FNRM 3262/5262: Remote sensing and geospatial analysis

Chad Babcock

Syllabus, Spring 2020, 3 credits

Instructor: Dr. Chad Babcock
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Office Hours: by appointment
Office: 220D Green Hall

Class Hours: MW 8:45-10:00am
Class Room: 203 Green Hall
Lab Hours: Th 3:00-4:55pm
Lab Room: 35 Skok Hall

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. The laboratory provides hands-on experience, including a practical/team project, in interpretation of aerial photographs and analysis of digital images.

Required Materials

No textbook is required, but many students may find Introduction to Remote Sensing by Campbell and Wynne a useful resource.


Learning Objectives: 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

<table>
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<tr>
<th>item</th>
<th>number</th>
<th>points each</th>
<th>total points</th>
<th>% of course</th>
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<tbody>
<tr>
<td>Exams</td>
<td>6</td>
<td>*</td>
<td>600</td>
<td>40</td>
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<tr>
<td>Lecture exercises</td>
<td>15†</td>
<td>10</td>
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<td>Lab exercises</td>
<td>11</td>
<td>30</td>
<td>320</td>
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<td>Class Project:</td>
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<td>65</td>
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* Points for exams will vary, but the total points will be scaled to 40% of the course.
† This is the maximum number of lecture exercises to expect. The total points will be scaled to 10% of the course.

Letter grade descriptions

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 but fails to fully meet the course requirements.

S — achievement that is satisfactory, which is equivalent to a C- or better.

F (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.

Student expectations

It is expected that in addition to the three hours in lecture and two hours of lab, students will need to spend an additional four hours a week on outside study and project work, or a total of 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.

Workload expectations for undergraduate and graduate students differ. Undergraduates will be allowed to choose from a set of prepared projects with provided data. Graduate students will be required to develop their own project idea, ideally from their graduate research, as well as gather their own data. In addition, quality standards for graduate student projects will be higher.

Copies of lecture slides, with diagrams and figures, will be available after each class on our Canvas 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 groups 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.

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 that uses aerial photographs or images, but which could be done as well without, 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 must discuss their project with the instructor to ensure their project is appropriate given the objectives and limitations of a one-semester 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:

- **Cover Page**: Needs to include the title and names of all group members.
- **Project Description/Objectives**: What is the purpose or need for your project? (real or hypothetical) What are you doing, and why?
- **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.
- **Project Timeline**: Needs to explicitly state the responsibilities of each group member.
- **Anticipated Products/Outcomes**: What will be your results? Maps, graphs, tables, recommendations, etc.

Project Story Map

Rather than having you write a standard report that nobody will ever see, you will be asked to create a Story Map. This is a technology by the company ESRI, Inc (the makers of ArcGIS) that provides for web-based display of geospatial data. More information on the structure and process for creating your Story Map will be provided during the course.

A draft Story Map will be due a few weeks before the final version. It will have the same structure as the final Story Map, 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 Story Map. The more of the project work you have completed for this draft, the better the feedback can be for you to improve the final version.
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: https://policy.umn.edu/node/7178). 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: https://policy.umn.edu/education/instructorresp

The Office for Community Standards provides guidance on avoiding academic dishonesty here: https://communitystandards.umn.edu/avoid-violations/avoiding-scholastic-dishonesty

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 the Disability Resource Center: https://disability.umn.edu/.

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://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:https://policy.umn.edu/hr/sexharassassault.

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: https://eoaa.umn.edu/policies