GEO-SCI426/626 Remote Sensing and image interpretation

3 cr, Spring 2009

Lecture: Tu 2:30-5:30 pm Morrill IV South 271

Instructor Qian Yu, Ph.D, Morrill 267, qyu@geo.umass.edu, 545-2095(O) , *Office hour* TuTh 11:00-12:00pm or by appointment

TA Weining Zhu, Morrill IV 264, zhuwn@geo.umass.edu, *Office hour* TBA

Required textbook for lectures

Jensen, John R., 2007, *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice Hall: Upper Saddle River, NJ. 2nd ed. ISBN 0-13-188950-8

Reference book for lectures

Jensen, John R., 2005, *Introductory Digital Image Processing: A Remote Sensing Perspective,* Prentice Hall: Upper Saddle River, NJ, 3rd ed. ISBN 0-13-145361-0

Lillesand, Thomas M., 2004, *Remote Sensing and Image Interpretation*, Wiley. ISBN 0-471-15227-7

Gong, Peng, Remote Sensing and Image Analysis http://www.cnr.berkeley.edu/~gong/textbook/

Prerequisites: High school Algebra and Geometry

Course purpose

To provide you with an introduction to the principles and practices of photo interpretation and digital remote sensing for use in environmental monitoring, measurements of structural parameters, and natural resource management.

Course description

This course provides an introduction to the fundamentals of remote sensing. Class lectures will focus on a range of concepts and techniques key to understanding how remote sensing data are acquired, displayed, restored, enhanced, and analyzed. Topics include remote sensing principles, aerial photography, image interpretation, major remote sensing systems, image display and enhancement, information extraction, accuracy assessment, and remote sensing in environmental research and applications. Weekly exercises will provide you with ample opportunity to gain hands-on experience using the image processing software ITT ENVI. We will also explore a range of practical issues related to the application of remote sensing to solving real world problems. This class involves a heavy use of computer software and projects.

Course objectives

This class will insure students have knowledge on these aspects:

1. the properties and characteristics of aerial photographs.
2. remote sensing systems: a) how to define the type of remote sensing needed to fulfill the user's stated objectives, b) where existing remote sensing data which fulfills his/her objectives may be located, and c) how to obtain new aerial photography, if necessary.
3. digital image processing: a) basic concepts on non-photographic remote sensing, b) general principles of digital image processing for remote sensing applications, and c) future applications of remote sensing to natural resource management and related fields.
4. remote sensing information extraction: a) which characteristics of land cover types can be mapped/measured from remote sensing, b) different techniques available for mapping and measuring these land cover types, and c) how accurately these land cover characteristics can be mapped from remote sensing.

Grading and evaluation: Exams will cover key concepts from lecture, article and laboratory activities. All written assignments must be handed in on time.

Exercises and assignments	25%	Mid-Term Exam	20%x2
Final Exam/Project	25%	Presentation&Class participation	10%
Total	100%		

Laboratory activities and assignments: We will work through some laboratory activities specified in additional documents to aid in understanding technical concepts taught in lectures. We will also explore some of the technical facets of ITT ENVI 4.5 software, which will help manipulate images.

Policy on attendance and due-dates for assignments:

- Attendance to both lecture and lab is required in the normal circumstances and forms a portion of your grade. Failure to meet course requirements due to illness will require documentation for alternate arrangements to be made. It is the responsibility of the student to obtain any materials (i.e. notes) from other students in the event the student cannot attend class for some reasons.
- All exercises must be turned in by the date the exercises are due. Any late submission in one week without advance permission by the instructor will cause a grade deduction by half. No exercise will be accepted after one week following the due date.
- No make-up exams will be given unless PRIOR arrangements have been made with instructor and documentation of an illness is provided.

Required textbook for lectures

Jensen, John R., 2007, *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice Hall: Upper Saddle River, NJ. 2nd ed. ISBN 0-13-188950-8

Reference book for lectures

1. Jensen, John R., 2005, *Introductory Digital Image Processing: A Remote Sensing Perspective,* Prentice Hall: Upper Saddle River, NJ, 3rd ed. ISBN 0-13-145361-0
2. Lillesand, Thomas M., 2007, *Remote Sensing and Image Interpretation*, Wiley. ISBN: 978-0-470-05245-7
3. Gong, Peng, Remote Sensing and Image Analysis http://www.cnr.berkeley.edu/~gong/textbook/

Prerequisites: High school Algebra and Geometry

Class Schedule (subject to change according to the student's progress) http://www.geo.umass.edu/courses/geo591q/

Week	Day	Arrangement	Topic	Reading
1 Jan26	Tu	Lecture 1	Introduction Physic basis of remote sensing: electromagnetic radiation principles (1)	
2 Feb2	Tu	Lecture 2 Lab 1	Physic basis of remote sensing: electromagnetic radiation principles (2) Hyperspectral curve, spectroradiometer	
3 Feb9	Tu	Lecture 3 Lab 2	Aerial photography: vantage point, cameras, filters, and film Stereo-airphoto interpretation	
4 Feb16	Tu	Lecture 4 Lab 3	Multispectral remote sensing systems (1) -concepts: digital images, resolution, orbits, platform, types of system Image display	
5 Feb23	Tu	Lecture 5 Lab 4	Multispectral remote sensing systems (2) -Landsat and SPOT -AVHRR, EOS, High resolution. Multispectral Remote Sensing System	
6 Mar2	Tu	Lecture 6	Thermal infrared remote sensing	
7 Mar9	Tu	Lecture 7 Lab 5	Active and passive microwave, and Lidar remote sensing Thermal infrared remote sensing interpretation	
8 Mar16	Spring break Image registration			
9 Mar23	Tu	**Mid-term**		
10 Mar30	Tu	Lecture 8 Lab 6	Image enhancement Image enhancement	
11 Apr6	Tu	Lecture 9 Lab 7	Information extraction: classification Information extraction: classification	
12 Apr13	Tu	Lecture 10	Remote sensing of vegetation	
13 Apr20	Tu	Monday schedule		
14 Apr27	Tu	Lecture 11	Remote sensing of water resource	
15 May4	Tu		Final project	
16 May11	Tu		Presentation	
May 21			Final report due	