

Environmental Analysis through Remote Sensing Geography 5110/6110 Spring 2007

Instructor: Dr. Richard R. Forster (rick.forster@geog.utah.edu)

Time and place: Wed. 8:35 – 11:35 AM, OSH 215 and the PC lab (OSH 277)

Office Hours: Wed. 11:35 – 1:00 PM and 3:00-5:00 PM or by appointment, OSH 270E

Phone: 581-3611

Web page: <http://www.geog.utah.edu/courses/geog5110/>

Teaching Assistant: Ryo Michishita

Office Hours: Mon. & Wed., 11:40 – 1:10 PM, OSH 109

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Text: *Introductory Digital Image Processing: A Remote Sensing Perspective*, John R. Jensen (2005) 3rd edition; Other readings (TBD) as handouts.

Objectives:

1. To understand remote sensing image analysis techniques and how to apply them using image processing software such as ENVI.
2. To implement these techniques in environmental science issues.

Class Format:

1. Lectures – about 50 minutes in OSH 215 to begin each class
2. Labs – the remainder of time will typically be spent getting hands-on experience in the PC lab OSH 277
3. Field Work – on campus for ground truth
4. Term Project – use remote sensing data to address an environmental issue and report the results in class presentation and a journal style paper. Working in pairs is allowed and encouraged.

Evaluation: Lab assignments 35%, Mid-term exam 25%, Term project 40%, No final exam!
All labs are due at the beginning of class the following week. The mid-term must be taken on the scheduled date. If there is a conflict with the mid-term date you must make arrangements with me prior to the exam. The term project presentations will be during the last week of class. The term papers are due during finals week.

Topics and Readings:

I. Remote Sensing Background

- A. Introduction to Digital Image Processing of Remotely Sensed Data. Chapter 1
- B. Remote Sensing Data Acquisition Alternatives. Chapter 2

II. Image Processing Hardware and Software

- A. Image Processing system Considerations. Chapter 3

B. Initial Display Alternatives and Scientific Visualization. Chapter 5

III. Image Pre-processing

A. Initial Statistics Extraction. Chapter 4

B. Radiometric and Geometric Correction. Chapter 6,7

IV. Image Enhancement - Chapter 8

A. Reduction and magnification.

B. Contrast enhancement

C. Band ratioing

D. Spatial filtering

E. Special transformations

V. Classification - Chapter 9

A. Supervised classification

B. Unsupervised classification

C. Fuzzy classification

D. Accuracy assessment

VI. Digital Change Detection - Chapter 12

Labs

1. Re-familiarization with ENVI (Ch. 3,4,5)

Workstation specifications, Ingestion of imagery into ENVI, image statistics

2. Image pre-processing (Ch. 6,7)

Radiometric correction, geometric correction

3. Contrast enhancement and band ratioing (Ch. 8)

4. Spatial filtering (Ch. 8)

Convolution filtering, Fast Fourier Transforms (FFT's)

5. Special transformations (Ch. 8)

Principal component analysis, vegetation indexes, texture transformations

6. Supervised classification (Ch. 9)

7. Unsupervised classification (Ch. 9)

8. Classification accuracy assessment (Ch. 13)

9. Change detection (Ch. 12)

General Guidelines

- 1) Exams must be taken at the time specified unless a valid, documented excuse is provided **before** the date of the exam. For medically related conflicts this requires a written note from a doctor.
- 2) Regular class attendance is strongly recommended, as it is required for class participation. Lectures are intended to supplement material in the readings. You are responsible for information provided in the lectures, as well as any announcements made in class.
- 3) Office hours are there to be used. These times can be used for additional instruction if you are having difficulty with the material or if you are interested in a topic and would like further information. I am also open to any suggestions or comments you have about the course; please don't wait until the end-of-semester evaluation if you have any constructive comments on the course. If you have a conflict and cannot make the posted office hours, please make an appointment for another time.
- 4) An "incomplete" will be given only in extreme cases when conditions beyond the student's control require an extended period of absence.
- 5) Extra credit work will not be accepted.

ACADEMIC MISCONDUCT STATEMENT

- Academic misconduct will not be tolerated. Penalties may include failure of an assignment, the entire course, and/or the filing of formal charges with appropriate university authorities. Academic misconduct includes, but is not limited to, cheating, misrepresenting one's work, and plagiarism:
- Cheating involves the unauthorized possession or use of information in an academic exercise, including unauthorized communication with another person during an exercise such as an examination.
- Misrepresenting one's work includes, but is not limited to, representing material prepared by another as one's own work or submitting the same work in more than one course without prior permission of all instructors.
- Plagiarism means the intentional unacknowledged use or incorporation of any other person's work in one's own work offered for academic consideration or public presentation.

Disability Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.