Geog 6240(Seminar in Environmental Management)

Urban Remote Sensing

Fall 2006

T-R 6:30- 9:20 PM SEC N108

INSTRUCTOR: **Dr. Tarek Rashed**, SEC 680 (rashed@ou.edu; 325-5104)
OFFICE HOURS: M-W 12:00– 1:00 PM or by appointment

OVERVIEW:

A basic premise of remote sensing (RS) is that features and landscapes on the Earth's surface can be discriminated, categorized, and mapped according to their spectral characteristics. Since its earliest development, most RS applications have been related primarily to the natural environment, and many models concerning the spectral characteristics of the natural landscape are now well established. In the case of built environments, the progress has been much slower because of the complexity of urban landscapes created by humans, the characteristics of the materials and land cover these landscapes are made of, and the differential ways by which such materials are arranged together over space. This seminar is designed to provide students with a better understanding of fundamental issues in urban remote sensing. Emphasis is placed on a range of theoretical and practical topics at the interface of contemporary remote sensing and urban studies; including the spectral, spatial and temporal requirements of remotely sensed data in relation to various urban phenomena, and methods and techniques for analyzing urban RS imagery and for integrating RS data and image processing with GIS to address urban problems.

PURPOSE:

The objectives of the seminar is to: (1) introduce students to advanced topics in passive remote sensing in the VNIR, SWIR and Thermal, with emphasis on the use of satellite imagery, both multispectral and hyperspectral, in the analysis of urban environments; (2) establish an understanding of the potential and limitations of methods and procedures involved in characterizing urban environments through remote sensing; and (3) provide considerable hands-on experience on the use of advanced image processing techniques on ENVI 4.3, IDRISI Andres, and ERDAS Imagine 8.7.

PREREQUISITE:

You need to have some background in remote sensing and GIS to cope with the load of work in this seminar. Therefore, both Remote Sensing (GEOG5933) and GIS (GEOG5453) or equivalents are required. Because of the heavy emphasis on labs and projects, you are expected to have a basic understanding of remote sensing principles and should also have some fluency in (or at least capable of getting yourself quickly familiar with) image processing packages such as ERDAS and ENVI. We will be working extensively with ENVI, but we may occasionally use ERDAS and IDRISI. Junior or senior level students wish to receive graduate credits for this course must file a petition form. Please check with the Graduate College on the deadline for such applications. The petition forms are available in the Graduate College Office, Room 313, Buchanan Hall or on the Graduate College web page at http://gradweb.ou.edu/

TEXT:

No assigned text. The instructor will assign some readings from journal articles and text books on a topic by topic basis. We will relay most heavily on topics covered by a text book edited by me and Carsten Jurgens on remote sensing of urban and suburban areas (to be released in late 2006/early2007).

Suggested Book References:

1- Donnay, J.-P., M. J. Barnsley, and P. A. Longley (Eds.). 2001. Remote Sensing and Urban Analysis. Taylor & Francis, London.
2- Mesev, V. (Ed.) 2003. Remotely Sensed Cities. Taylor & Francis, London.

3- Ridd and Hipple (Eds.) 2006. Remote Sensing of Human Settlements (Volume 5 in the Manual of Remote Sensing), ASPRS.
4- Lillesand Kiffer, and Chipman 2004. Remote Sensing and Image Interpretation, 5th edition. John Wiley & Sons. New York.
5- Liang, S 2004. Quantitative Remote Sensing of Land Surfaces. John Wiley & Sons. New York.
6- McCoy, R 2005. Field Methods in Remote Sensing. The Guilford Press, New York.
7- Congalton, R and K. Green 1999. Assessing the Accuracy of Remotely Sensed Data: Principles and Practices, CRC Press.

Useful Websites:

1- NASA's Remote Sensing Tutorials http://rst.gsfc.nasa.gov/Front/tofc.html
2- Canada's Center for Remote Sensing Tutorials http://ccrs.nrcan.gc.ca/resource/index_e.php#tutor
3- USGS Spectroscopy Lab http://speclab.cr.usgs.gov/

COURSE FORMAT:

Lectures: There will be a number of lecture sessions during the course of the seminar, although this is not typical in graduate seminar. The lectures will focus on techniques and methods within specific focus issues and be totally informal with plenty of discussions and questions along the way.

Labs: There will be 4 hands-on labs during the course of the seminar. **You are expected to attend all pre-scheduled labs** and remember the semester has no so much time left to make up missed labs!

Literature Review: You will be required to compile a bibliography of 4 papers including a one page summary and critique of each from one or more of the topics listed below (although you can always suggest your own). Papers selected have to be from peer-reviewed journal and recent (< 5 years old), although a real-classic would be acceptable. The papers have to deal with urban analyses

Scale issues
Change detection
Image calibration
Atmospheric modeling and correction
Pattern recognition and object orientation
Spectral mixture analysis and fuzzy techniques
Classification
Texture transform analysis
Wavelets and fractal analysis
Sensor fusion
Hyperspectral techniques
Integration with GIS

Project: The last two weeks of the seminar will be devoted to carryout a project using one of the advanced remote sensing techniques covered during the course of the seminar. You may select your own topic and/or data or I can provide you with one or both of them. A research plan and one paragraph summary of your project needs to be delivered to me by the end of the fifth week of the seminar. You will need however to start thinking about your project very soon. The scope of the project should be manageable to finish within a two-weeks framework. **Delivery of project outcome will take a form of a professional report that is a minimum of 10 page in length and a 20 minute presentation by each student.** The submitted report should be of a good quality to provide a basis for a more extended article that can be submitted to publication, or for a grant proposal, etc.

Exams or Quizzes: None is required for this seminar

GRADING

- Lab assignments: 50%
- Review papers: 20%
- Final term paper: 30%

- ***Grading scheme:*** **A**: 90% or more, **B**: 80-89.99%, **C**: 70-79.99%, **D**: 60-60.99%, and **F**: less than 60%. Grades are determined at absolute scale based on accumulative points.

IMPORTANT POLICY INFORMATION:

Academic Honesty: Academic honesty is a cornerstone of the development and acquisition of knowledge. The instructors have zero tolerance to cheating and plagiarism and will take proper actions against academic misconduct. The instructors assume that all students are aware of all forms of academic misconduct related to plagiarism, multiple-submissions of a single paper to different classes, and any form of "collaboration" during exams. If not, you must take a moment and make sure you read and understand the OU academic conduct code (http://www.ou.edu/studentcode/OUStudentCode.pdf).

Integrity Pledge: OU Honor Council, which is an initiative shared by the OU Student Association and the Office of the Provost (www.ou.edu/honorcouncil), has asked that students be asked to sign an Integrity Pledge, which reads ***"On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise."*** on each single piece or work submitted, whether labs, quizzes, exams, or even a report. By submitting any quiz, exam, or lab work you acknowledge that you have read the pledge and agreed with its content.

Students with Disabilities: Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact any of the instructors personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your education opportunities.

Religious Holidays: It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.

SUMMARY SCHEDULE (SUBJECT TO CHANGE):

	Day		Topic	Remarks
1	10/17	T	Syllabus/Course Introduction Focus issue 1: Challenges in urban remote sensing	
	10/19	R		**Lab 1**
2	10/24	T	Focus issue 2: Data preparation tools	
	10/26	R		*Paper review 1*
3	10/31	T	Focus issue 3: Crisp classification tools	*Lab 1 due* **Lab 2**
	11/2	R		*Paper review 2*
4	11/7	T	Focus issue 4:Soft classification tools	*Lab 2 due* **Lab 3**
	11/8	R		*Paper review 3*
5	11/14	T		
	11/16	R	Focus issue 5:Machine learning tools	*Lab 3 due* **Lab 4** ***Research plan due***

6	11/21	T		*Paper review 4*
	11/23	R	*Thanksgiving Break – No Class*	
7	11/28	T	Project	*Lab 4 due*
	11/30	R	Project	
8	12/5	T	Project	
	12/7	R	Project	
9			***Presentation of Projects and Term Papers due***	