**Course Description**

Digital Remote Sensing is designed to provide students with a fundamental and working knowledge of biophysical – quantitative remote sensing. Both the theoretical basis and practical aspects of this approach to remote sensing are addressed, including sections on energy-matter interactions, radiation measurements and sensors, and digital image processing and analysis. Lectures and reading assignments will be supplemented by problems and exercises providing hands-on experience in working with remote sensing data and digital image processing, as well as in-class discussion.

**Credits:** 3

**Grading:**
- Exams (3) 50%
- Problems and Projects 50%

Likely grades: A = 90 - 99%, B = 80 - 89%, C = 70 - 79%  
- the plus/minus system of grading will be used


**Supplemental Texts:**

**Reference Materials:**
Supplemental texts and other reference materials are on reserve in the Natural Resources Library, 390A Hodson Hall

**Prerequisite:**
FR 3262 or 5262, Remote Sensing of Natural Resources and Environment, or consent of instructor

**Location/Time:** 203 Green Hall, 8:30 - 9:20, Monday, Wednesday, Friday

**Laboratory:** There is not a scheduled laboratory. Computers and software for problems and projects are available in 210A Green Hall.

**Instructor:**
Marvin Bauer  
220B Green Hall  
*Phone:* 624-3703  
*E-mail:* mbauer@umn.edu

**Office Hours:** 10:30 - 11:30 Wednesday or by appointment. Or, come by and see if I am available; often I will be. I will welcome questions and interacting with you.
**Course Goals**

*Understand...*
- the concepts and principles of biophysical – quantitative remote sensing
- the advantages and limitations of digital remote sensing
- the terminology, theory, methods and techniques of digital remote sensing
- how digital remote sensing can contribute to resource inventory, monitoring and analysis
- the potential of contemporary image processing and analysis systems
- the choices of digital remote sensing data and their relationship to applications
- the interface between remote sensing and other geospatial technologies
- how to plan and implement a digital image processing and classification project

**Course Format**

The format of the class will be a combination of lecture, discussion and work on problems and projects. I encourage you to ask questions in class; questions are an important part of learning. Some I will answer immediately; others, I may pass on to the class for discussion.

There will be several problems and projects to that will amplify and illustrate what we cover in lecture. These include:

1. Image processing and classification project. This will be a team approach with teams of two and is 40% of the grade.

2. Preparation and presentation (mini-lecture) of a report on a selected aspect of remote sensing that we have not explicitly covered in class. This is 10%.
Reference Materials – Available in the Natural Resources Library (390A Hodson Hall)

Texts and Other Books (on Reserve)
- Introductory Digital Image Processing (Jensen)
- Remote Sensing: The Quantitative Approach (Swain and Davis)
- Remote Sensing Digital Image Analysis (Richards)
- Signal Theory Methods in Multispectral Remote Sensing (Landgrebe)
- Introduction to Remote Sensing (Campbell & Wynne)
- Remote Sensing and Image Interpretation (Lillesand, Kiefer and Chipman)
- Fundamentals of Satellite Remote Sensing (Chuvieco and Huete)
- Classification Methods for Remotely Sensed Data (Mather and Tso)
- Digital Analysis of Remotely Sensed Imagery (Gao)
- Theory and Applications of Optical Remote Sensing (Asrar)
- Remote Sensing: The Image Chain Approach (Schott)
- Remote Sensing and GIS in Ecosystem Management (Sample, ed.)
- Environmental Remote Sensing from Regional to Global Scales (Foody, ed.)
- Assessing the Accuracy of Remotely Sensed Data: Principles and Practices (Congalton and Green)
- Scale in Remote Sensing and GIS (Quattrochi and Goodchild, eds.)
- Looking at Earth (Strain and Engle)
- Satellite Atlas of the World (National Geographic Society)

Note: If one of the above books is not available, ask the librarian if it is for FR 5262; several books are used for both courses.

Remote Sensing Journals
- Remote Sensing of Environment
- Photogrammetric Engineering and Remote Sensing
- International Journal of Remote Sensing
- Canadian Journal of Remote Sensing

Reprints
Approximately 20 selected papers and reports, listed under assigned readings and identified by a number, title and author in the schedule of reading assignments, will be available as handouts, on reserve in the Natural Resources Library, or as website links.

It is recommended that you read the assigned material prior to the lecture. Key concepts will be emphasized in lecture and discussion and reading assignments will supplement lectures.
Credits and Workload Expectations

One credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester). A student taking a 3-credit course that meets for three hours a week should expect to spend an additional six hours a week on coursework outside the classroom to achieve an average grade in the course.

University Grading Standards

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  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 receive 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.

Academic Dishonesty

Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

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.

In this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask.

The course will be conducted under an Honor System in which students accept responsibility for student conduct during exams. It operates under the assumption that students are honest and enjoy working in an environment where their honesty and the honesty of others are not in question. It operates to respect honesty and to prevent cheating, as well as to punish those who cheat.
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 or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via http://www.mentalhealth.umn.edu/.