INTRODUCTION TO REMOTE SENSING – GEOG 373/573

New Mexico State University
Department of Geography

FALL 2010

Lecture: Mon & Wed, 3:30 – 4:20 PM; Breland Hall Room #192

Professor: **Carol Campbell**
Office: Breland Hall; Room # 143
Phone: (575) 646-3509
E-mail: geobird@nmsu.edu
Office Hours: Mon & Wed, 8:30-9:30AM
Wed 1:30– 2:30 PM

You may always email me with questions, concerns, or set up an appointment by contacting me via the Blackboard page.

Tues, 2:15-4:45 PM; Breland Hall Room #192
OR
Fri, 8:00 – 10:15 AM; Breland 192

Labs: All sections meet in Breland 192, the Geography Department's Teaching Lab. Discuss changes in your specific lab choice or day-to-day concerns with your Lab Instructor. You are responsible for maintaining files, workspace and back-ups of your work. Computer memory may be cleaned at any time. Save your work.

YOU MUST PASS THE LAB TO PASS THE CLASS.

Tuesday Lab Instructor: Mr. Ari Menon
Office: Breland Hall; Room # 142
Phone: (575) 646-3307
E-mail: ameons@gmail.com
Office Hours: Wed 10:00– 12:00 PM

Friday Lab Instructor: Ms. Anna Patterson
Office: Breland Hall; Room # 180
Phone: (575) 646-4311
E-mail: eridani@gmail.com
Office Hours: Tues/Thurs 11:30 12:30 PM and Thursday (on-line) 6-7 PM

Course Description

This course provides a foundation in the theory, techniques, and applications of remote sensing—the art, science, and technology of obtaining information about an object or phenomenon without being in direct physical contact with the object or phenomenon under

study. The topics of discussion range from the remote sensing process and basic electromagnetic radiation principles to various aspects of the analysis and interpretation of aerial photography and satellite imagery. Specific consideration is given to the remote sensing of the biosphere, hydrosphere, atmosphere, lithosphere, and cultural landscapes. The course includes both a lecture and lab component. The lab allows students to apply concepts and techniques discussed in the lecture and involves the visual and digital analysis and interpretation of both aerial photographs and satellite images.

Course Goals and Objectives

Upon completion of this course, students should be able to:

- demonstrate a functional understanding of basic remote sensing principles, applications, as well as potentials, challenges, and limitations of remote sensing in geography and other fields of inquiry;
- demonstrate a fundamental knowledge of how electromagnetic radiation interacts with Earth materials such as vegetation, soil, rock, or water, and how the electromagnetic energy reflected or emitted from these materials is recorded using a variety of remote sensing instruments; and
- apply some basic image analysis and interpretation skills (visual and digital), e.g., be able to extract some fundamental biophysical or cultural information from sensing data to solve real-world problems.

Course Structure

This is a *fast-paced* course that introduces a variety of concepts, terms, and principles relevant to remote sensing. The major topics are treated separately in each of the chapters in your textbook as well as during the lectures. However, the subject of remote sensing can only be fully appreciated or grasped by *synthesis* and *integration* of the many topics discussed throughout the semester. In other words, the topics discussed throughout the semester are interrelated in intricate ways—an understanding of topics treated during the third week of class demands an understanding of the topics treated during the first and second weeks of class, and so forth. It is thus particularly important that you keep up with the readings, discussions, and assignments and that you attend class regularly.

The textbook required for this class provides a solid background for the course. However, there will be additional or alternative material in the lectures that is not in your textbook. Hence, I recommend that you review my lecture notes and attend class. There will be lab exercises, which are designed to enhance your understanding of the course material by allowing you to apply many of the relevant concepts, terms, and principles to specific problems. A number of short quizzes will be given throughout the term, which requires you to keep up with the lectures and labs at all times throughout the semester. Two rather comprehensive exams, a mid-term and final exam, will assess both your topical and analytical expertise acquired in this course.

Required Textbook

Jensen, J. R. 2006. *Remote Sensing of the Environment: An Earth Resource Perspective*. 2/E ed. Upper Saddle River, NJ: Prentice-Hall.

Lab Manual

There is no formal lab manual for this class. Weekly exercises will be posted on Blackboard under "Labs" and you are required to print them out *before* attending your lab.

Bring to lecture and lab every time

- Textbook & Lectures notes
- Calculator
- Flash drive with course materials

Web Page

The page can be found at https://learn.nmsu.edu/. To access our course materials, log in to your Blackboard account and click the link for this course. On the web page, you will find lecture notes, class handouts, lab exercises, additional reading materials, announcements, your grades, and a discussion board. The web page is a key element of this course and you are required to review its contents regularly. If you encounter problems with or related to the web page, please contact me immediately.

Grading

Your final course grade is determined by the amount of points you accrue out of a total possible 880 points for Geog 373 and total possible 980 points Geog 573. The points are allocated as follows:

Mid-term exam:	200 points
Final exam:	250 points
Quizzes (11):	110 points
Labs (13):	320 points
Grad Literature Reviews (4):	100 points
TOTAL	UG 880 points / GR 980 points

Your final course letter grade will be based on the percentages:

A = < 90%, B = 89-80%, C = 79-70%, D = 69- 60%

Individual assignments and tests will not be curved (neither upward nor downward!). I *may* make adjustments of the final letter grade after an assessment of the class curve at the end of the semester. I consider class participation, attendance, and improvement over the term as justification for discounting a grade that is uncharacteristically lower than others.

Detailed information regarding the nature and grading of labs, quizzes, and exams will be provided to you in class and/or on Blackboard. Instructions for the "Current Event Documentations" are outlined in a separate document and made available to you both in hardcopy and digital (Blackboard/Course Documents) format.

Important Notes

Students are responsible for registering for classes and for verifying their schedules.

*The **last day to drop a Fall Semester Class with a "W" grade** is Tuesday, October 10, 2010.*

I am available to respond to any questions or concerns you may have. I will take all of your emails and personal addresses seriously, and will respond to you as soon and as specific as possible. Any issues that are of interest and importance to all students will be addressed and discussed in class as well as announced on Blackboard. Don't be shy and ask as soon as ambiguities, problems, or concerns arise!

I reserve the right to change scheduled lecture topics as well as assignments and their due dates (Any changes made will not adversely affect your workload or grade.).

Honesty –Do your own work. I do and will check for plagiarisms. Cite your references in the text as you write. Use the Chicago Manual of Style. As stated in the University Undergraduate Catalog *"Students at NMSU are expected to observe and maintain the highest academic, ethical and professional standards of conduct. Any student found guilty of academic misconduct shall be subject to disciplinary action."*
Please refer to the following website regarding plagiarism.
http://lib.nmsu.edu/instruction/plagiarismforstudents.htm

Geog 573 Grad students Only - Literature Review

This will give you a chance to build your library of research topics that can contribute to your thesis or research question. Review 4 articles from the peer –reviewed, scientific literature that describe and discuss imagery analysis related to your research. Summarize each briefly including what aspect is related to your research, if the techniques used will suit your needs or what modifications would be required if you took a similar approach. Turn in: a pdf of the article (or stable URL), a half- to one-page write-up per article for a total of about 2 pages and 4 articles per assignment.

Summary: Four articles/each report, total of 16 articles for the semester. Note: some articles will be read but may not be what you are looking for – just state why or why not and include them. Turn these in via blackboard mail by the date on the syllabus.

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New Mexico State University, Department of Geography
Fall 2010

Tentative Course Outline*

Week	Date	Topics	Assigned Readings
1	08/23 08/25	Syllabus **Quiz 1** **Introduction to Remote Sensing** *Lab #1: Remote Sensing Resources*-Handout in Lecture due in Lab	Ch. 1
2	08/30 09/01	**Quiz 2** **Electromagnetic Radiation Principles** Cont'd *Lab #2: Introduction to ERDAS IMAGINE I*	Ch. 2
3	09/06 09/08	**No School Labor Day (skip Quiz 3)** *Aerial Photos* *Lab #3: Introduction to ERDAS IMAGINE II*	Ch. 3 + 4
4	09/13 09/15	**Quiz 4** **Literature Review #1 Due** **Elements of Visual Image Interpretation** Cont'd *Lab #4: Visual Analysis and Interpretation of Air and Satellite Data*	Ch. 5
5	09/20 09/22	**Photogrammetry** Cont'd **Lab #5: Quantitative Analysis of Aerial Photographs Optional*	Ch. 6
6	09/27 09/29	**Quiz 6** Cont.'d *Lab #6: Generation of Digital Orthophoto Quadrangles*	TBD
7	10/04 10/06	**Quiz 7** **Literature Review #2 Due** **Multi- and Hyperspectral Remote Sensing** Cont.'d *Lab #7: Analysis and Interpretation of Multi- and Hyperspectral Imagery*	Ch. 7
8	**10/11** 10/13	**MID-TERM EXAM** **Quiz 8** **Thermal Infrared Remote Sensing** *Lab #8: Analysis and Interpretation of Thermal Infrared Imagery*	Ch. 8
9	10/18 10/20	**Quiz 9** **RADAR and LIDAR Remote Sensing** Cont.'d *Lab #9: Analysis and Interpretation of RADAR and LIDAR Imagery*	Ch. 9 + 10

10	10/25 10/27	**Quiz 10** **Remote Sensing of Vegetation** Cont.'d *Lab #10: Remote Sensing of Vegetation*	Ch. 11
11	11/01 11/03	**Quiz 11** **Remote Sensing of Water** Cont.'d *Lab #11: Remote Sensing of Water*	Ch. 12
12	**11/08** 11/10	**Quiz 12** **Literature Review #3 Due** **Remote Sensing of Soils, Minerals, and Geomorphology** Cont.'d *Lab #12: Remote Sensing of Soils, Minerals, and Geomorphology*	Ch. 14
13	11/5 11/17	**Quiz 13** **Remote Sensing of Urban Landscapes** *Lab #13: Remote Sensing of Urban Landscapes*	Ch. 13
14	11/22 11/24	***Thanksgiving Vacation – No class!***	
15	11/29 12/01	**Literature Review #4 Due** ***In Situ* Reflectance Measurement** Preview: Advanced Remote Sensing *Lab #14: Fun Preview of Next Semester's Activities* **-optional**	Ch. 15
16	**12/6**	**3:30 PM–5:30 PM → FINAL EXAM (COMPREHENSIVE)**	

*subject to revision