Introduction to Remote Sensing  
(GIS4035/5034, Fall 2009)

Instructor:  
Dr. Xiaojun Yang, 321 Bellamy, Phone: 644-8379, Email: xyang@fsu.edu

Lecture Hours:  
Mondays: 2:30 - 5:00 p.m. 0035 Bellamy Building (COSS GIS Lab)

Lab Session:  
Mondays: 5:00 - 6:00 p.m. 0035 Bellamy Building (COSS GIS Lab)  
(You must register the one-hour remote sensing lab session: GIS4035L for GIS4035 students or GIS5034L for GIS5034 students; If you have any question about this, please contact me)

Office Hours:  
Fridays: 1:30 – 3:30 p.m., or by appointment.

Lab Instructor/Teaching Assistant:  
Libin Zhou (lz06c@fsu.edu); her office hours will be announced later.

Computing Lab Manager (any problem related to computer system):  
Shawn Lewers (slewers@fsu.edu)

Course Description and Objectives  
This course emphasizes the understanding of the aerospace remote sensing foundations and the use of remote sensor data and image interpretation and processing techniques for environmental and urban applications. Specifically, the course will cover concepts and foundations of remote sensing, aerial photography and photogrammetry, visual image interpretation, characteristics of various sensing systems (i.e. multispectral, thermal, hyperspectral, microwave and lidar), and an introduction to digital image processing techniques. The primary objective of this course is to provide students with the conceptual foundations and the technical skills to apply remote sensing for problem solving in environmental and cultural domains. Through laboratory work, students will have opportunities to practice the concepts and techniques learnt in the lectures. Weekly discussion of peer-reviewed journal articles or book chapters is required for graduate participants.

Laboratories  
Attendance at the one-hour lab session is required. The labs are integral part of the course and attendance is absolutely needed. Lab assignments are to be completed and handed in to the lab instructor before a due day that can be found from your assignment sheet. Some lab assignments may require you to spend your own time to complete, and you should contact your lab instructor/teaching assistant or myself for any question.

Prerequisite  
Currently, there is no any prerequisite enforced for this course. However, we are considering to use a basic physics course as prerequisite in the near future. You will know that remote sensing has a strong connection with physics. If you do not feel comfortable with any basic concepts in physics, you should try to read a textbook. **Note that this course requires a great deal of patience and a substantial time**
commitment. If you have any question about this, please contact the instructor.

Computing Environment, Software and GIS Lab Policies
The windows-based ERDAS Imagine software package may be used for several lab assignments. **However, you must be aware that this is not a software training course. If you are looking for such a course (learning a specific software package), you should visit the homepages for specific software packages. These vendors may provide short training courses or more software-specific training materials.**

You will be given a temporary account in order to log on a computer in COSS GIS Lab. This account may expire by the end of the semester. When you are at the computer lab, you must observe the COSS GIS lab and FSU’s related policies. The GIS lab rules include (on the following page):

- No food or drink in the lab.
- Lab computers are for GIS work only. Your other class work is to be done in other labs.
- Lab printers are for GIS work only.
- DO NOT install software without permission from your instructor or the lab manager. If you need software, ask!
- DO NOT save your work on the local machines. Use your Z: drive. If you use the local machine or temp directory, others will be able to see your work and it may not be there later.
- DO NOT waste color prints, as they are expensive. Use the black and white printer whenever possible.
- Be courteous of others in the lab and stay quiet.
- Clean up after yourself. Lab attendants will throw out things that are left behind.
- DO NOT remove equipment that belongs in the lab from the lab. You will be criminally prosecuted if you are caught.
- DO NOT download MP3 or movie files. Most of these websites are compromised by viruses.
- Always log-off the computers when you are done, but DO Not shut them down.
- No instant messaging is allowed.
- Follow the FSU Honor Code and Code of Conduct rules and behave in an adult-like manner.

It is your responsibility to check and observe these rules. Any violation of these rules can result in the loss of privileges to use this facility. If that happens, it is your responsibility to find an alternative so that you could work on your lab assignments. If you are unsure about a rule or rules, ask a lab employee or Shawn Lewers (slewers@fsu.edu).

Course Blackboard Site
The Blackboard will be used to host the course lecture and lab materials. You may find the lecture slides there, but there is no guarantee that these lecture materials will be available on time. You will still need to take notes during a lecture session. You are required to check that site from time to time because some important announcements may be posted there. The Blackboard address is: [http://campus.fsu.edu](http://campus.fsu.edu). You will need to use your FSU account username and password to access this site.

*Please note for copyright reason please do not distribute anything posted at the course blackboard site to any third persons.*

Grading Polices

Grading System
In qualitative terms, the grade standards are: **A**, Outstanding, few errors or omissions (if any); **B**, Good, only minor errors/omissions; **C**, Satisfactory, at least one major error/omission; **D**, Poor, several major errors/omissions; and **F**, Fail: many major errors/omissions.

### Grading Components (including the lab component)

<table>
<thead>
<tr>
<th>Components</th>
<th>Description</th>
<th>GIS4035</th>
<th>GIS5034</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two exams</td>
<td>120 minutes each; non-cumulative</td>
<td>30% X2 = 60%</td>
<td></td>
</tr>
<tr>
<td>Lab assignments</td>
<td>There are 10 lab assignments to be completed within a fixed time frame</td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td>Journal article review (GIS5034 only)</td>
<td>Review one article, plus a presentation, leading discussion, and reporting (more information will be provided later)</td>
<td>NA</td>
<td>10%*</td>
</tr>
<tr>
<td>Remote sensing story (GIS4035 only)</td>
<td>Share an interesting story relating to remote sensing theories or applications to the entire class (normally a few slides are needed to summarize the story; further guidelines will be provided later)</td>
<td>10%*</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Unlimited bonus points will be given to those who are active in the article discussion session.*

### Course Attendance

Students are required to attend all classes and be punctual. Missing even one lecture can affect your grade substantially. Announcements regarding the course outline and the schedule of the lectures, labs and exam (including changes of these) may be made in class. All organizational/administrative announcements made during the class period are assumed to be known by all students.

**Cell phones, pagers, alarms, laptops, calculators, and other electronic devices must be turned off in class at all times. In a lecture session, please do not log on any lab computer!**

### Course Exams

An exam can involve any material covered in lectures, reading or discussion assignments, and labs. There is no provision for extra credit work. A make-up exam might be arranged only when you present an acceptable excuse: documented illness, deaths in the immediate family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. Most other excuses for missing an exam are not acceptable. This policy will be strictly applied.

### Lab Grading Policies

**Lab grade will be combined with other components (exams and article review) to form a single grade**
for the entire class. Grades of your lab exercises are based on the quality of your answers. Any answer should be concise and be well organized. They must be in print. The grade for each of the exercises is reported as points_scored /total_points_of_exercise. For example, if an assignment is worth 20 points and your answers score 16 points then you should see 16/20 on your marked assignment.

Each of the assignments will have a due day clearly written on the first page of your lab assignment. The due time is 5:00 p.m. on the due day. Any assignment that is turned in after the due day is considered late, which will receive penalty strictly.

The penalty for a late assignment is based on the number of days late (including weekends). If an assignment is late less than 24 hours, it is considered 1 day late. If an assignment is late less than 48 hours but more than 24 hours, it is considered 2 days late, and so on. Late assignments are penalized 20% per day. Here is the formula for calculating the points of a late assignment:

Points_get = Points_scored - 0.20*num_days_late*Points_scored

The minimum value of Points_get is 0. Assignments handed in after I have returned the graded assignment to class (usually one week after the due date) will receive no points. Again, you must provide acceptable excuse (see exam section) in order to receive more time for you to complete lab exercises without penalty applied. You should discuss with your lab instructor about your situation no later than the due day. This policy will be strictly applied.

Note that every person must hand in his or her own lab assignments. Working together is permitted and encouraged. BUT each person will be graded separately, must answer “creative response” questions independently, and must create his or her OWN maps if applicable. Turning in identical or substantially similar assignments will result in significant grade reduction.

Journal Article Review and Discussion
Each graduate participant is required to review one journal article or book chapter chosen by yourself. They must be chosen from a set of peer-reviewed journals (check Section Course Materials for details). NO web materials can be used to replace a peer-reviewed journal article. Each GIS5034 participant needs to do a short presentation and lead discussion for one article. The leader is expected to prepare 3-5 questions for that particular article in one week before the actual discussion. These questions should be posted on the Blackboard site momentarily with the help of the teaching assistant/instructor, and each student will need to address these questions when reading through that article. The leader should prepare several slides to initiate the discussion, and summarize the major findings resulting from the classroom discussion. The summary report is due one week after the discussion. Each discussion session could last 15-20 minutes depending upon the topic. All students are expected to actively participate in the discussion.

Course Materials
Suggested Supplies: You may need pencil, eraser, magnifying glass, and calculator for your lab assignments.


Other Textbooks:
Remote Sensing Journals

- Photogrammetric Engineering and Remote Sensing (American Society for Photogrammetry and Remote Sensing)
- International Journal of Remote Sensing (Taylor & Francis)
- Remote Sensing of Environment (Elsevier)
- IEEE Transactions of Geosciences and Remote Sensing
- IEEE Geoscience and Remote Sensing Letters
- ISPRS Journal of Photogrammetry and Remote Sensing
- International Journal of Applied Earth Observation and Geoinformation
- Canadian Journal of Remote Sensing (CRSS)
- GIScience and Remote Sensing
- GeoCarto International

Electronic discussion groups and internet for remote sensing:

Students with an electronic mail account can sign up for an electronic discussion group on remote sensing or/and digital image processing. The most important group is called IMAGRS-L Group. There
are many discussion groups for individual software, e.g., there is one for ERDAR Imagine and one for IDRISI.

Another trend in remote sensing is the use of Internet to deliver remotely sensed data. Some image analyses can also be done through the Internet. You should constantly check the websites. There are many websites on remote sensing. You can use a search engine, such as http://www.google.com/ to search for them. If you are reading this syllabus in our remote sensing class website, you will be directed to link to a number of important websites for information on programs and data.

**Honor Code**
The Florida State University Academic Honor Policy outlines the University’s expectations for the integrity of students’ academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to “... be honest and truthful and ... [to] strive for personal and institutional integrity at Florida State University.” (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm.)

**PLAGIARISM:** All submitted assignments must be your own original, independent work. All sources must be properly cited (especially in the graduate student paper). Ask the instructor if you are unsure what to do. Plagiarism will result in significant grade reduction.

**ADA Requirements**
Students with disabilities needing academic accommodation should:
(1) register with and provide documentation to the Student Disability Resource Center; and
(2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request. For more information about services available to FSU students with disabilities, contact the:
Student Disability Resource Center
97 Woodward Avenue, South
108 Student Services Building, FSU
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
http://www.disabilitycenter.fsu.edu/
# Tentative Schedule
(Fall 2009)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topics</th>
<th>Lab Assignments</th>
<th>Reading</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/24</td>
<td>Introduction to the course/COSS GIS lab facilities</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>8/31</td>
<td>Remote sensing foundation (I)</td>
<td>Internet resources for remote sensing learning</td>
<td>Ch. 1</td>
<td>Article title due</td>
</tr>
<tr>
<td>3</td>
<td>9/07</td>
<td></td>
<td></td>
<td></td>
<td>Lab Day/Happy Holiday!</td>
</tr>
<tr>
<td>4</td>
<td>9/14</td>
<td>Remote sensing foundation (II)</td>
<td>Electromagnetic radiation principles</td>
<td>Ch. 1</td>
<td>Questions due</td>
</tr>
<tr>
<td>5</td>
<td>9/21</td>
<td>Aerial photography and photogrammetry</td>
<td>Viewing digital imagery and understanding digital numbers</td>
<td>Ch. 2&amp;3</td>
<td>Discussion I, II, and III</td>
</tr>
<tr>
<td>6</td>
<td>9/28</td>
<td></td>
<td>Basic computations in photogrammetry</td>
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<td>7</td>
<td>10/05</td>
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<tr>
<td>8</td>
<td>10/12</td>
<td><strong>Reading and Lecture Exam One (120')</strong></td>
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<tr>
<td>9</td>
<td>10/19</td>
<td>Introducing visual image interpretation</td>
<td>Three-dimensional viewing and image element understanding</td>
<td>Ch. 4</td>
<td>Discussion IV</td>
</tr>
<tr>
<td>10</td>
<td>10/26</td>
<td>Multispectral, thermal, and hyperspectral sensing</td>
<td>Image interpretation/remote sensing applications</td>
<td>Ch. 5</td>
<td>Discussion V</td>
</tr>
<tr>
<td>11</td>
<td>11/02</td>
<td>Earth resource satellites operating in the optical spectrum</td>
<td>Thermal infrared image interpretation</td>
<td>Ch. 6</td>
<td>Discussion VI</td>
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<tr>
<td>12</td>
<td>11/9</td>
<td>Microwave and lidar sensing</td>
<td>Analysis of multispectral remote sensor data</td>
<td>Ch. 8</td>
<td>Discussion VII</td>
</tr>
<tr>
<td>13</td>
<td>11/16</td>
<td>Analysis and interpretation of radar imagery (Lab assignment only)</td>
<td>NA</td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>11/23</td>
<td>Introducing digital image processing</td>
<td>Image classification</td>
<td>Ch. 7</td>
<td>Discussion VIII</td>
</tr>
<tr>
<td>15</td>
<td>11/30</td>
<td><strong>Lecture and Reading Exam Two (120'; non-cumulative)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>12/07</td>
<td></td>
<td>Make-up work and all reports due</td>
<td></td>
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</tbody>
</table>