

Geography 588 - Intermediate Remote Sensing  
Spring 2009  
Lecture: Tu/Th 12:30 – 13:45; Lab: Tu 14:00 – 16:40  
Office hours: Wed 11:00 -12:00, Th 14:00-15:00 or by appt.

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## **COURSE SYLLABUS**

**Objectives:** To build upon the theory and practical skills developed in GEOG 587 by exploring:  
(1) computer-assisted image processing, (2) remote sensing systems that produce image data by capturing non-visible electromagnetic radiation, and (3) earth resource applications based on these sensing techniques and image data.

**Scope:** The techniques and processing sequences of digital image processing will be introduced through lectures, laboratory exercises, and a class project. Thermal infrared, passive microwave, and side-looking radar remote sensing systems will be covered, as well as methods for interpreting and applying the image data that these sensors produce. Students will be exposed to advanced geographic and resource management applications.

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|---------------------|--------------------|-----|
| <b>Grade Basis:</b> | Lab Exercises      | 22% |
|                     | Lab Project        | 9%  |
|                     | Lab Practical Exam | 9%  |
|                     | Two Midterm Exams  | 38% |
|                     | Final Exam         | 22% |

**Text:** Jensen, 2005, Introductory Digital Image Processing: A Remote Sensing Perspective (3rd edition)  
Jensen, 2007, Remote Sensing of the Environment: An Earth Resource Perspective (2nd edition)

### **Lecture Topics:**

- Course Introduction
- Introduction to Digital Image Processing and Computer-Assisted Image Interpretation
- Image Enhancement (brightness, color, and spatial)
- Image Restoration (radiometric and geometric)
- Spectral-Radiometric Feature Extraction
- Image Classification and Thematic Mapping
- Integration of R.S., I.P. and Geographic Information Systems
- Biophysical Processing and Analysis
- Temporal Analysis
- Properties of the Thermal Infrared and Microwave Portions of the EM Spectrum
- Thermal Infrared Systems
- Thermal Infrared Image Interpretation
- Passive Microwave Systems and Imaging
- Passive Microwave Image Interpretation
- Radar Systems and Imaging
- Radar Image Interpretation
- Urban Applications
- Renewable Resource Applications
- Urban Applications
- Geologic Applications
- Coastal and Marine Applications

**Exams and Grades:**

Two mid-term exams and half the final exam will be based only on the lecture and reading material covered since the last exam (or for the first mid-term, since the start of the course). A greater emphasis will be placed on materials covered in the lectures. The exam format will be variable, consisting of multiple choice, true/false, matching, and problem solving. The final exam will also contain a major essay question, for which students will be given the general question ahead of time and will have several weeks to prepare. It will involve an application scenario that will enable students to comprehensively tie together details learned in the course. A lab practical exam will be given just before the end of the course, during the lab period. The lab exam will mostly cover material learned in the labs, but could include hands-on image interpretation of concepts discussed in the lecture.

Missing exams will not be made up and count as zero points, unless the instructor is notified prior to the exam and the student receives prior approval to make up the exam. If a sudden illness or emergency occurs, students must make every attempt to call the instructor before the exam and verify the excuse by a note from a responsible person. Make-up exams are discouraged. Consecutive exams or vacation travel during final exams week is not a sufficient reason for arranging make-up exams. If a make-up exam is required, the student must take the exam after it is administered to the rest of the class. The make-up exam will generally be more extensive than the regular exam. Cheating on an exam constitutes a violation of university rules and students caught cheating will automatically receive a zero grade for the exam. Two incidences of cheating will result in expulsion from the class and possible university disciplinary action.

The final class grade will be based on the cumulative point total for all exams and lab exercises; there is just one grade for the four units. Final grade decisions will be based on a flexible curve, taking into consideration distributions from past Geography 588 classes. The instructor reserves the option to raise a grade by one half to a whole grade based on consistent improvement in exam performance.

**Lab Content:** Hands-on image processing experience will be gained with the aid of ERDAS Imagine image processing software. Lab exercises will be conducted in teams and a class project will be completed by each student. Manual interpretation exercises based on thermal infrared (TIR), passive microwave and radar imagery will be completed by small groups.

**Lab Exercises:**

- Introduction to ERDAS Imagine
- Spatial Enhancement
- Geometric Processing
- Feature Extraction & Supervised Classification
- Unsupervised Classification
- GIS Interface and Analyses
- Image Algebra
- Principles of TIR Sensing
- TIR Image Interpretation
- Passive Microwave Image Interpretation
- Radar Image Interpretation
- Class Projects
- Lab Exam
- Class Projects