Civil Engineering 603 (CE 603) / Geodetic Science (GS 603)
Remote Sensing of Environment – Course Outline
Winter Quarter 2009

Course Description. CE603/GS603. 4 credits. The energies of the natural and cultural environment; current remote sensing systems and case histories of applications in measuring the environment.

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class website: http://hcgl.eng.ohio-state.edu/~ceg603/

Office Hours: Monday, Wednesday: 8:30-9:30 A.M. Also, appointments can be scheduled.

Objectives of Course: The course is designed to give students an understanding of the electromagnetic spectrum, as used in remote sensing techniques and applications.

Prerequisites: CE405 or SUR450 or equivalent with written permission of instructor.

Textbook: Jensen, J.R. (2007) *Remote Sensing of the Environment: An Earth Resource Perspective*, Second Edition, Pearson Prentice-Hall: Upper Saddle River, New Jersey.

Requirements: Students are expected to attend each class and perform the computer labs. Class is held from 7:30-8:18 P.M. Monday, Wednesday and Friday in Bolz 314. A laboratory session will meet for 3 hours on Tuesday, starting at 2:30 P.M. in Hitchcock 322. For make-up classes, we will meet in BO124 on Tuesdays at 2:30 P.M. After receiving initial instructions, the labs can be done independently using the ERDAS Imagine software on the PCs located in Room 322, 342 Hitchcock or 217, 326 Bolz Hall.

Grading is as follows:

- 45% – 1 midterm exam and a final exam
- 30% – Laboratory exercises (7)
- 25% – Project paper

Course Outline - CE603/GS603 - Daily Schedule
Winter Quarter 2009

Date	*Topic*	*Chapter Readings*
1-5	Introduction to remote sensing	1: 1-32
1-6	Lab session – Lab #1	
1-7	Introduction to remote sensing	
1-9	Electromagnetic radiation	2: 37-60
1-12	No class – TRB/IRF	
1-13	Lab session – Lab #1 (continued)	
1-14	Electromagnetic radiation	
1-16	Aerial photography	3: 61-88 (more historical interest)
1-19	No class – Martin Luther King Day	
1-20	Lab session – Lab #2	
1-21	Aerial photography	4: 91-125; 6: 149-169
1-23	Multispectral remote sensing systems	7: 193-233; 237-246
1-26	Multispectral remote sensing systems	
1-27	Lab session – Lab #3	
1-28	Landsat observation satellite systems	
1-30	Commercial satellite systems	7: 233-237
2-2	Remote sensing of thermal energy	8: 249-288
2-3	Lab session – Lab #4	
2-4	Remote sensing of thermal energy	
2-6	Midterm	
2-9	Remote sensing of thermal energy	
2-10	Lab session – Lab #5	
2-11	Active remote sensing – microwave & passive	9: 291-332
2-13	Active remote sensing – microwave & passive	
2-16	Active remote sensing – microwave & passive	
2-17	Lab session – Lab #6	
2-18	LIDAR remote sensing	10: 335-352
2-20	LIDAR remote sensing	
2-23	Remote sensing of vegetation	11: 355-402
2-24	Lab session – Lab #7	
2-25	Remote sensing of vegetation	
2-27	Remote sensing of water	12: 409-439
3-2	Remote sensing of water	
3-3	Lab session – Open session (work on class project)	
3-4	Remote sensing of the urban landscape	13: 443-501
3-6	Ethics in remote sensing	
3-9	No class – ASPRS – work on class project	
3-10	Lab session – Open session (work on class project)	
3-11	No class – ASPRS – work on class project	
3-13	No class – ASPRS – work on class project	
3-19	Final Exam (7:30-9:18 P.M.) – Thursday, March 19	

Course Outline – CE603/GS603 – Remote Sensing of Environment

Introduction to remote sensing
- Definition
- History
- Principles

Electromagnetic radiation
- Electromagnetic spectrum
- Radiation principles
- Energy interactions
- Data acquisition and interpretation

Aerial photography
- Aerial cameras
- Panchromatic, black-and-white infrared, color, & color infrared films
- Scale and resolution
- Sources of aerial photos
- Flight planning

Satellite orbits

Framing *vs.* scanning systems

Land observation satellite systems; data products; applications
- NOAA AVHRR, SeaWiFS
- Landsat MSS, TM, ETM+
- SPOT HRV
- Indian IRS

Commercial satellite systems

Remote sensing of thermal energy
- Radiation principles
- Geometry of thermal images
- Interpreting thermal images

Active and passive microwave remote sensing
- Radar fundamentals
- Side-Looking Airborne Radar (SLAR)
- Interpreting SLAR imagery
- Satellite imaging radars
- Passive microwave sensing

LiDAR remote sensing

Remote sensing of vegetation

Remote sensing of water

Remote sensing of the urban landscape

Ethics in remote sensing

CE/GS603 Project Paper

The objective of the class project is to address an *open-ended* problem and develop a creative solution using remote sensing techniques learned in this course. You may select any application to formulate a design problem statement and criteria. You will conduct the project using digital satellite or aircraft data. To evaluate the capability of remote sensing to solve your application problem, one should make use of general information available. This information would include items like topographic maps, soil surveys, on-site field visits, reference literature, thematic maps, or any other additional sources of information. Sites to locate imagery are included on the class web page (http://hcgl1.eng.ohio-state.edu/~ceg603/). Also, remember that there is a large archive of Landsat imagery in Region 1.

Each project paper should contain the following headings, where appropriate: Title, Abstract, Introduction, Background, Methods, Results and Discussion, Conclusions, Recommendations, References Cited, and Appendices (if necessary).

The project paper should be typewritten, double-spaced, 2000 words in length (about 6 pages), and will be due the last day of the quarter **– 5 P.M., Friday, 13 March 2008.** Include a word count at the end of your paper. Be sure to label your figures with captions (Figure 1. <figure caption>), number and title each table (Table 1. <table description>), and label any appendices (Appendix A).

References cited in the text are made by giving the author's name and date of publication, *e.g.* (Smith, 1999). Reference citations should follow the following examples:

Journal article:

Adkins, K.F. and C.J. Merry, 1994. Accuracy assessment of elevation data sets using the Global Positioning System, *Photogrammetric Engineering and Remote Sensing,* **60**(2):195-202.

Book:

Jensen, J.R. (2007) *Remote Sensing of the Environment: An Earth Resource Perspective,* Second Edition, Pearson Prentice-Hall: Upper Saddle River, New Jersey.

Conference proceedings:

Merry, C.J., M.R. McCord, F. Jafar and L.A. Pérez, 1996. Feasibility of using simulated satellite data coordinated with traffic ground counts, Proceedings of the National Traffic Data Acquisition Conference, Albuquerque, New Mexico, 5-9 May, I:493-497.

Grading

The project paper will be graded based on the following elements:

- use of remote sensing technologies learned in class
- originality and technical correctness
- clarity and conciseness of the written presentation

Laboratory Report Format

The lab report is to summarize what you did in the laboratory exercise. Treat this report as if you are giving this report to your supervisor. Remember that your supervisor does not know how you determined your results, so your report should summarize clearly how you performed this piece of work.

Your laboratory report should have the following sections. The report should be typed. Remember to use complete sentences – this is a technical report.

Title: The title of the laboratory exercise. Make sure your name is on the report.

Objectives: State what the objectives or purpose of the laboratory exercise are.

Procedures: Describe the process (briefly) in a paragraph or two on what you went through in conducting the laboratory exercise. There is no need to describe every single software command that you used. Remember that your supervisor probably has no clue on how the software works. A description of the general process that you went through to perform the lab is required for this section.

Results and Discussion: Describe, in detail, the results you found during the exercise. In essence, this would involve answering the questions that were asked in the lab. If tables, maps or diagrams are necessary for supportive evidence, then include these also. Be sure to label each table, figure and map.

Conclusions: Provide overall conclusions of what you performed in the laboratory.

Recommendations: If possible, provide a recommendation for future improvement of the lab. This helps me in improving the lab exercise for next year.