GEOG 372 – Summer 2012

Introduction to Remote Sensing

(3 Credits)

Instructor:
Office Hours: By Appointment

Lab Instructor & TA:
Office Hours: By Appointment

Goals of the Course:
This course is intended to provide an introduction to remote sensing of the environment, with particular attention to the role of electromagnetic energy and specifically focusing on systems that are used to monitor the earth’s land surfaces and oceans. It will introduce the basic principles of image interpretation, remote sensing, and digital data processing in relation to optical, thermal, and microwave (including imaging radar) remote sensing systems. Examples of remote sensing applications will be presented along with methods for obtaining quantitative information from remotely sensed images. The lab sessions will focus on introduction of techniques used in computer-aided analyses of remotely sensed data (e.g., digital image processing), with an emphasis on the study of spatial and environmental relationships.

Target Audience:
This course is intended for those who want to learn more about remote sensing either as a termination for a more general program or as a gateway to 400 level classes in Geography, especially GEOG472. Non-Geography students or undeclared majors are welcome.

Overlaps:
This course has no overlaps with others inside or outside the Department of Geography.

Prerequisites:
This course does not have any pre-requisites, but GEOG 306 is highly recommended.

Enrollment limit:
35 Students

Geography Major Program Information:
This course counts as a gateway course for Geography majors. See Geography advisers in LeFrak Rm. 2108 (Tel. 301-405-4073) for further information on course selection.

Course Structure:
Please expect to dedicate 10 hours per week to this class:
- 3-4 hours of lecture per week
- 3-4 hours of lab work per week
- 2-3 hours of reading, study, and twice-weekly course section evaluation/assignments
1. Readings
   a. From the textbook (see below), as well as additional assigned scientific papers
   b. To be completed before watching lecture

2. Course Modules
   a. Lectures
      i. The lectures in this course are prerecorded, and should be watched after completing readings, but before the bi-weekly course section evaluation deadline.
   b. Twice-weekly Evaluations
      i. After completing the lectures and the readings, these evaluations are designed to test your understanding of the material covered in that section’s readings & lecture.
      ii. They will be in the format of quizzes with any combination of multiple choice, fill-in-the-blank, matching, and/or short answer questions.
      iii. These are to be completed ALONE, although the use of course materials is allowed. However, they are time-limited and can only be attempted once, so you should have a clear understanding of the topics to be covered before you begin the evaluation.
      iv. Please see the schedule at the end of this document for more information on due dates.
      v. Check the ELMS classroom site to find lectures & associated course module evaluation assignments.

3. Labs
   a. The labs are intended to introduce you to a powerful and widely used image analysis software, ENVI, as well as to the methods remote sensors use for image preparation and analysis.
   b. There will be 1-2 labs per week.

Text Book:
Other required & recommended readings for this course will be available for download on the ELMS webpage.

Assessment & Grading:

<table>
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<tr>
<th>Component</th>
<th>Percentage of Grade</th>
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<tbody>
<tr>
<td>1 – 60 minute midterm exam</td>
<td>20%</td>
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<tr>
<td>9 course modules (equally weighted) – 2.5% each</td>
<td>22.5%</td>
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<tr>
<td>8 laboratory assignments (equally weighted) – 2.5% each</td>
<td>20%</td>
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<tr>
<td>1 – 90 minute comprehensive final exam</td>
<td>30%</td>
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<tr>
<td>Participation in discussion on online message board</td>
<td>7.5%</td>
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The midterm exam will cover roughly the first 2/3 of the lecture material. The comprehensive final will be cumulative with several questions drawing on the pre-midterm lecture material, as well as evaluating your understanding of the material presented post-midterm. The exams will cover material presented in the lecture as well as assigned readings.
The laboratory assignments will count for 20% of the student’s grade. Although the number of questions on each laboratory assignment may differ, each lab will be worth the same amount. The due dates of the labs are written on the top of each lab, so please read them carefully!

Final Exam:
The final exam will take place on
Currently, it is scheduled to be offered online; however it may be offered in class, depending on performance during the midterm.

Honor Code:
The University has a nationally recognized Honor Code, administered by the Student Honor Council. The Student Honor Council proposed and the University Senate approved an Honor Pledge. The University of Maryland Honor Pledge reads:

"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."

Unless you are specifically advised to the contrary, the Pledge statement should be handwritten and signed on the front cover of all papers, projects, or other academic assignments submitted for evaluation in this course. Students who fail to write and sign the Pledge will be asked to confer with the instructor.

Student Conduct
Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility with one another, the teaching assistants, or the instructor will be subject to being referred to the Office of Student Conduct or to Campus Police. You are expected to adhere to the Code of Student Conduct.

Medical Absences
Campus Senate policy requires students who are absent due to illness/injury to furnish documentary support to the instructor. For this course, I require students to contact me by email or by phone prior to class time in which you indicate that you have an illness or an injury, or as soon as possible if the treatment by medical personnel conflicts with this requirement. You must provide written documentation verifying your illness/injury immediately upon your return to class. You will not be allowed to turn in missed assignments or make up quizzes, tests, papers, etc. if you have not provided this documentation. Documentation not presented to me in a timely manner will not be accepted. In addition, if it is found that you have falsified the documentation provided, I will refer you to the University’s Student Conduct Office.

Disabilities
I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide me with a University of Maryland DSS Accommodation form which has been updated for the Summer 2012 semester. This form must be presented to me no later than 17 July 2011. I am not able to accommodate students who are not registered with DSS or who do not provide me with documentation which has been reviewed by DSS after 17 July 2012.

Religious Observance
By **17 July 2012**, students must provide me in writing a request for a make-up exam if I have indicated a date on this syllabus that you are unable to make due to a specific religious observance (specify) on a specific date. In addition, written requests must also be made for turning in a lab assignment late because of a specific religious observance. Please refer to the Online Undergraduate Catalog Policy on Religious Observance.

**Keys to Success:**
This course is challenging for many students because of the highly quantitative nature of the field of remote sensing and the use of computer-based software. In order to assist all students in Geography 372, I have identified several keys to success in this course:

1. *Carefully pay attention to all lectures – each is a critical component of this class.*

2. *Read the assigned text chapters/sections prior to watching the lecture, and have the book available to you to follow along with the lecture.*

3. *During lectures, focus on listening to the material being presented and synthesizing this information by taking notes that summarize the key points.*

4. *Before attempting the evaluation, review your class notes and assigned readings to be sure that you understand the key terms and concepts introduced in the lectures that week. It is strongly encouraged that you utilize the online discussion board to interact with fellow students as well as me (your lecturer) and the TA.*

5. *Ask questions. Utilize the discussion board, and schedule to meet with me during office hours. I am additionally available by email.*
# Lecture/Hourly Exam Schedule and Assigned Readings (Subject to Change)

- Chapter readings, unless otherwise noted, refer to Jensen textbook
- Please complete listed readings PRIOR to lecture

<table>
<thead>
<tr>
<th>Module</th>
<th>Module Topics</th>
<th>Module Evaluation Due Date</th>
<th>Lab Topic</th>
<th>Readings</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Remote Sensing; Principles of Electromagnetic Radiation</td>
<td>Lab 1: Data Sources</td>
<td>- Ch. 1, 3</td>
<td>- Nunnally (1973)</td>
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<tr>
<td>2</td>
<td>Energy/Matter Interaction – Atmosphere and Land Cover</td>
<td>Lab 2: Introduction to ENVI, Data Visual Analysis</td>
<td>- Ch. 2</td>
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<td>3</td>
<td>Aerial Photography, Photogrammetry, and Visual Image Interpretation</td>
<td>Lab 3: Data Visual Analysis and High Resolution Visual Analysis</td>
<td>- Ch. 4, 5, 6 (p. 149-162)</td>
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<tr>
<td>4</td>
<td>Multispectral RS Systems and Design</td>
<td>Lab 4: Geometric Registration and Mosaicking</td>
<td>- Ch. 7</td>
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<td>6</td>
<td>VIS/NIR Remote Sensing of Water, Soil, and Urban Areas</td>
<td>Lab 6: Extracting Soil, Water, and Impervious Signatures</td>
<td>- Ch. 13, 14</td>
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<td>7</td>
<td>MIDTERM EXAM - 31 July</td>
<td>No Lab</td>
<td>- Ch. 8</td>
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<tr>
<td>8</td>
<td>Thermal IR – Radiation Properties, Systems, and Applications</td>
<td>Lab 7: Analyzing Thermal IR Signatures</td>
<td>- Ch. 8</td>
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<td>9</td>
<td>Image Classification</td>
<td>Lab 8: Image Classification/Multi-temporal change detection</td>
<td>- Ch. 9, 10</td>
<td>- Ch. 15</td>
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<td>Microwave and LIDAR RS – Principles and Applications; Remote Sensing Applications</td>
<td>No Lab</td>
<td>- Ch. 15</td>
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<td></td>
<td>Catch up &amp; Review Session</td>
<td>No Lab</td>
<td>- Ch. 15</td>
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<tr>
<td>10</td>
<td>FINAL EXAM – 16 August</td>
<td>No Lab</td>
<td>- Ch. 15</td>
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