

URBAN REMOTE SENSING

(GEO5934 04- Spring 2012)

Instructor:

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<http://mailer.fsu.edu/~xyang>

Class Hours:

Tuesdays: 2:00 – 4:30 p.m., 320 Bellamy Building (COSS GIS Lab)

Office Hours:

Tuesdays: 4:30 – 5:30 p.m.; Fridays: 1:00 – 3:00 p.m.

(Volunteered) Teaching Assistants:

Ting Liu (tl08c@my.fsu.edu) and Dee Shi (ds10f@my.fsu.edu). Both volunteer to provide help for the lab assignments. They should let you know their office hours shortly.

Computing Lab Manager (any problem related to computer system):

Mr. Shawn Lewers (slewers@fsu.edu)

Course Objective and Description

This course examines how the modern concepts, technologies and methods in remote sensing can be effectively used to solve urban problems relevant to a wide range of topics extending beyond urban feature extraction into areas of urban socioeconomic and environmental analyses. It will cover five major areas: the nature and scope of urban remote sensing; major remote sensing systems including multispectral, hyperspectral, microwave, and lidar systems; digital image processing; urban social analysis; and urban environmental analysis.

This course will be taught at the intermediate-advanced level, with instructor-led lectures, unsupervised lab assignments, reading and discussions, literature reviews, and a term paper. The lecture focuses on selected topics related to remote sensing techniques and urban applications. The unsupervised lab component centers on the use of a leading commercial remote sensing software package for digital processing of remote sensor data. A literature review on selected topics in urban remote sensing is required for each participant. Finally, each student needs to complete an independent term paper and present the result to the entire class.

Prerequisite

GIS4035/5034 (Introduction to Remote Sensing) or equivalent. In addition to this formal prerequisite, students are expected to have a reasonable background in college algebra and univariate and multivariate statistics.

Computing Environment, Software and GIS Lab Policies

The Windows-based ERDAS Imagine software package will be used for 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:

- 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>. You will need to use your FSU account username and password to access this site.

Grading Polices

System:

A	94-100	B	84-86	C	72-76	D	62-65
A-	90-93	B-	80-83	C-	70-71	D-	60-61
B+	87-89	C+	77-79	D+	66-69	F	< 59

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.

Components:

Components	Description	Weights
Class participation	Every student is expected to be active in the classroom.	5%
One writing assignment (open book exam)	A set of questions to be answered within a fixed period.	30%
Lab assignments	A set of lab assignments to be completed within a fixed time frame.	20%
Literature review	Review two chapters from the required textbook, write a report, and discuss it in the class.	15%
Term paper	Either a literature review or work on an urban remote sensing project that involves in data processing and analysis. For each option, you need to write a short proposal, survey literature or conduct research, present the findings to the entire class, and write a final report.	30%

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!*

Exam (Writing Assignment):

The exam (open-book writing assignment) 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 applied strictly.

Lab grading policies:

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:

$$\text{Points}_{\text{get}} = \text{Points}_{\text{scored}} - 0.20 * \text{num_days_late} * \text{Points}_{\text{scored}}$$

The minimum value of $\text{Points}_{\text{get}}$ 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 applied strictly.

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/visual products if appropriate. Turning in identical or substantially similar assignments will result in significant grade reduction.

Literature review and discussion:

Each participant is required to review 2 chapters from the required textbook, and they will be assigned by the instructor. Each participant needs to do a 30-minute powerpoint presentation and lead the discussion for the articles. The leader is expected to prepare a set of questions (5 or so) for that particular set of the articles in one week before the actual discussion. These questions should be posted on the Blackboard site momentarily with the help of the Instructor. Along with a leader (who actually reviews the articles), at least one "Discussant" will be assigned to each set of the chapters. Every student will need to address the

review questions when reading through the articles, and the assigned “discussant” should play a critical role in the discussion. The leader should prepare some 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.

Term Paper:

To be discussed in a separate document.

Course Materials

Required Textbook: Yang, X. (ed) 2011. *Urban Remote Sensing: Monitoring, Synthesis and Modeling in the Urban Environment*. Chichester: Wiley. 408p. **You should bring this book for all lecture hours.**

Other Textbooks:

- Campbell, J.B. and Wynne, R. H. 2011. *Introduction to Remote Sensing* (5th). New York: Guilford Publications. 666p.
- Donnay, J. P., Barnsley, M. J., and Longley, P.A. 2001. *Remote Sensing and Urban Analysis*. London: Taylor & Francis. 268p.
- Jensen, J.R. 2005. *Introductory Digital Image Processing: A Remote Sensing Perspective* (3rd). Upper Saddle River, N.J. : Prentice Hall.
- Jensen, J. 2007. *Remote Sensing of the Environment: An Earth Resource Perspective* (2nd). Upper Saddle River, N.J.: Prentice Hall. 592p.
- Jensen, R. R., Gatrell, J. D., and McLean, D. (eds.) 2007. *Geo-Spatial Technologies in Urban Environments: Policy, Practice, and Pixels* (2nd). Berlin: Springer. 242 p.
- Lillesand, T.M., Kiefer, R. W. and Chipman, J.W. 2007. *Remote Sensing and Image Interpretation* (6th). New York: Wiley. 756p.
- Lo, C. P. 1986. *Applied Remote Sensing*. New York: Longman. 393 p.
- Mather, P.M. and Koch, M. 2011. *Computer Processing of Remotely-Sensed Images* (4th). Chichester: Wiley. 434 p.
- Mesev, V. (ed.) 2003. *Remotely-Sensed Cities*. CRC Press, 368 p
- Mesev, V. (ed.) 2007. *Integration of GIS and Remote Sensing*. Chichester: Wiley. 296p.
- Netzband, M., Stefanov, W. L and Redman, C. L. (eds.) 2007. *Applied Remote Sensing For Urban Planning, Governance and Sustainability*. Berlin: Springer. 220p.
- Rashed, T. and Jürgens, C (eds.) *Remote Sensing of Urban and Suburban Areas*. Berlin:Springer. 352p.
- Ridd, M.K. and Hipple, J.D. (eds.) 2006. *Manual of Remote Sensing, Volume 5: Remote Sensing of Human Settlements*. ASPRS. 752p
- Weng, Q. (ed.) 2008. *Remote Sensing of Impervious Surfaces*. CRC Press. 488p.
- Weng, Q. and Quattrochi, D. (eds.) 2007. *Urban Remote Sensing*. CRC Press. 412p.

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

Internet resources for remote sensing:

A major 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/>

Free Tutoring from FSU

For tutoring and writing help in any course at Florida State University, visit the Academic Center for Excellence (ACE) Tutoring Services' comprehensive list of tutoring options - see <http://ace.fsu.edu/tutoring> or contact tutor@fsu.edu for more information. High-quality tutoring is available by appointment and on a walk-in basis. These services are offered by tutors trained to encourage the highest level of individual academic success while upholding personal academic integrity.

Spring 2012 Urban Remote Sensing Tentative Schedule

Weeks	Date	Lectures	Labs*	Readings	Remarks
1	1/10	Course introduction/What is urban remote sensing?/Remote sensing process	NA	Ch. 1	
2	1/17	Remote sensor overview I: Landat sensors/high resolution sensors/hyperspectral sensors	NA	Ch. 2, 3 & 4	Literature review assignment
3	1/24	Remote sensor overview II: Active microwave systems/lidar remote sensing	Imagine Essentials (I): Viwers and Import & Export /Idrisi 5-1: MLC Classification	Ch. 5&6	Term paper guidelines/ Review I
4	1/31	Digital image processing techniques I: DIP systems and image preprocessing	Imagine Essentials (II): Polynomial Rectification / Idrisi 5-2: Image Segmentation	Lillesand Ch 7	Review II
5	2/7	Digital image processing techniques II: image enhancement	Imagine Advantage: Image Interpreter / Idrisi 5-3: Soft Classifiers I	Ch 10 & Lillesand Ch. 7	Term paper proposal due/Review III
6	2/14	Digital image processing techniques III: image classification/change detection/accuracy assessment	Imagine Professional (I): Spatial Modeler I / Idrisi 5-4: Hardeners	Ch. 7, 8&9	Review IV
7	2/21	Urban social analysis I: electrification rate estimation/ population estimation	Imagine Professional (II): Spatial Modeler II /Idrisi 5-5:Soft Classifiers II	Ch. 15/13	Review V
8	2/28	AAG Week/No Lecture	Imagine Professional (III): Advanced Classification / Idrisi 5-6: Dempster-Shafer and Classification Uncertainty; Idrisi 4-6: Change Analysis		
9	3/6	FSU Spring Break (Enjoy!)			
10	3/13	Urban social analysis II: Sociodemographic data redistribution/urban sprawl characterization	Term Paper Work	Ch 14/12	Review VI
11	3/20	Urban social analysis III: Human healthy/environmental justice		Ch 16	Review VII
12	3/27	Urban environmental analysis I: Impervious surface, hydrology and air quality		Ch. 17/18/21	Review VIII
13	4/03	Urban environmental analysis II: Carbon sequestration estimation/biodiversity		Ch. 19/20	Review IX
14	4/10	Writing Assignment			
15	4/17	Research Presentation I			
16	4/24	Research Presentation II			

**Those who have taken my advanced remote sensing will work on a set of lab assignments prepared by the Idrisi Project.*