

# **GEOG 361/651 Course Syllabus**

**Spring 2025**

## **Course Information**

Course Number: GEOG 361/651

Course Title: **Remote Sensing in Geosciences** (GEOG 361) & **Remote Sensing for Geographical Analysis** (GEOG 651)

Section: GEOG 361-500, 501 & 502 and GEOG 651-600

Time: **Lecture** - Tuesday & Thursday 2:20 pm - 3:35 pm, **Labs** - 500: Monday 3:00 pm - 4:50 pm, 501: Wednesday 11:30 am - 1:20 pm, 502: Thursday 9:35 am - 11:25 am

Location: **Lecture** - CSA #303, **Labs** - 500: CSA #307, 501: CSA #307, 502: CSA #311

Credit Hours: 4 - 3 Lecture/1 Lab (GEOG 361), 3 (GEOG 651)

## **Instructor Details**

Instructor: Ms. Joni Kincaid

Office: Eller O&M Building #802B

E-Mail: [joni.kincaid@tamu.edu](mailto:joni.kincaid@tamu.edu)

Office Hours: Scheduled office hours will be held on **Fridays from 10:30 am to 12:00 pm**. They will be held simultaneously for both in-person and Zoom attendees. Priority will be given to those students attending in person. If you are unable to attend the scheduled office hours you may always schedule an appointment to meet with me at another time.

Join Zoom Office Hours:

<https://tamu.zoom.us/j/5403790322?pwd=GAy2LHoNDRQWp4Mb8OWYcxC8mTiLCw.1>

## Teaching Assistants

### Sections 500 & 501

Ms. Mengqu Han

Office: Eller O&M 707G

E-Mail: [mehan5548@tamu.edu](mailto:mehan5548@tamu.edu)

Office Hours: Scheduled office hours will be held on **Fridays from 1:00 to 3:00 pm** or by appointment.

### Section 502

Mr. Xiao Guo

Office: Eller O&M 707G

E-Mail: [xguo@tamu.edu](mailto:xguo@tamu.edu)

Office Hours: Scheduled office hours will be held on **Mondays from 9:20 am to 10:20 am** or by appointment.

## Course Description

Introduction to the physics behind and technical issues surrounding the acquisition and utilization of remotely sensed airborne and satellite images for the study of physical and human landscapes. Techniques for analyzing and interpreting images for studying biological, geological, hydrological and oceanographic processes as well as human activities will be emphasized.

## Course Prerequisites

There are no prerequisites for either GEOG 361 or GEOG 651

## Special Course Designation

None

## Course Learning Outcomes

This course aligns its content with learning objectives in the [\*Geographic Information Science & Technology Body of Knowledge\*](#) ([Links to an external site](#)), that has been

produced by the University Consortium for Geographic Information Science (UCGIS). In particular, it meets many of the objectives the **Remote Sensing Platforms & Sensors** topics in the **Data Capture** Knowledge Area

The overarching learning objective of the course can be summarized as follows:

- Students will be able to articulate the basics of how electromagnetic energy enables remote sensing and be able to describe why different wavelength regions of the electromagnetic spectrum are useful for different types of remote sensing as well as why various portions of the electromagnetic spectrum cannot be used for remote sensing.
- Students will be able to explain the concepts of *spatial*, *spectral*, *radiometric* and *temporal* resolution and how they impact the selection of the most appropriate data source(s) for a particular analytical task. Students will also be able to compare and contrast current common sensors on the basis of these properties and explain if a sensor is useful for particular tasks.
- Students will be able to describe the basic elements of visual image analysis and will be able to interpret aerial photographs.
- Students will be able to extract basic quantities information from these including areas and heights of features as well explain the basic concepts underpinning of photogrammetry including *parallax* and *orthorectification*.
- Students will be able to describe *spectral signatures* and use this knowledge to explain how different wavelengths can successfully be used to differentiate between different land surface types.
- Students will be able to explain and perform fundamental digital image processing tasks including: *georectification*, *radiometric preprocessing*, *band ratioing* and *supervised and unsupervised image classification*.

## **Textbook and/or Resource Materials**

### **Required**

Jensen, J.R. 2007. ***Remote Sensing of the Environment - an Earth Resource Perspective*** 2<sup>nd</sup> ed. Upper Saddle River, NJ, Prentice Hall. 592 pp

## Recommended

*electronic resources to be added within the course modules as the course progresses*

## Software

This course will employ **ArcGIS Pro 3.X** as the primary software tool. **ENVI** may be used as a supplementary tool, primarily through its integration with ArcGIS Pro.

## Grading Policy

Your grade in the class will be based on the following

### GEOG 361

#### Exams - 400 pts

There will be three examinations: two midterms and a final

Makeups will be allowed only for university excused absences as covered in [Section 7 of the Texas A&M Student Rules](#)

#### Lab Assignments - 500 pts

Late labs will receive reduced credit unless evidence of a university excused absence is provided.

#### Inquiry Exercises - 50 pts

The class will have two inquiry projects which will be done in small groups.

#### Lecture and Lab Participation - 50 pts

Students are expected to not only attend lecture and lab, but also be active participants. Lecture attendance will be tracked through the use of in class **Poll Everywhere** questions which will focus both on a topic covered during that lecture and on an *Image of the Day*. Lab attendance will be tracked by the Teaching Assistants. Together, this attendance will comprise 40 of the 50 participation points.

The remaining 10 participation points will be earned through the submission of an Image of the Day **no later than the last lecture period of the course**. The idea is to find a remote sensing image that is of interest to you and you feel will also interest the class. A subset of the those submitted will be presented at the beginning of the class to stimulate discussion. It will serve as the basis of one of each lecture's **Poll Everywhere** questions which may about what the image depicts or what part of the world it captures. So its your opportunity

to stump your classmates! *Please submit your image of the day in Canvas **and** email your Image of the Day to the instructor using Canvas' email functionality.*

**The total possible points that can be earned in GEOG 361 is 1000**

## **GEOG 651**

**Exams** - 400 pts

There will be three examinations: two midterms (125 pts each) and a final (150 pts)

Makeups will be allowed only for university excused absences as covered in [Section 7 of the Texas A&M Student Rules](#)

**Lab Assignments** - 500 pts

Late labs will receive reduced credit unless evidence of a university excused absence is provided.

**Lecture and Lab Participation** - 50 pts

Students are expected to not only attend lecture and lab, but also be active participants. *See the information in the GEOG 361 section for additional details.*

**Project** - 150 pts

The Graduate Student Final Project involves applying your newfound knowledge of remote sensing to a *scientific question* related to your graduate research. Ideally, this final project will help you along your academic journey towards your thesis or dissertation regardless of whether you are enrolled in GEOG 651. If there is no possibility of using remote sensing to further/enhance your graduate research project, you should choose a project idea that is of personal interest.

The project is structured to help progress in a timely manner to successful completion of the project and has the following components that build to the Final Report due at the end of the semester:

1. Proposal - 10 pts
2. Remote Sensing Data Sources - 5 pts
3. Literature Review - 15 pts
4. Methods - 20 pts
5. Final Report- 100 pts

Additional details on the literature review as well as supporting resources are available in Canvas.

**The total possible points that can be earned in GEOG 651 is 1100**

*Grades will follow this general grading scale:*

- A 90+ %
- B 80-89%
- C 70-79%
- D 60-69%
- F < 60%

**Late Work Policy**

The due dates for all assignments are posted in Canvas. Scores for late assignments, including labs, will be deducted 10% per day.

In general, labs will be due one week after they are assigned. Labs turned in one week after the due date will receive no credit. *However, each student will be allowed to turn one lab in late without penalty.* To use this “late pass” on an assignment, you must notify your Teaching Assistant by the date that lab would otherwise be due.

In past years, failure to complete labs in a timely manner has been the primary cause of poor performance in this class. It is your responsibility to keep up with lab assignments. You should talk to your Teaching Assistant and or the instructor BEFORE late labs become a problem

*Work submitted by a student as makeup work for an excused absence is not considered late work and is exempted from the late work policy ([Student Rule 7](#)).*

**Course Schedule**

The schedule for the course including the dates of the midterms and finals and the due dates for the inquiry projects is listed below. Additional readings will be added during the semester to supplement the textbook chapters. The due dates of all exams, projects and labs are also available on their respective assignment pages and in the Canvas course schedule.

*I reserve the right to make changes to the course schedule as unforeseen circumstances may arise.*

**Week 1 - [What is Remote Sensing?](#) and a [Brief History of Remote Sensing](#)**

*January 14<sup>th</sup> & 16<sup>th</sup>*

Reading - Jensen, Chapter 1 & 3

**No labs this week**

**Week 2 - [Principles of Electromagnetic Radiation and the EM Spectrum](#)**

*January 21<sup>st</sup> & 23<sup>rd</sup>*

Reading - Jensen Chapters 2 & 15

**No labs this week**

**GEOG 651 Project Idea due on January 24<sup>th</sup>**

**Week 3 - Old School [Aerial Photography](#)**

*January 28<sup>th</sup> & January 30<sup>th</sup>*

Reading - Jensen Chapters 3 & 4

Lab 1 - A Hands on Introduction to Remote Sensing

**Inquiry Project #1 Due on January 31<sup>st</sup>**

**Week 4 - [Visual Image Interpretation](#)**

*February 4<sup>th</sup> & 6<sup>th</sup>*

Reading - Jensen Chapter 5

Lab 2 - Visual Image Interpretation

**GEOG 651 Project Data Sources due on February 7<sup>th</sup>**

**Week 5 - [Basic Photogrammetry](#)**

*February 11<sup>th</sup> & 13<sup>th</sup>*

Reading - Jensen Chapter 6

Lab 3 - Preparing Multispectral Data for Analysis

**Midterm 1 - February 13<sup>th</sup>**

**Week 6 - [Multispectral Remote Sensing - Principles](#)**

*February 18<sup>th</sup> & 20<sup>th</sup>*

Reading - Jensen Chapter 7

Lab 4 - Multispectral Image Analysis

**GEOG 651 Project Literature Review due on February 21<sup>st</sup>**

## **Week 7 - [Multispectral Remote Sensing - Satellites and Sensors](#)**

*February 25<sup>th</sup> & 27<sup>th</sup>*

Reading - Jensen Chapter 7

Lab 5 - Multispectral Image Classification

## **Week 8 - [Multispectral Image Processing Techniques](#)**

*March 4<sup>th</sup> & 6<sup>th</sup>*

Reading - Jensen Chapter 7

**GEOG 651 Project Methods due on March 7<sup>th</sup>**

## **Week 9 - SPRING BREAK (*March 10<sup>th</sup> - 14<sup>th</sup>*)**

## **Week 10 - [Hyperspectral Remote Sensing](#)**

*March 18<sup>th</sup> & 20<sup>th</sup>*

Reading: TBD

Lab 6 - Spectral and Hyperspectral Analysis

**Midterm 2 - March 20<sup>th</sup>**

## **Week 11 - [Drones](#)**

*March 25<sup>th</sup> & 27<sup>th</sup>*

Reading - TBD

Lab 7 - Drone Image Analysis and Structure from Motion

## **Week 12 - [Lidar Remote Sensing](#)**

*April 1<sup>st</sup> & 3<sup>rd</sup>*

Reading - Jensen Chapter 10

Lab 8 - Lidar Analysis

**Inquiry Project #2 Due on April 3<sup>rd</sup>**

## **Week 13 - [Thermal Remote Sensing](#)**

*April 8<sup>th</sup> & 10<sup>th</sup>*

Reading - Jensen Chapter 8

Lab 9 - Thermal Image Analysis



## **Week 14 - Active and Passive Microwave Remote Sensing**

April 15<sup>th</sup> & 17<sup>th</sup>

Reading - Jensen Chapter 9

Lab 10 - SAR Image Analysis

## **Week 15 - Gravity and Other Specialized Science Missions**

April 22<sup>nd</sup> & 24<sup>th</sup>

Reading TBD

**No labs this week**

**GEOG 651 Final Report due on April 29<sup>th</sup>**

### **Final Exam**

The final exam for this class will be held on **Tuesday May 6<sup>th</sup> from 1:00 to 3:00 pm**

## **Optional Course Information Items**

### ***Labs***

This course will utilize the two **Trimble Technology Labs** located on the 3rd floor of CSA. Labs are an important and integral portion of the course. There is simply no way to learn about GISci (Geographic Information Science) including Remote Sensing without spending considerable time in hands-on-learning. While the scheduled lab time is two hours, labs will typically require time outside of the scheduled lab hours to complete.

It is my expectation that students will attend the full lab session unless your TA instructs differently. This is your scheduled time when the TAs are available to assist with the course. If you do not take advantage of this lab time, it is not reasonable to expect the TAs to assist outside of their scheduled office hours. So please use time in lab to your advantage.

I recognize that many students feel they may be able to complete their lab assignments without actually attending lab. This, however, precludes a student from taking full advantage of one of the most effective learning approaches there is - learning from others. Please do not deprive yourself of this important learning environment.

### ***Cellular Telephones and eDevices***

As a courtesy to the instructor and other students please turn off all cellular telephones before the class begins. I find it extremely impolite to be interrupted by a cellular telephone when I am lecturing. As this is a technology intensive class, it is permissible to use personal computers and tablets during class for class activities such as note taking,

searching for supporting information etc. Use of electronic devices for email, Facebook, Twitter or other non-course related activities during class is prohibited

### **Technology Support**

Regarding technology support, please note some available help resources (i.e., Canvas Help and the Geosciences Distance Help Desk), where whom to contact depends on the nature of the issue encountered:

(1) If you need assistance with CANVAS, you may either call the 24x7 CANVAS helpline at +1-877-354-4821, you may open a ticket from the link inside CANVAS; and

(2) If you have non-CANVAS technical questions (e.g., an issue related to ArcGIS installation or performance in the Virtual Desktop environment, etc.), you should open a Geosciences Distance Help Desk ticket by emailing: [online-support@geos.tamu.edu](mailto:online-support@geos.tamu.edu)

### **University Policies**

This section outlines the university level policies. The TAMU Faculty Senate established the wording of these policies.

#### **Attendance Policy**

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

***It has been my experience that failure to attend class, especially labs is a major cause of poor performance in the class therefore I encourage all students to regularly attend both class and lecture.***

#### **Makeup Work Policy**

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](#)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. ([See Student Rule 24](#)).

### **Academic Integrity Statement and Policy**

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](http://aggiehonor.tamu.edu).

### **Americans with Disabilities Act (ADA) Policy**

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources office on your campus (resources listed below). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit <https://disability.tamu.edu/>.

## **Title IX and Statement on Limits to Confidentiality**

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns related to mental and/or physical health in a confidential setting are encouraged to make an appointment with [University Health Services](#) or download the [TELUS Health Student Support app](#) for 24/7 access to professional counseling in multiple languages. Walk-in services for urgent, non-emergency needs are available during normal business hours at University Health Services locations; call 979.458.4584 for details.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

## Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors influencing a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care practices by utilizing the resources and services available through [University Health Services](#). Students needing a listening ear can call the Texas A&M Helpline (979.845.2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends for mental health peer support while classes are in session. The [TELUS Health Student Support](#) app provides access to professional counseling in multiple languages anytime, anywhere by phone or chat, and the 988 Suicide & Crisis Lifeline offers 24-hour emergency support at 988 or [988lifeline.org](https://988lifeline.org).

Students needing a listening ear can contact University Health Services (979.458.4584) or call the Texas A&M Helpline (979.845.2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends while classes are in session. 24-hour emergency help is also available through the 988 Suicide & Crisis Lifeline (988) or at [988lifeline.org](https://988lifeline.org).

**Food/Housing Insecurity:** Any student who faces challenges securing their food or housing and believes this may affect their academic performance is urged to contact the instructor. As your instructor, I will do my best to provide you with any resources or services I may be aware of.

## College and Department Policies

None

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