

GEO 425 / EVS 525

Introduction to Geographic Information Systems & Remote Sensing

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PURPOSE: The purpose of this course is to introduce students to Remote Sensing and Geographic Information Systems (GIS), which have become perhaps the most important new tools for dealing with spatially distributed data in a broad range of fields. We shall concentrate, in this course, on the applications of GIS in research in geography, geology, environmental science, and natural resources. Because the overwhelming majority of these applications use data derived from remotely sensed imagery, the majority of our data sources will be from remote sensing.

The course includes both a lecture and a laboratory. The lecture portion of the course will present the theoretical aspects of GIS. The laboratory will provide hands-on experience with the industry standard raster-based GIS package, ERDAS Imagine. The goal of the lecture portion of the course is to provide a broad introduction of Remote Sensing and GIS as fields; it will deal with both raster-logic and vector-logic GIS systems and the relationship between remotely sensed imagery and the data most commonly used in geographic information systems. The laboratory portion is designed both to enable the student both to perform some meaningful analyses of data and to provide a foundation for the student to learn other GIS software packages that he or she may encounter in the future. It will concentrate on raster-logic GIS and its applications to remote sensing, although it will touch on vector-logic GIS as well.

MATERIALS: The course has one textbook: *Introduction to Remote Sensing (5th edition)*, by James B. Campbell. This book is available both at the University Bookstore and from sources such as Amazon.com. Sharing is encouraged! This will also be the textbook for the forthcoming GEO/EVS 427/527, advanced Topics in Remote Sensing and Geographic Information Systems, which is scheduled to be offered in the Spring. Any investment you make in the textbook will serve you for both courses.

The laboratory for the course will take place in the Environmental Remote Sensing Laboratory of the Department of Biological, Geological, and Environmental Sciences (SR G-71). All files which you will need are either on the department's computer network or can be obtained from the WorldWide Web.

GRADING: Grades will be based on three separate parts: Your portfolio of materials produced for individual laboratories will be 40% of your grade. The final examination will be 35% of your grade. Sharing ideas on the on-line course discussion group and in recitations will be 25% of your grade.

Laboratories are important. GIS is very much a hands-on activity, and you need to *do* it in order to learn it. It is for this reason that laboratory work will account for 65% of your grade (i.e. the portfolio and the discussions that stem from your work in the laboratory). You should take this portion of the course quite seriously. You will receive two grades for each laboratory unit: one on the portion of the laboratory going into your portfolio and one on your discussion, both on the on-line discussion group and in the recitation itself. Note that you will benefit from completing the exercises prior to the recitation, so that you can bring hard copy of your results to class, and you will also benefit from contributing new observations and ideas to the on-line discussion group, so that your colleagues can consider your thoughts prior to the recitation.

We will have only one (final) examination in this course. It will be a practical exercise that will deal both with those aspects of GIS that are introduced in the course that have not been covered in the practical laboratory work and with those issues that have been considered in laboratories in detail. Its purpose is to integrate the laboratory and the lecture materials. You will have one week to complete this examination.

LABORATORY UNITS: Laboratories in this course will all work in the same general fashion. You'll receive a handout in the recitation on Tuesday afternoon. This handout will include detailed instructions

for the following week's work in the laboratory, as well as a specification for materials to be included in your portfolio. You can do the laboratory work anytime you choose. All work will be done in the BGES Remote Sensing Laboratory, Science Research G-71.

One of the things included in the instructions for the some of the laboratories may be an explanation of the icons or menu selections that you will be dealing with as you carry out the laboratory exercise. You may wish to collect these as references for your use throughout the semester. You should also note that many of the icons represent actions that can also be accomplished using the mouse or keystrokes on the keyboard. I will try to indicate as many of these as possible, but you should learn to keep it in mind that there are often several ways to "skin the cat".

It is to be anticipated that these exercises will raise questions. Indeed it is to be *hoped* that they will raise questions in your minds that will lead you to experiment. In either case, you should communicate your questions, observations, plans, etc. to the class as a whole. You'll do this using the class discussion group on Blackboard. To access Blackboard, you can use Netscape or Internet Explorer to go to the course discussion group home page (www.bges.csuohio.edu/dg.htm), and click on the link to Blackboard. Note that this discussion group for both undergraduate and graduate sections of the course is listed under the graduate section, EVS 525.

The format of all of the units in this course is the same. The first part of the unit will contain the detailed instructions for the exercises within the unit. The second part will be a series of questions, which you are to answer on the discussion group prior to the recitation. The questions and observations which you raise and share with your colleagues in the class will serve as the springboard for our discussions in the recitation. Your contributions to the recitations -- both using the discussion group and in your inner-class comments -- will constitute a significant portion of your grade. The third part of each unit will be a specific assignment for your portfolio. At the beginning of the semester, as you are still learning how to use Imagine, these portfolio assignments will be fairly cut and dried. Toward the end of the semester, they will be considerably less so. You should bring the portfolio assignments to the recitation. Again, your having completed them by the time of the recitation will show up in your grade. Your completed portfolio, which will be turned in at the end of the semester, will constitute a significant portion of your grade.

All of the images that you create in this course will be stored on your X: drive. To ensure that nobody's activities screw up other students in the class, you will not be able to store images on any of the other drives used by Imagine.

MEETING SCHEDULE: The course will have two meetings each week. In general, you will be given new handouts at our Tuesday meeting, and formal lectures will also be made on Tuesdays. Following the lecture, I will provide an orientation to the week's laboratory materials, and you will have an opportunity to work on laboratory materials with my active involvement. Thursday's meetings will be more informal, generally providing an opportunity to work on lab exercises. They will often be interrupted with explanations of issues raised by students as they work on laboratory exercises.

MEETING PLACE: You will attend lectures and carry out the laboratory exercises at any time appropriate to your schedules, in the Environmental Remote Sensing Laboratory, room G-71 of the Science Research Building. The laboratory is available to students all day Monday through Friday while the department is open. Students will also be able to get key cards to get entry into the Environmental Remote Sensing laboratory at other times if you do not have them from having taken GCT.

SCHEDULE: The schedule below is subject to change.

GRADUATE STUDENTS: Students registered in EVS 525 will be required, in addition to the portfolio and the final examination, to prepare a project design for an application of Geographic Information Systems or remote sensing that would be applicable to a research project in their field. Where possible, this should be an application relevant to their thesis or dissertation.

Schedule for Laboratory Exercises

Week	Monday	Laboratory Exercise
1	30 August	1. The ERDAS Imagine Viewer and File Types
2	6 September	2. The ERDAS Imagine Viewer: Query and Editing
3	13 September	3. The ERDAS Imagine Map Composer
4	20 September	4. Operations on Raster Images
5	27 September	5. Overview of Vector Images
6	4 October	6. DEMs, DLGs, and Map Reference Systems
7	11 October	Lab in use for national meeting; catch up portfolio
8	18 October	7. More on Vector Images
9	25 October	8. Using the Spatial Modeler
10	1 November	9. Satellite Image Rectification
11	8 November	10. Supervised Classification
12	15 November	11. Unsupervised Classification
13	22 November	12. Thanksgiving week: Classification Error Analysis
14	29 November	13. Band Ratios
15	6 December	14. Finding Remote Sensing Imagery
Exam	13 December	
<p>The final exam will be available at the time of the last class. Your examination and portfolio (and project design for graduate students) must be completed and turned in by 5:00 on <i>Tuesday</i> of Examination Week.</p>		