

Geography 472
Remote Sensing: Digital Image Processing and Analysis
Spring 2009

Course Information Credit Hours: 3 Online Lecture: Tuesdays 5:30 – 8:00pm Website: http://elms.umd.edu	
<i>Instructor</i> Dr. Hyunwoo Lim 1167 LeFrak Hall Office Hours: Mondays 4 – 5pm E-mail: hwlim@umd.edu Phone: 301-405-6584	<i>Teaching Assistant</i> Peggi Dudley Office Hours: TBA E-mail: pdudley@umd.edu

Course Description

This course is designed to introduce the principles and applications of remote sensing and contemporary methods of digital image processing. Remote sensing technology is essential for modern spatial analysis in order to identify features and phenomena at the surface of the Earth. Remote sensing has been used for research and applications in a wide range of disciplines such as engineering, geology, geography, urban studies, forestry, agriculture, and archaeology.

Prerequisites

Geog 579: Remote Sensing and Geographic Information Systems or equivalent
Geog 506: Introduction to Quantitative Methods for the Geographic Sciences or equivalent

Required Text

Lillesand, T.M., Kiefer, R.W. and J. W. Chipman (2008). *Remote Sensing and Image Interpretation*, 6th Ed. John Wiley & Sons, ISBN-13: 978-0470052457

Other Resources

Mather, P.M. (2004) *Computer Processing of Remotely Sensed Images*, 3rd edition. John Wiley & Sons Ltd, Chichester, West Sussex, England. (324 pp.) ISBN: 978-0-470-84919-4

Jensen, J.R. (2004) *Introductory Digital Image Processing: A Remote Sensing Perspective*, 3rd ed. Prentice Hall, Upper Saddle River, New Jersey. (text in 2005) ISBN-10: 0131453610

Course Requirements and Grading

Even though this course is primarily given online, students are strongly encouraged to attend each lecture and actively participate in discussions. Lab assignments will be given on a weekly basis to help students gain practical experience in digital image processing using Environment for Visualizing Images (ENVI). Finally students need to identify a specific study or project in which they are currently applying remotely sensed data. For this remote sensing application, each student is required to:

- Submit 1 paragraph description of this application by March 31.
- Within the context of this application, each student will acquire relevant digital remotely sensed data, preferable Landsat or equivalent, that they will subject to the image processing and analysis that is presented in this course.
- On May12, each student will make a 10-minute presentation of this work to the class and submit a short report on their finding from this analysis. This paper will include suitable figures and appropriate citations to the research literature that each student examined to support their analysis.

Final grades will be determined by the following items:

- Participation 5%
- Lab assignments 70%
- Project 25%

Make-up Policy

Assignments must be turned in at the beginning of the class at which they are due. No late assignments will be accepted without prior arrangement. If you have a documented disability and wish to discuss academic accommodations, please contact me immediately. Incomplete grades will not be given without extraordinary circumstances.

Academic Integrity

The University of Maryland, College Park, has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.

Within our class, students may work together to review class notes and home assignments. However, assignments must be done individually. Each student must turn in his or her own work, from his or her own computer. Any discussion or problem solution must be his or her alone, without assistance from any other person.

Online Learning

This is an online course with occasional in-person experiences. We will meet online at the announced time for a live audio/video lecture. The lecture will be archived for anyone who absolutely must miss the class, but I encourage you to login at the appointed time so that you can ask questions.

Our class will meet within Blackboard, the university's online learning system. Go to <http://elms.umd.edu> to access the course. After you login, our course will be listed in the right column under My Courses. Click on the course link to access the course.

Short videos that illustrate how to use the online learning system are available on the course page. Click the Tutorials button on the left sidebar to access the tutorials.

Hardware and Software Requirements for this course

All students must have a UMD glue account to obtain permissions to access the software in the lab and on the Citrix server. If you have never worked in the Open Lab, contact me to get permission.

We will primarily use ITT's ENVI software available in the Open Lab. If you cannot visit campus on a regular basis, you can purchase 12-month ENVI student license for \$195 with proof of enrollment of this course. If you are interested, please visit the following link: <https://www.ittvis.com/Academic/Students.aspx>

You may use either a PC or a Macintosh computer to access Blackboard. Whichever you choose, it must be equipped with the following hardware:

- Webcam
- Headset (including headphones and microphone)

You will also need the following plug-ins (be sure you have the latest versions):

- Real Media
- Flash Player
- Quicktime for PCs
- Quicktime with the Flip4Mac plugin (for Macs)
- FTP software: we recommend Secure FTP for PC and Fetch for Mac. Both of these are free downloads from <http://helpdesk.umd.edu> -- scroll down and choose Software Downloads. If you choose to use a different FTP software, it must be capable of SFTP (secure uploads).

Support for Online Learning

This method of taking classes is undoubtedly new to some of you, so we have a few tools to make life easier for you.

Email

Both TA and instructor will always be available by email. Use the email link in the sidebar to send us emails at any time. We will try to answer within 24 hours and probably much sooner.

Online office hours

We will both have office hours in a Live Classroom each week. The times will be posted in the Announcements. Use the link in the sidebar to access office hours.

On campus office hours

We will post times when we will be available on campus for face-to-face office hours. The TAs will have lab office hours on periodic Saturday mornings.

Lounge

We have created a place for you to visit with your classmates. This discussion board uses both text and voice. Share everything from discussions about the course material to what you did last weekend. I will look in from time to time but I probably won't respond to anything posted here.

Study Rooms

Several study rooms have been set up for you to form study groups with your classmates. We will not be monitoring these rooms. Remember that the Honor Code specifies that you are free to work together to discuss the assignments but that you must then separately produce an original and independent result.

Tentative Course Schedule

Schedule	Topic	Readings	Lab Assignment
Mar 3	Introduction to Image Processing and Analysis Digital Data Source	Ch 1	Landsat Data and Metadata
Mar 10	Single and Multi-Image Display and Analysis	Ch 4	Single Image Visualization
Mar 17	No class (Spring break)		
Mar 24	Image Geometry and Earth Registration	Ch 7	Multispectral Image Display and Evaluation
Mar 31	Radiometry, Calibration and Adjustments	Ch 5	Relative Geo-registration and Resampling
Apr 7	Spatial and spectral transforms	Ch 7	Radiance and Reflectance Calibration
Apr 14	Pattern Recognition methods	Ch7	Pixel Algebra and SVIs
Apr 21	Classification & Accuracy Assessment	Ch 7	Land Cover Classification
Apr 28	Change Detection		Confusion Matrix and Classification
May 5	SAR & Lidar GIS and Remote Sensing Integration	Ch 8	Land Cover Change
May 12	Student presentation		