

**Geosciences 444/544**  
**Remote Sensing of the Environment**  
**Fall 2007**

<b>Instructor</b>	Dr. Anne Nolin Wilkinson 120 nolina@science.oregonstate.edu (541) 737-8051
<b>Office Hours</b>	Tuesday 10:00AM-12:00PM or by appointment
<b>Class Schedule</b>	Lecture: MW, 10:00-10:50 AM, Wilkinson 108 Lab, Section 010: W 14:00PM - 15:50PM, Wilkinson 210 Lab, Section 011: Th 14:00PM - 15:50PM, Wilkinson 210
<b>Teaching Assistant</b>	Biniam Iyob, iyobbi@geo.oregonstate.edu, Office hours Thursday 7-:00 – 9:00PM, Wilkinson 210
<b>Course Description</b>	Fundamentals of satellite remote sensing and image analysis from the ultraviolet to the microwave. Topics include: physical principles, sensors and sensor technology, and environmental applications of remote sensing using image analysis.
<b>Prerequisites</b>	GEO 301 (Map and Image Analysis) is the prerequisite for this course. You will need to have basic skills in trigonometry and algebra. A basic understanding of physics is also helpful. Some lab assignments will require use of Excel spreadsheets.
<b>Course web site</b>	<a href="http://www.geo.oregonstate.edu/~nolina/GEO444_544">http:// www.geo.oregonstate.edu/~nolina/GEO444_544</a> , Blackboard
<b>Textbook</b>	Jensen, J. R., <i>Remote Sensing of the Environment, an Earth Resource Perspective, 2<sup>nd</sup> Ed.</i> , Prentice Hall, 2007

**Course Learning Objectives**

All students completing GEO 444 or GEO 544 should be able to:

- (1) Describe the basic physics and principles of remote sensing
- (2) Summarize the differences and basic workings of various sensors that are currently in orbit
- (3) Perform image analysis (using image processing software) and understand basic image analysis techniques for environmental applications of remote sensing
- (4) Assess the synergies and limitations of remote sensing for environmental analysis

Additionally, graduate students completing GEO 544 should be able to:

- (5) Formulate a research hypothesis related to remote sensing and image analysis
- (6) Design and perform an image analysis research project using satellite imagery
- (7) Analyze the imagery and draw a conclusion with respect to the hypothesis
- (8) Communicate the research in a professional and effective manner

## Grading

Undergraduates: labs 45%, quizzes 35%, final 20%  
Graduate students: labs 30%, quizzes 30%, term project 25% (Part I is graded as check, check minus, check plus; Part II, the completed project, is assigned a grade for the whole), final 15%. A weighting factor based on class attendance will be applied, if necessary, to determine the final grade.

It is Oregon State University policy that when a graduate course is dual-listed with an undergraduate course (e.g., GEO 444/544), students taking the graduate course should receive additional education and training and must be held to higher standards of performance than students taking the undergraduate course.

In order to comply with this policy, graduate students taking GEO 544 will complete the term project individually. In addition, when grading and assigning points to student work (lab assignments, quizzes and exams), the instructor will hold graduate students to higher standards of originality, accuracy, completeness, justification, and presentation than undergraduate students.

## Grading Scale

Grades are based on the percentage of maximum points accumulated and assigned according to the following table:

A 92-100%	B+ 88-89%	C+ 78-79%	D+ 68-69%	F <60%
A- 90-91%	B 82-87%	C 72-77%	D 62-67%	
	B- 80-81%	C- 70-71%	D- 60-61%	

## COURSE POLICIES

### Reading Assignments

Reading assignments are required for nearly all lectures. Students must complete these assignments before attending the corresponding lecture

### Lab Assignments

Lab assignments are due within 7 days, prior to your lab period. They are to be submitted electronically to the course folder. Efforts will be made to return them graded within one week after they are turned in. Late assignments will be penalized at the instructor's discretion

### Quizzes and Examinations

**Students are expected to take the weekly quizzes and the final exam on the scheduled dates (see schedule).** If a student is unable to attend a quiz due to verifiable unforeseeable reasons (e.g. illness, accident, etc.), the instructor will, at her discretion, decide whether to designate a make-up date for the quiz or to aggregate the weight of the missed quiz with that of the final exam.

### **Attendance**

Students are expected to attend all lectures and laboratory periods. It is expected that students will arrive on time. A weighting factor based on class attendance will be applied, if necessary, to determine the final grade.

### **Graduate Student Projects**

Graduate students have an additional requirement to complete a project on the subject of their choosing. The subject should relate to the use of remote sensing techniques to solve problems in their field of study. You should discuss your proposed project Dr. Nolin within the first two weeks of the course. The project will be graded in two parts. For the first part, you will need to provide me with a hardcopy of your 2-page write-up that includes your hypothesis or problem statement, a description of the study site, description of the remote sensing dataset(s), and an example of the data (showing me that you have downloaded the data and have worked with it). This is due on **Monday, October 15th** by 5PM. The final portion of the project will be a 2-page extended abstract and a conference-style poster. In this second part, you need to provide an overview of the project (problem statement, significance, specific objectives, methodology, data sources, study area), analysis of the results, a discussion of their meaning, careful and clear presentation of figures, and a discussion of sources of error. A conference style presentation of the graduate student projects will take place on **Wednesday, November 28th** and the extended abstracts are also due on that day.

### **Take-home Final**

All students will be involved in a round-robin critique of the graduate students posters, which will be presented on **Wednesday, November 28<sup>th</sup>**. The take-home final is **due on December 6<sup>th</sup> by 4:00 PM**. Each student will be assigned one poster to review and critique. The reviews need to involve a careful reading of the poster content and the extended abstracts as well as a discussion of the project with the graduate student presenter. **You are required to describe and critique the graduate student project in such a way that it is clear that you have met learning objectives 1-4.** A template for the critiques will be provided to you on the day of the poster presentations.

### **Special notes**

If you have a conflict between religious observances and class lectures or labs please let me know in advance so these can be made up.

Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should be aware of, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, and no later than the first week of the term. Class materials will be made available in accessible format upon request.

Please review the OSU policies on classroom conduct and academic honesty at <http://oregonstate.edu/admin/stucon/achon.htm>.

**Course Schedule (Subject to Change)**

WEEK	DAY	TOPIC	READING	LAB
1	9/24 9/26	Introduction Electromagnetic radiation: physical principles	Ch. 1 Ch. 2	1 and Pre-test
2	10/1 10/3	Interaction of EMR with the atmosphere Interaction of EMR with the surface; Principles of detection <b>Quiz #1</b>	Ch 2 Ch. 4 & 5	2
3	10/8 10/10	Resolution: spatial, spectral, temporal, radiometric Resolution, continued <b>Quiz #2</b>		3
4	10/15 10/17	Multispectral and hyperspectral remote sensing; <b>Part I. of graduate student project is due on 10/15</b> Multiangular and thermal remote sensing <b>Quiz #3</b>	Ch. 7  Ch. 8	4
5	10/22 10/24	Active microwave remote sensing and Interferometry (InSAR) <b>Quiz #4</b>	Ch. 9	5
6	10/29 10/31	Lidar and Passive microwave remote sensing <b>Quiz #5</b>	Ch. 9	6
7	11/6 11/7	Applications: Vegetation Applications: Land cover/land use change <b>Quiz #6</b>	Ch. 10 Ch. 12	7
8	11/12 11/14	Applications: Soils and geomorphology Applications: Mineralogy and other geologic applications <b>Quiz #7</b>	Ch. 13	8
9	11/19 11/21	Applications: Acoustic remote sensing and Water <b>Quiz #8</b>	Ch. 11	No lab
10	11/26 11/28	Applications: Urban remote sensing and societal applications <b>Graduate student posters presentations and extended abstracts are due</b>	Ch. 12	Post- test
<b>Final Exam</b>	<b>12/6</b>	<b>Take-home final exam is due no later than 4:00 PM (e-submission)</b>		