AGRY 545/ASM 591R

Remote Sensing of Land Resources

Fall Semester 2005

Course Syllabus

Agronomy 545/ASM 591R is a graduate level course designed to teach students how to analyze and interpret remotely sensed data. The emphasis of the course is on the remote observation of soil, vegetation and water resources (together referred to as land resources). Students who learn the basics of remote sensing will be exposed to the latest developments of the technology and will learn how to apply these technologies to the inventorying and mapping of land resources.

Instructors:

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Lab/Teaching Assistant: Patrick Gies
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Office Hours: Make appointments to schedule time

Schedule:

Lecture and recitation:
Tuesday, 08:30-09:20, Room 204 ABE
Thursday, 08:30-09:20, Room 204 ABE
Lab demonstration and tutorial:
Tuesday, 09:30-12:20 ABE 105 and 116/118

Note: This course is primarily a "hands-on" computer based course. Normally the demonstration and tutorial on Lab days will be completed within the first hour. This will simply be an introduction to the exercise of the week. The Leica Geosystems ERDAS IMAGINE, RSI ENVI and Purdue-developed Multispec image processing software packages are all available on all computers in ABE 105 and 116/118. Other computers with Imagine can be found in the Forestry, Civil and Agronomy buildings.

Suggested Key Reference Books/Journals for the Course:

1. Lillesand, T.M., R.W. Kiefer and J.W. Chipman. 2004. Remote Sensing and Image Interpretation. 5th Edition. John Wiley and Sons. New York. You are encouraged to purchase this book as it will be the main text for the course. **LKC**

2. Jensen, J.R. 2000 Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Edition. Prentice-Hall. 544 pp. (There will be 2 copies of this book on reserve in the Life Science Library.) **JJ**
3. July 1997 Issue of Photogrammetric Engineering and Remote Sensing Journal PE
4. GPS Handbooks, Trimble (On reserve in Life Science Library)

The following reference books and publications for student use are found in the Remote Sensing Resource Center, (Lilly 3350). Note these materials are not to be removed from the Center.

1. Aronoff, S. 1989. Geographic Information Systems. A Management Perspective. WDL Publications. Ottawa.

2. Kennedy, M. 1996. The Global Positioning System and GIS. Ann Arbor Press, Inc. Chelsea, Michigan.

3. Swain, P.H. and S.M. Davis. 1978. Remote Sensing: The Quantitative Approach. McGraw Hill, NY.

4. Johannsen, C. J. and J. L. Sanders (eds.) 1982. Remote Sensing for Resource Management, Soil Conservation Society of America, Ankeny, IA 665 pp.

5. Colwell, R. N. Editor, 1989. Manual of Remote Sensing, Vol. I and II, American Society of Photogrammetry.

6. Liverman, D., et al. 1998. People and Pixels, National Academy Press, Washington, DC, 244 pp.

7. And many other textbooks related to remote sensing topics are in the west book shelves.

Journals:

Earth Observer
Earth Observation Magazine
Geographic Information Systems
Global Change Newsletter
GPS World
International Journal of Remote Sensing
Photogrammetric Engineering & Remote Sensing
Professional Surveyor

COURSE OBJECTIVE

To study the applications of remote sensing & global positioning system technologies and geographic information systems (GIS) for the management and conservation of soil, vegetation and water resources (i.e. land resources); to study the use of these technologies to improve the information base for local, regional and global change studies and for decision-making in the management of terrestrial ecosystems at different spatial, spectral and temporal resolutions.

COURSE OUTLINE

Date **Subject and References.**

Tuesday, Aug 23
- Lecture 1: Introduction to Remote Sensing of Land Resources
- Lab 1: Introduction: WebCT, ERDAS Imagine& Radiometric Enhancement

Thursday, Aug 25
- Lecture 2: Energy Sources and Radiation Principles. (**LKC** Chap 1, pp. 1-9)

Tuesday, Aug 30
- Lecture 3: Energy Interactions with the Earth and the Atmosphere. (LKC: Chapter 1: 9-23)
- Lab 2: Spatial & Spectral Enhancements

Thursday, Sept 1
- Lecture 4: Data Acquisition, Recording Data (pixels) (**LKC**: Chapter 1: 23-27)

Tuesday, Sept 6
- Lecture 5: Characteristics of an Ideal Remote Sensing System (**LKC**: Chapter 1: 35-41)
- Lab 3: Image Rectification

Thursday, Sept 8
- Lecture 6: Digital Image Processing – Preprocessing Step (**LKC**, Chapter 7: 491-531)

Tuesday, Sept 13
- Lecture 7: Digital Image Processing, GIS Integration and other Remote Sensing Packages (**LKC**, Chapter 7: 531-610)
- Lab 4: Classification I: Unsupervised Classification & Preparation for Supervised Classification.

Thursday, Sept 15
- Lecture 8: Collection of Ground Reference Data/Information (**LKC**: Chapter 1: 26-32; http://rst.gsfc.nasa.gov/Sect13/Sect13_1.html; plus handouts)

Tuesday, Sept 20
- Lecture 9: Importance of GPS to Remote Sensing - (Trimble GPS booklets in Life Science Library)

Lab 5: Classification II: Evaluation of Signatures, Performance & Accuracy Assessment of Supervised Classification

Thursday, Sept 22
Exam #1

Tuesday, Sept 27
Lecture10: Maps, Digital Cartography (Handouts)
Literature Review Report Due
Lab 6: Output: ArcGIS

Thursday, Sept 29
Lecture11: Multispectral & Thermal Sensing. (**LKC**, Chapter 5: 330-384,; **JJ**, Chapter 2:44-47)

Tuesday, Oct 4
Lecture 12: Thermal and Hyperspectral Sensing. (**LKC**, Chapter 5: 330-384,; **JJ**, Chapter 2:44-47)
Lab 7: ENVI & MultiSpec

Thursday, Oct 6
Lecture 13: Hyperspectral Sensing (**LKC**: Chapter 5: 384-392); **JJ:** Chapter 11: 450-461)

Tuesday, Oct 11
October Break (October 10-11)

Thursday, Oct 13
Lecture 14: History, Viewing Space Photography/Images (**LKC**, Chapter 2: 58 - 111; http://rst.gsfc.nasa.gov/Sect10/Sect10_1.html)
Lab 7 due: Handout Lab #8 Mini-Project: Land Cover Classification; Demo 1

Tuesday, Oct 18
Lecture 15: Basics of Photo and Image Interpretation (**LKC**, Chapter 3: 126-190)
Lab 8: Mini-Project questions; Demos 2 & 3

Thursday, Oct 20
Lecture 16: Introduction to Purdue's Terrestrial Observatory (Handouts) – Larry Biehl

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Tuesday, Oct 25

Lecture 17: Satellite Remote Sensing Systems (**LKC**, Chapter 6: 376-466, PE: July 1997 Issue, also reference materials in your notebooks)

Lab Team Project topics selected.

Lab 8 due. Lab: Project Design Presentation

Thursday, Oct 27

Exam #2

Tuesday, Nov 1

Lecture 18: Radar Imaging of Land Resources (**LKC**, Chapter 8: 638-732); **JJ**: Chapter 9: 285-331) – Laura Bowling

Demos

Thursday, Nov 3

Lecture 19: Spatial Resolution (**LKC**: Chapter 1: 38, 40, Chapter 7: 617-622)

Project Design Report due.

Tuesday, Nov 8

Lecture 20: Spectral and Temporal Resolution (**JJ**: Chapter 1: 14-18, Chapter 12: 468-470)

Thursday, Nov 10

Lecture 21: Crop Anomaly Classification System

Tuesday, Nov 15

Lecture 22: Mapping Soil Resources (**LKC**: Chapter 4: 226-237)

Thursday, Nov 17

***Preliminary Project Results due*.** You will need to present your results visually as a Group in the Lab.

Tuesday, Nov 22

Lecture 23: Mapping Vegetation Resources (http://rst.gsfc.nasa.gov/Sect3/Sect3_1.html; **JJ**: Chapter 8:301-322)

Thursday, Nov. 24

Thanksgiving Break

Tuesday, Nov 29

Lecture 24: Precision Agriculture (Handouts)

Thursday, Dec 1

Lecture 25: Remote Sensing of Land Resources (**JJ**: Chapter 11: 341-350**).**

Tuesday, Dec 6

Lecture & Lab (8:30 – 10:20 AM) Student Presentations on Term Projects.

Semester Project Reports Due: 8:30 a.m.

Thursday, Dec 8

Lecture: (8:30 – 10:20 AM) Student Presentations on Term Projects.

????? Dec ??: Final Exam, Time: ? – ?? ?.?.

BASIS FOR CALCULATION OF FINAL GRADE

Exams		
	Exam #1	100 points
	Exam #2	100 points
	Final Exam (comprehensive)	150 points (Final will cover entire course)
Homework		
	Laboratory Exercises (8)*	250 points
	Literature Review Report	100 points
Project		
	Project Design Report	50 points
	Project Preliminary Results/demo	50 points
	Project Presentation	100 points
	Project Final Report	100 points
Total		1000 Points

* Lab 8 will count as 75 points. Labs 1-7 are 25 points each.

COURSE POLICY ON ACADEMIC DISHONESTY

Academic dishonesty in this course will not be tolerated. Academic dishonesty may consist of the following actions:

1. Obtaining or using work other than your own on tests, exams, quizzes or assignments..
2. Unauthorized use of calculators or other programmable equipment during tests, exams, or quizzes.
3. Unauthorized uses of study aids, answer or crib sheets.
4. Soliciting or providing answers on exams, tests, or quizzes.

Students who participate in any of the above actions can expect disciplinary action. Disciplinary action may consist of receiving a zero on the assignment, failing the course, being reported to the Dean of Students, or other action as deemed appropriate by the course instructor.