 11.1 Snow mapping
  - 11.2 Bi-directional reflectance snow
  - 11.3 Onset of snow melt
  - 11.4 Elevation: Greenland ice sheet
  
- 12, 13 12 Application: Hydrosphere
  - 12.1 Sea surface temperature
  - 12.2 Ocean circulation
  - 12.3 El Nino
  - 12.4 Winds over the ocean & lake
  - 12.5 Ocean altimetry and sea level rise
  
- 13 13 Application: Biosphere
  - 13.1 Vegetation damage
  - 13.2 Crop identification
  - 13.3 Estimation of green leaf area
  - 13.4 Estimation of global biomass
  
- 14 **Thanksgiving Break**
  
- 15 14 Application: Lithosphere
  - 14.1 Geological reconnaissance
  - 14.2 Detection of landforms
  - 14.3 Thermal inertia mapping
  - 14.4 Spectral remote sensing in Geology
  - 14.5 Crustal Deformation from InSAR
  
- 16 **FINAL (December 8)**

***Statement on Disabilities*** If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and <http://www.Colorado.EDU/disabilityservices>

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