

## **GEOG 4860/7860 : Advanced Remote Sensing**

**Spring 2009**

Lecture: Tuesday and Thursday 9:30 – 10:45 AM, Room 106  
Lab: Thursday 9:30 – 10:45 PM, Room 107

### **Instructor: Dr. Cuizhen (Susan) Wang**

Office: 10A Stewart Hall  
Office hrs: Tuesday and Thursday 2:00-3:30 PM; other times by appointment  
E-mail: [wangcu@missouri.edu](mailto:wangcu@missouri.edu)

### **Textbook**

John R. Jensen, 2005. Introductory Digital Image Processing, A Remote Sensing Perspective. 3<sup>rd</sup> Edition. Pearson Prentice Hall.

### **Course Description:**

This course is about information extraction and LULC mapping with remote sensing imagery. Topics include:

- Image pre-process: radiometric/atmospheric/geometric correction,
- spatial and spectral transformation,
- land use/land cover classification, and
- LULC change detection.

You are responsible to finish a final project to solve specific research question using the techniques of digital image processing that are discussed in this course. Detailed requirement of class project is described in next page.

### **Grading Scheme:**

Lab Exercises (average of 100 points):	15%
Quiz (100 points)	5%
Exam I (100 points):	20%
Exam II (100 points):	20%
Project proposal+presentation (100 points)	5%
Final Project (100 points):	25%
Final project presentation (100 points)	10%

**Total score 100%**

For example, if your **average** lab grade = 80 points, quiz = 90 points, Mid-exam = 95 points, final exam = 60 points, and class project = 93 points, then your final score =  $(80*0.25+90*0.05+95*0.25+60*0.25+93*0.2)=81.9$ .

**The grading will be curve-based. GEOG4860 and GEOG7860 will be graded separately.**

### **Software in the lab:**

You will use the ERDAS/Imagine in the SPAM lab. For those of you who have never used the software, some instructions will be handed out to help you catch up. The primary objective of the labs is to practice a diverse and powerful set of digital image processing techniques for extracting qualitative and quantitative information from remotely sensed imagery. At the end of this semester, you will be able to finish your class project independently.

### **Class Project**

The project involves original work using remotely sensed data and techniques discussed in class. Sooner or later after you step into this class, you may have a specific problem in mind, and some imagery you want to use. For example, if you want to examine the land use and land cover change of Columbia in the past ten years, you may want to use the TM image in 1990s and ETM+ image in 2000s.

Limiting the scope of the problem is a good idea. If you collect your data and solve the research problems, no matter how perfect they are, rather late in the semester, you may end up without enough time to perform the processing and do the writeup.

As a relatively small-size class, single project is encouraged to ensure each of you earn the capability of DIP-involved problem solving. Group projects (up to 2 persons) are not suggested until a large and comprehensive project is proposed.

The project includes four parts: proposal writeup+ presentation, project writeup+ presentation:

#### **Project proposal** (due at 5:00PM, April 16<sup>th</sup>.)

Two-page (double spaced) typed document that accomplishes four topics:

- identifies the research problem
- describe study area
- **find** the image(s) and/or ground data required to work on the problem
- outlines techniques and DIP methods you will use
- indicates a time line for completing the project (data input, processing, analysis, writeup)

#### **Proposal presentation:** (lab time, April 16<sup>th</sup>):

- 5 minutes for each student;
- Specify study area, explain the research problem in the study area;
- Present the subset of the image in the study area (not just the whole scene of image!)
- Outline basic DIP techniques

#### **Project writeup** (due at 5:00PM, Tuesday, May 12<sup>th</sup>)

The paper should be around 10 pages (double-spaced) in length. It is a research report. Write in an appropriate style. Describe clearly:

- Introduction (literature review, your research problem, and your objective(s))
- study area and data description (field data, RS image, accessories, etc)
- methodology (DIP methods you learned in the class, and other necessary methods that you use to solve your research question)
- results
- conclusion/discussion, and
- reference.

Attach figures and tables in the end of the report to help clarify your statement. No plagiarism! Cite it whenever you use other's ideas or work.

### **Project presentation (the last week of semester)**

- 15 minutes for each student (plus 5min for questions);
- follow the same style as in conference meetings.
- If necessary, may extend to the assigned final exam time: 10:30-12:30PM, May 12.

### **Late Policy:**

**Lab Assignments and class projects handed in late will receive a 5% penalty for each day late up to five weekdays. Assignments turned in more than 5 weekdays late will not be accepted for grading.**

### **Academic dishonesty:**

Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated. Please refer to pages 8-10 of the student handbook for details regarding the University's policies on academic dishonesty. (<http://www.missouri.edu/~mbookwww/M-Book2002.pdf> )

Plagiarism is a serious offense and can result in failure of the class and possible dismissal from the University. General review: 1. You must cite ideas and concepts that you have read in another source and are incorporating into your assignments and paper. 2. You must ALWAYS cite direct quotes from other sources whether they are long or short. 3. Direct quotes must be enclosed in quotation marks or in the case of a long quote, you should separate and indent the quoted block. If you have questions or concerns about whether a part of your writing would constitute plagiarism, please consult me BEFORE submitting your paper or project.

### **Support Services for Students with Disabilities (ADA):**

If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building

must be evacuated, please inform me immediately. Please see me privately after class or at my office during office hours or by appointment.

To request academic accommodations (for example, a note taker), students must also register with the [Office of Disability Services](http://disabilityservices.missouri.edu), (<http://disabilityservices.missouri.edu>), S5 Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course requirements. For other MU resources for students with disabilities, click on "Disability Resources" on the MU homepage.

### Class Schedule:

Week	Date	Lecture/lab topic
1	Jan. 20 Jan. 22	Introduction to DIP: remote sensing overview Image display and data collection <i>Handout: introduction to ERDAS/Imagine</i>
2	Jan. 27 <b>Jan. 29</b>	atmospheric correction <b>Lab1: image subset and spatial modeling</b>
3	Feb. 3 <b>Feb. 5</b>	Geometric correction <b>Lab2: Atmospheric and Geometric correction</b>
4	Feb. 10 <i>Feb.12</i>	PCA and TCA <i>Lab2: cont.</i>
5	Feb. 17 <b>Feb. 19</b>	contrast enhancement <b>Lab3: Spectral transformation</b>
6	Feb. 24 <b>Feb. 26</b>	Spatial convolution (1) <b>Lab4: Spatial transformation</b>
7	Mar. 3 <b>Mar. 5</b>	Spatial convolution (2) <b>Exam I</b>
8	<b>Mar. 10</b> <b>Mar. 12</b>	<b>Preparing class project: image collection and correction</b>
9	Mar. 17 <i>Mar. 19</i>	Image classification overview <i>Supervised and unsupervised classification</i>

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10	Mar. 24 Mar. 26	Spring Break week
11	Mar. 31 Apr. 2	Accuracy assessment <b>Lab5: classification and accuracy assessment</b>
12	Apr. 7 Apr. 9	Change detection analysis <i>Lab5 cont.</i>
13	Apr. 14 Apr. 16	Other classification methods <b>project proposal presentation (proposal due at 5:00PM)</b>
14	Apr. 21 <b>Apr. 23</b>	vegetation index <b>Exam II</b>
15	Apr. 28 May 30	<i>Working on Project</i> <i>Working on Project</i>
16	May 5 May 7	<b>Project Presentation</b> <b>Project Presentation</b>
17	May`12- 14	No final exam <b>Final project due: May 12 (5:00PM)</b>

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