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:
Professor Keith A. Cherkauer
Department of Agricultural and Biological Engineering (ABE), ABE 312
Phone: (765) 496-7982, Email: cherkaue@purdue.edu
Office Hours: Make appointments to schedule time

Lab/Teaching Assistant: Patrick Gies
Department of Agricultural and Biological Engineering (ABE), ABE 107A
Phone: (765) 494-1196, Email: pgies@purdue.edu
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:

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.

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

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<th>Date</th>
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| 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](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) |

3 8/22/05
Lab 5: Classification II: Evaluation of Signatures, Performance & Accuracy Assessment of Supervised Classification

Thursday, Sept 22
Exam #1

Tuesday, Sept 27
Lecture 10: Maps, Digital Cartography (Handouts)

**Literature Review Report Due**
Lab 6: Output: ArcGIS

Thursday, Sept 29

Tuesday, Oct 4
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
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

Tuesday, Oct 25

**Lab Team Project topics selected.**
Lab 8 due. Lab: Project Design Presentation

Thursday, Oct 27
Exam #2

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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.**

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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

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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.

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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*

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Tuesday, Nov 29
Lecture 24: Precision Agriculture (Handouts)

Thursday, Dec 1

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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.

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????? 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.