

# Laboratory Syllabus

## FR 3262 / 5262 – Remote Sensing of Natural Resources and Environment

### Course Objectives:

Remote Sensing is a discipline that includes a wide range of technologies. In this course you will learn about: major sensor and image formats; basic principles of physics important in remote sensing; approaches to image interpretation; introductory methods of photogrammetry; introductory image analysis; and the design and implementation of a remote sensing based group project.

By the time you complete the course you will have a good overview of the application of remote sensing to practical problems. This course will not make you an expert in all aspects of remote sensing, but it will provide you with a basic understanding of how these technologies fit into the overall scheme of resource management, planning, evaluation and monitoring.

**Lab Location and Time:** Most labs will be held in room 203 Green Hall. Several sessions will be held in Green Hall 210-A as specified in the schedule.

Section 1 8:30 - 10:25 Tuesday

Section 2 10:40 - 12:35 Tuesday

### Teaching Assistant:

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Office Hours: by appointment

### Items Required:

- Lab manual and photo set
- Ultra fine point, permanent ink Sharpie or Pilot pens (red, blue, green and black)
- Pencil
- Calculator
- Ruler (marked in millimeters)
- Scissors (Lab 3 only)

**Optional Items:** Magnifying lens

## Workload:

The lab is an essential part of the course and constitutes 40% of the total course grade; therefore, **you must pass the lab to pass this course**. There is nothing inherently difficult about the material, but it does require some time and effort to master it. Typically grades reflect the time spent on the course. 40% of your lab grade is based on your own individual work (quizzes) and 60% is based on the group project. Everyone in the group receives the same grade for the group project.

Since labs are a hands-on experience, attendance is critical. If you must miss a lab please see your TA about attending another section. Whenever possible please make such arrangements a week in advance so we can shift necessary lab supplies to the appropriate section.

You should expect to spend the full two hours in lab each week. In addition you should expect to spend approximately 40 hours of outside time during the semester on lab related work. The majority of this outside time (30 hours) will likely relate to work on the group project. Perhaps an hour or two a week should be reserved for reading of labs and review for quizzes. These times are provided as guidelines for your own planning and will vary for each individual student.

## Grades and Grading:

Final course grades are computed **in conjunction** with the lecture exams on a class-wide basis; the lab is 40% of the total course grade. There is no distinction made between lab sections. If you have questions regarding final course grading please refer to the lecture syllabus or talk with Professor Bauer.

**You are not to provide information regarding lab quizzes to people in sections of lab following your own! The penalties for cheating are severe.**

Due to the overlapping nature of material covered in lecture and lab, you should expect to see some of these concepts covered in both places and appear on the midterm and final exams as well as on lab quizzes.

A total of 100 points are available to you in the lab as follows:

Quizzes:	Best ten quizzes @ 4 points each	40
Project:	Proposal / Time Line	10
	Draft Project Report	10
	Oral Presentation	10
	Final Project Report	20
	Project Journal	10
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### **Lab Format:**

Lab periods will begin with a short quiz (approximately 10 minutes). **BE ON TIME!!** All quizzes will be collected together; if you are late you will have less time to complete your quiz. **Missed quizzes WILL NOT be available for makeup without a valid WRITTEN excuse**, i.e., a note from a professor, doctor, coach or employer. (Parking difficulties, cold weather, oversleeping, etc. are NOT valid excuses). Material covered in the course is largely cumulative so quizzes will typically include information from previous labs. It is to your advantage to take all twelve quizzes; your two lowest scores will be dropped.

Following the quiz we will discuss the topic of the day, including new procedures and techniques. It is recommended that you review each week's material before coming to lab so you have an understanding of the objectives and approach. Students will then be free to work on the practice problems included in the lab manual. Answers to practice problems will be posted in the lab.

You are allowed and strongly encouraged to work in lab in teams of two. These teams will be maintained through the entire semester. Teams should work together to complete the weekly lab exercises. You are encouraged to discuss the lab exercises with your partner and others in the class to ensure complete understanding of the exercises. By the end of the each lab period you should feel comfortable that you understand the material and can individually perform the procedures covered. The lab instructor will be available throughout the period to assist with questions.

### **Lab Project:**

Teams of three people will plan and complete a lab project. Projects may focus on any natural resource issue so long as it requires the use of aerial photography in its completion. You are encouraged to propose a topic related to your present activities or interests.

The lab project has two main purposes. The first purpose is to provide an opportunity for you to apply the skills learned in the labs, including photo interpretation and basic measurements such as scale, distances, areas, heights and/or computer analysis. The second purpose of the lab project is to give you experience in designing and carrying out a project from the initial idea phase to presentation of the results. The lab project includes a proposal, draft and final written reports, project journal entry, and an oral presentation.

In most cases you will find that aerial photography or digital imagery for Minnesota is more easily obtained than for other areas of the country. Some good places to begin a search for aerial photography include the Borchert Map Library or government offices (City, County, State or Federal). On campus the John R. Borchert Map Library (West Bank, basement of Wilson Library) has an extensive collection of aerial photographs for

all Minnesota counties dating from 1936-present. The Borchert library also has maps for the entire United States and many other parts of the world. For information call (612) 624-4549 or check their website at: <http://map.lib.umn.edu/>.

Tool kits will be available in the Forestry Library for you to check out for two hours at a time so that you may make measurements on your photos. Please remember not to mark on Library photos.

Groups are strongly encouraged to make an appointment to discuss their project with the lab instructor to ensure their project is appropriate given the objectives and limitations of a sixteen week course.

### **Project Proposal:**

Each group should have a topic and approach for their project formulated as soon as possible. A formal, written project proposal is due at the end of the sixth week. If you would like to discuss your ideas and approach please schedule an appointment. A project which uses aerial photography but which could be done as well without it is not a good choice. Do not hesitate to consult with Professor Bauer or your TA if you have problems choosing a project topic.

The format for the proposal (2-3 pages suggested) is as follows:

- I. **Cover Page:** including title, section and names of all group members.
- II. **Project Description / Objectives:** What is the purpose or need for your project? (real or hypothetical) What are you doing, and why?
- III. **Data Sources:** Make sure you can get the necessary maps, photos, etc., or better yet, have them in hand already.
- IV. **Timeline:** including explicit responsibilities of each group member
- V. **Anticipated Products/Outcomes:** What will your results? Maps, graphs, tables, recommendations, etc.

### **Project Report:** (format for the draft and final reports)

The body of the final report should be 7 to 10 pages typed, and submitted as a team effort. [A *page* is double spaced, 12 point type, (Times Roman or similar) with one-inch margins on all sides]. The final report should include all of the sections listed below.

It is in your group's best interest to make the draft report as complete as you can. You will receive more feedback from your TA and then your final report will be better. You will also benefit by not leaving your project until the last minute. As a minimum, the draft report should include: I. Cover page, II. Objectives, III. Materials, tools and concepts, IV. Procedures, and V. Anticipated Results.

You should also turn in your draft report with the final report (even if you have marked these up). The draft reports will be used to evaluate how you addressed the comments made on them. If you don't turn in your draft report, 2 points will be deducted from your final report.

**I. Cover page:** Include project title, names of group members, and section number.

**II. Objectives:** Describe your project and the area where you are doing your project. Describe the location and the approximate size of the area you are studying. Describe project objectives. What final product did you expect to obtain? Why is your project important, i.e., why would someone want to do this type of project using remote sensing?

**III. Materials, tools, concepts:** What materials and techniques were used to accomplish the project? Include:

- List of maps used and description of each map (type, scale. If it is a USGS topo map, name the quad sheet)
- List of aerial photographs or other imagery, their location, whether they are BW or color IR, their nominal scale, dates, the agency that acquired the photos (e.g. DNR)
- Where you obtained the aerial photos (e.g., DNR, Borchert Map Library)
- List of any other data you are using (e.g., reports, articles, etc.).

Note: It may be best to put this list of materials in an Appendix but make certain you reference the Appendix in the body of your report)

**IV. Procedures:** Steps followed to produce the final product or result. This section should be detailed enough that someone else could follow your procedures and do the same project. This is also where you show your knowledge of the procedures you learned in lab. For example, your procedures may look something like this (you may also choose a different format such as a flowchart, written description, outline):

1. Define effective areas of photos.
2. Interpretation and delineation of different land uses. Use of XYZ classification scheme to identify all land use areas.
3. Measure scale on all photos (and within photos if in hilly terrain).
4. Measure areas of land uses for all years.

You will also need to provide more detail in your text describing how you did each of these steps. Show the equations used and sample calculations (Again, it may be best to put this in an Appendix but reference the Appendix in the main body of your report).

**V. Results:** What were your findings from the data generated? Your results may be something that would be used for further study or analysis. Were you able to accomplish your objectives?

For the **draft report**, although you may not have all your results yet, describe what you will show for results (for example, land use areas in different years, % of total area in different land uses). Also indicate how you will present these results (tables, graphs, figures, etc).

**VI. Discussion:** What problems were encountered? How did you deal with them? How would you advise someone who was now going to do the same or similar project? Would the cost of data specific to your project needs be justified or was the available data adequate?

**VII. References:** Include references to books, journals, photos and maps.

**VIII. Appendices:** Any relevant attachments, including graphs, tables, maps.

### **Project Journal:**

The purpose of the project journal is to give the student an opportunity to reflect on the project process. This should be a personal account of what was gained from this experience, not a summary of the final project report. Some of the things that should be included are:

1. Reasons why you chose the topic for your project.
2. How you incorporated what you learned in the lab, lecture, textbook or other resources into this project.
3. What obstacles you encountered and what you did to overcome them.
4. The successes and difficulties of the group process.
5. An evaluation of yourself and your group members on their contribution to the group project.

The journal entry should be of sufficient length to complete your discussion of the topics of the project that you wish to comment on. As a guideline 2-3 typed (double-spaced, 12 pt font) pages is reasonable, we are concerned with quality rather than quantity. Although good writing is desirable, focus your efforts on your reflection on the material. Write the journal for yourself rather than to me as the instructor. The journal is intended as a tool to help *you* think about the project process. Each person is required to complete this exercise individually.

### **Oral presentation:**

All team members are expected to present a portion of the oral presentation. Time will be strictly kept, so plan accordingly. Teams will have 15 minutes to present followed by 5 minutes of questions and answers. You should organize your presentation in the way that best conveys your message. This may include media such as overheads, computer

slides, posters, etc. Presentations should be given in a professional manner (PowerPoint slides are highly recommended). If you require any special equipment for your presentation please make necessary arrangements with the instructor at least a week in advance. Grading of the oral presentation is by a panel of graders, typically composed of graduate students or faculty.

The group presentation should explain clearly and concisely what you did for your group project, why this application was needed, and how you did it, what the results were, and any conclusions you reached, including how you might be able to improve the project if you were to do it again and had more resources/time. While it may be a summary of your final report, don't simply read the report to the class.

The presentation will be graded on the following areas:

1. **Group participation** (2 pts)  
Did everyone in your group participate, about equally, in the presentation?
2. **Presentation** (2 pts)  
Could everyone in the room hear you? Did you have eye contact? Did you avoid vocal pauses (ums, ands, you knows, etc)? Did you speak clearly and not rush through your talk?
3. **Interest** (2 pts)  
Did you convey interest about your project in the presentation? Did the introduction or opening to the presentation make us want to hear more?
4. **Content and Clarity** (2 pts)  
Did you clearly explain your project, your methods, and results so we could understand what you did?
5. **Visual Aids** (2 pts)  
Were overheads, slides, other visual aids used effectively to explain your project and present your results?