I. GENERAL INFORMATION

COURSE NAME: REMOTE SENSING OF THE PHYSICAL ENVIRONMENT
(**GR 4333/6333**)

TERM AND YEAR: Fall, 2025

LECTURE/LAB: **Room 310, Hilbun Hall**
Tuesdays & Thursdays, 9:30 A.M. – 10:45 A.M.
Thursdays, 2:00 P.M. – 2:50 P.M. (Optional)

INSTRUCTOR: Dr. Padmanava Dash
Associate Professor, Geosciences
Room # 109B, Hilbun Hall
Telephone: 662.325.0364
E-mail: pd175@msstate.edu
Office Hours: Tuesdays & Thursday, 12:30 - 1:30 P.M.
For other times, please make an appointment.

TEACHING ASSISTANT: Hafez Ahmad
Graduate Student, Geosciences
Room # 109, Hilbun Hall
Email: ha626@msstate.edu

REQUIRED TEXTBOOK:

Jensen, John R., 2007, Remote Sensing of the Environment: An Earth Resource Perspective, 2nd
Ed., Upper Saddle River, NJ: Prentice Hall, 592 pages.

Lecture slides will be posted on MSU Canvas (http://canvas.msstate.edu).

COURSE DESCRIPTION:

This course is designed to be an introduction to the fundamental principles of remote sensing
technology for earth resources and environmental studies. Students will learn about electromagnetic
energy, data acquisition platforms, spectral responses of earth objects, various satellite sensors and
their applications. Students will be introduced to radiative transfer theory and multispectral/
hyperspectral/thermal/microwave/LIDAR remote sensing of vegetation, water, urban landscape,
soils, minerals, and geomorphology. This course also deals with proximal sensing, where students
will analyze data from proximal sensors such as a GER 1500 radiometer.

COURSE OBJECTIVES:

Remote sensing technologies are heavily used in environmental science for mapping and monitoring of various natural resources, e.g., water quality, wetlands, forests. A working knowledge of these technologies and related software is required for the interspersion of ideas and concepts among higher education, research, industry, and government. An understanding of remote sensing principles requires the assimilation of knowledge and techniques from the basic branches of science such as physics, mathematics, and biology. Those engaged in disciplines such as geosciences, geography, environmental science, natural resource management, forestry, ecology, earth science, and government would benefit greatly through an understanding of these modern technologies.

Learning Outcomes: On completion of this course students will be able to-

- Understand the importance of remotely sensed data vis-à-vis *in situ* data.
- Understand electromagnetic radiation principles.
- Learn about various existing airborne, space-borne and unmanned aerial remote sensing systems.
- Learn fundamental principles of multispectral, thermal, radar, and lidar remote sensing.
- Understand how multispectral, thermal, radar, and lidar remote sensing remote sensing techniques can be employed to solve geoscientific questions on vegetation, water, urban landscape, soils, minerals, and geomorphology.

II. GRADING CRITERIA

GRADING SCALE:

Letter Grade	Grading Percent	Points Needed
A	90 - 100	450 - 500
B	80 - 89	400 - 449
C	65 - 79	325 - 399
D	50 - 64	250 - 324
F	Below 50	0 - 249

GRADING CRITERIA FOR UNDERGRADUATE STUDENTS (GR 4343):

Assignment Type	Percent of Grade	Points
Test 1	20% of grade	100
Test 2	20% of grade	100
Final Examination	20% of grade	100
Laboratory Exercises (*See* the details below)	20% of grade	100
Quizzes after end of each chapter (*See* the details below)	5% of grade	25
Summaries after end of each chapter (*See* the details below)	5% of grade	25
Attendance & Participation	10% of grade	50
TOTAL	**100%**	**500**

Cell phones must be turned off and put in your purse/book bags during classes and examination periods.

QUIZZES:

After the end of each chapter, a quiz will be posted on Canvas. Most of the quizzes will be constituting of three questions pertaining to the material discussed in class.

- Due: Each quiz is due <u>before the start of a new chapter in the next class</u>. The quiz grade will be reduced by 10% for every day that it is late beyond the due date unless otherwise stated by the instructor.

SUMMARIES:

Students are required to submit one-page summary of each chapter after it is covered in the class. The summaries should be single-spaced on A4 size papers with one-inch margins. Times New Roman typeface with a 12-point font should be used. You will upload the summaries to Canvas. Emailed summaries won't be accepted.

- Due: Each summary is due <u>exactly one week from the day it is assigned</u>. The summary grade will be reduced by 10% for every day that it is late beyond the due date unless otherwise stated by the instructor.

- The Summary essay should be carefully written and should be error-free. It should include all the components of the chapter. For each line not making sense, points will be deducted. Reading the document 2-3 times prior to sending is strongly suggested. The quality of the write-up will contribute towards the final grade.

- If the document is less or more than 1 page, points will be deducted. Copied from fellow student(s), if found, would affect the grade negatively.

LABORATORY EXERCISES:

Lab exercises will use ERDAS Imagine and Arc GIS. Handouts will be given for each exercise.

Objectives:
The general objective of this course is to provide the students with hands-on experience in basic satellite data processing. This course is highly methods oriented. The goal of the course is to teach the students the basic skills needed to work independently to acquire, analyze and visualize data sets derived from a variety of satellite sensors.

Description:
The lab assignments are designed to allow the student to develop familiarity with the basics of remote sensing. They are not intended to give you a comprehensive knowledge of the field. The software applications for the lab assignments have a reasonable learning curve. The students are expected to conduct their own, independent explorations and readings if they intend to acquire further knowledge about remote sensing theory and applications.

Criteria for Grading:
In each lab class a handout will be distributed. Basically, those handouts would be step-by-step instructions for completing the laboratory exercise. Each student should turn in the completed lab exercise, <u>exactly one week from the day it is assigned</u>. The lab grade will be reduced by 10% for every day that it is late beyond the due date unless otherwise stated by the instructor.

ADDITIONAL GRADING CRITERIA FOR GRADUATE STUDENTS (GR 6333):

In addition to the above criteria, graduate students are required to submit a term paper on an instructor-approved topic. The term paper for this class is aimed at motivating the students for active learning, assisting to understand the concepts covered in the class and broadening the scope of the subjects. Each student is required to demonstrate that they have developed a good understanding of the principles and applications of

       1. Remote Sensing
       2. Digital Image Processing

Each student will identify a minimum of five references around a common subject in remote sensing that deal with current uses of remote sensing in the application area selected. These may be five journal or magazine articles, books, chapters in books or other references (e.g., WWW sites, commercial literature). Select references that provide a good representative range of applications in the area you select. An excellent starting point for searching for literature is the remote sensing e-journals available in the library. The topic should be approved from the instructor at an appropriate time during the semester – the sooner the better and no later than Test-1. The entire term paper is due with the Final Exam. The term paper should be done independently by each student. The term paper should follow the following style for getting credits for each part:

    1. Title   [2.5 points]
    2. Abstract (no more than 500 words)   [5 points]
    3. Main body of the paper   [10 points]
    4. Summary   [5 points]
    5. References   [2.5 points]

The paper should be double spaced using MS Word or similar software with 12 pt Times New Roman font and 1" margin on a standard printer paper (A4 size). The main text (excluding the cover page, figures, and references) should be 5 pages or longer and should be uploaded to Canvas. Emailed papers won't be accepted.

The final grading criteria for graduate students is given below:

Assignment Type	Percent of Grade	Points
Test 1	20% of grade	100
Test 2	20% of grade	100
Final Examination	20% of grade	100
Laboratory Exercises (*See* the details above)	20% of grade	100
Quizzes after end of each chapter (*See* the details above)	5% of grade	25
Summaries after end of each chapter (*See* the details above)	5% of grade	25
Attendance & Participation	5% of grade	25
Term Paper	5% of grade	25
TOTAL	**100%**	**500**

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III. LECTURES

Chapter 1   Remote Sensing of the Environment

Chapter 2   Electromagnetic Radiation Principles

Chapter 3, 4, 5, & 6   Aerial Photography

Chapter 7   Multispectral Remote Sensing Systems

Chapter 8   Thermal Infrared Remote Sensing

Chapter 9   Active and Passive Microwave Remote Sensing

Chapter 10   LIDAR Remote sensing

Chapter 11   Remote Sensing of Vegetation

Chapter 12   Remote Sensing of Water

Chapter 13   Remote Sensing the Urban Landscape

Chapter 14   Remote Sensing of Soils, Minerals, and Geomorphology

IV. LABS

Chapter-1:   Imagery on the internet
                             Ordering and downloading satellite data from the OceanColor Web

Chapter-2:   Analysis of spectral reflectance curves

Chapter-7:   Characteristics of selected satellite remote sensor data

Chapter-8:   Thermal infrared image interpretation

Chapter-9:   Analysis and interpretation of radar imagery

Chapter-10:   Analysis of LIDAR data

Chapter-11:   Remote sensing of vegetation

Chapter-12:   Generating water quality maps using Unmanned Aerial Systems
                             (UAS) imagery

Chapter-13:   Remote Sensing of Urban Phenomena

Chapter-14:   Remote Sensing of Soils and Geomorphology

Note: The above schedule in this course is subject to changes in the event of extenuating circumstances. Please note that when changes are made, students will be notified accordingly.

1. Students are expected to be in the classroom at <u>9:30 am sharp</u>. If you arrive after the start of the lecture, then please do <u>not</u> sign in the attendance sheet to be fair with other students.
2. The student should <u>review</u> all the material that was covered in the previous class and be prepared for the <u>quiz </u> in the subsequent class after the end of each chapter.
3. Students are encouraged to <u>participate</u> in class discussions.
4. Students are to <u>turn off all cell phones and pagers before entering the classroom</u>.

IV. ACADEMIC HONOR CODE

Mississippi State has an approved Honor Code that applies to all students. The code is as follows: "As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Student will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code. For additional information, please visit: http://honorcode.msstate.edu/policy.

V. TITLE IX

MSU is committed to complying with Title IX, a federal law that prohibits discrimination, including violence and harassment, based on sex. This means that MSU's educational programs and activities must be free from sex discrimination, sexual harassment, and other forms of sexual misconduct. If you or someone you know has experienced sex discrimination, sexual violence and/or harassment by any member of the University community, you are encouraged to report the conduct to MSU's Director of Title IX/EEO Programs at 325-8124 or by e-mail to titleix@msstate.edu. Additional resources are available at http://www.msstate.edu/web/security, or at http://students.msstate.edu/sexualmisconduct/ .

VI. SUPPORT SERVICES

Students who need academic accommodations based on a disability should visit the Office of Student Support Services, 01 Montgomery Hall, call 662-325-3335, or visit the website at www.sss.msstate.edu.