Course Description: This course is designed to provide students with a working knowledge of the principles and applications of remote sensing. It provides a survey of the concepts and techniques of remote sensing and image analysis for mapping and monitoring natural resources, environment and land use. Both photographic and digital sensing approaches are considered. The laboratory provides hands-on experience, including a practical / team project, in interpretation of aerial photographs and analysis of digital images. 3 credits.

Lecture: 08:45 - 10:00 am T,TH, 203 Green Hall, Saint Paul

Lab: 08:30 - 10:25 am Monday, 35 Skok Hall, Saint Paul

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Course Goals: Understand...
- Concepts and principles of remote sensing
- Advantages and limitations of remote sensing
- Methods and techniques of remote sensing
- Applications of remote sensing to resource inventory, monitoring and analysis
- Potential of contemporary image processing and analysis systems
- Remote sensing data, analysis approaches, and their relationship to applications
- Interface between remote sensing and other geospatial technologies
- How to plan and implement a remote sensing project
- Prospects for future sensing systems and applications
Grades and Workload

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A -- achievement that is outstanding relative to the level necessary to meet course requirements.
B -- achievement that is significantly above the level necessary to meet course requirements.
C -- achievement that meets the course requirements in every respect.
D -- achievement that is worthy of credit even though it fails to meet fully the course requirements.
S -- achievement that is satisfactory, which is equivalent to a C- or better.
F (or N) -- Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an Incomplete.
I -- (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student.

It is expected that in addition to the three hours in lecture and two hours of lab, students will need to spend an additional three to four hours a week on outside study and project work, or a total of eight to nine hours per week, to achieve an average or satisfactory grade in the course. While grades tend to be correlated with amount of time devoted to study and work, they are based on the quality of the work, not the hours of effort.

Copies of lecture slides, with diagrams and figures, will be after each class on our Moodle site. The slides are provided to assist you in studying for the exams; they are not a substitute for attending lectures.

Class Project Overview

Student teams will plan and complete a course project. For FNRM 3262 students, several pre-organized projects will be available that provide pre-defined objectives (and for some, data). You will be responsible for planning an approach and accomplishing the objectives. FNRM 5262 students will be required to choose their own project topic and find their own data. Projects may focus on any natural resource issue so long as it requires the use of digital images or aerial photography in its completion. You are encouraged to propose a topic related to your present activities or interests.

The project has two main purposes. The first purpose is to provide an opportunity for you to apply the skills learned in the course. The second purpose is to give you experience in designing and carrying out a project from the initial idea phase to presentation of the results. The project includes a proposal, final written report, and a poster presentation.
Your project must include some usage of remotely sensed imagery or derivatives, either from a satellite, aerial, or ground platform. The imagery can be of any type, including optical, lidar, radar, or thermal. A project which uses aerial photographs or images, but which could be done as well without it is not a good choice. There are many free sources of imagery, which we will discuss in class. Please consult your instructor for other questions.

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

**Project Proposal**

Each group should have a topic and approach for their project chosen as soon as possible. A formal, written project proposal is due as indicated on the course schedule below. Before submitting your proposal you must discuss your project ideas with the instructor. Do not hesitate to consult with your instructor if you have problems choosing a project topic.

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

1. **Cover Page:** including title and names of all group members.
2. **Project Description / Objectives:** What is the purpose or need for your project? (real or hypothetical) What are you doing, and why?
3. **Data Sources and Methods:** Make sure you can get the necessary imagery, or better yet, have them in hand already. Describe what methods you plan to use to carry out your project.
4. **Timeline:** including explicit responsibilities of each group member
5. **Anticipated Products/Outcomes:** What will be your results? Maps, graphs, tables, recommendations, etc.

**Project Report**

The project report will be in a non-traditional format that is subject to your approval. Rather than having you write a standard report that nobody will ever see, you will be asked to provide your report as a part of the Remote Sensing Core Curriculum (http://r-s-c-c.org). The RSCC is one of the main repositories of remote sensing knowledge. A new section featuring student projects has been added, which is where your project reports will be placed. You can opt out of having your report on the web if you like, or have it posted anonymously, but we ask that you consider submitting to the RSCC to provide a service to the community. We will discuss this in much more detail in class.

The format for the project report (10-12 pages suggested) is as follows:

1. **Cover Page:** including title and names of all group members.
2. **Introduction / Objectives:** What is the justification for your project? Why is it important? What were your specific objectives?
3. **Data Sources and Methods:** Fully describe all of the data sources and methods you used
4. **Results:** What were your results? This is where you put most of your maps, graphs, tables, etc. High quality visual aids will increase your grade.
5. **Discussion:** What do your results mean? How could they be used in research, policy, or resource management? What recommendations would you have for a user of your results, including caveats?

6. **Division of Work:** Specify each of the project tasks performed (including report and presentation creation) and which group member did each task.

Your report should have one inch margins and spacing no greater than double.

A draft project report will be due a few weeks before the final report. It will have the same structure and headings as the final report, but you need not have all of your work completed for this draft. The goal of the draft is to allow your instructor to assess your progress and provide feedback for the final report. The more of the project work you have completed for this draft, the better the feedback can be for you to improve the final report.

**Project Poster Presentation**

All team members are expected to be present for the poster presentation and be able to fully explain the project. The poster 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. Grading of the poster presentations will be by a panel of graders, including your classmates. Full poster preparation and grading guidelines will be provided separately.

**Classroom Conduct**

All students at the University have the right to a civil, productive, and stimulating learning environment. In turn, instructors have a responsibility to nurture and maintain such an environment. Students who disrupt the educational process because of discourteous, threatening, harassing, or other aggressive behavior will be removed from class.

- Please arrive on time and stay the entire class period. If you must arrive late or leave early, please sit near the door and try to enter or exit quietly.
- Turn off or silence your electronic devices (e.g. cellphones, laptops) before class begins.
- If you use a computer during class, please refrain from using it for non-course-related activities, as this may distract other students.
- Avoid eating meals during class (drinks or light snacks are ok).

**Absences and Late Policy**

You are expected to be present for all class meetings. You are responsible for documenting the legitimacy of any absences. Legitimate absences include:

- illnesses certified by Boynton Health Service or your family physician
- emergencies caused by a death or serious illness in your immediate family
- participation in intercollegiate athletic events or other official University activities
- subpoenas, jury duty, military service, and religious observances

If you know that you will need to be absent on a particular day, let the instructor know beforehand. To retake an exam or submit a late assignment without penalty, you must provide documentation of your absence. Otherwise late assignments will be subject to a 25% penalty provided they are submitted within one week of the scheduled due date; late assignments will not
be accepted after one week except in the case of a documented legitimate absence. There will be no makeup exams given without documentation.

**Student Academic Integrity and Scholastic Dishonesty**
You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: [http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html](http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html)). If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: [http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html](http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html).

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: [http://www1.umn.edu/oscai/integrity/student/index.html](http://www1.umn.edu/oscai/integrity/student/index.html). If you have further questions, please see the instructor.

**Accommodations for Students with Disabilities**
The University is committed to providing quality education to all students regardless of ability. Determining appropriate disability accommodations is a collaborative process. You as a student must register with Disability Services and provide documentation of your disability. The course instructor must provide information regarding a course's content, methods, and essential components. The combination of this information will be used by Disability Services to determine appropriate accommodations for a particular student in a particular course. For more information, please reference Disability Services: [http://ds.umn.edu/student-services.html](http://ds.umn.edu/student-services.html).

**Student Mental Health and Stress Management**
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: [http://www.mentalhealth.umn.edu](http://www.mentalhealth.umn.edu).

**Sexual Harassment**
Sexual harassment means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:
Equity, Diversity, Equal Opportunity, and Affirmative Action
The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://www1.umn.edu/regents/policies/administrative/Equity_Diversity_EO_AA.html