

# Introduction to Remote Sensing

GIS 4040/5040 — Fall 2016

**Class Time:** Wednesday 4:20 AM - 6:50 PM

**Location:** Des Peres Hall 204

Instructor: Dr. Wasit Wulamu (Center for Sustainability)

Office Hours: Wednesday 2-4PM

Des Peres 209D

Phone: 314-977-5156

E-mail: awulamu@slu.edu

## Course Description (from Catalogue):

Fundamental knowledge on the physics of remote sensing, photogrammetry, multispectral, hyperspectral, thermal imaging and RADAR and LIDAR principles are reviewed in lectures while lab assignments cover image processing, environmental modeling & analysis. Course objective is to demonstrate present applications of RS in environmental sciences with software training in ENVI+IDL, SARscape.

## Course Objectives:

A major objective of the course is to introduce students to the fundamentals of remote sensing, and demonstrate present applications of the technology in integrated & applied sciences including environmental and health science studies. Another objective is to have each student become familiar with the latest image processing techniques to be actively involved in environmental studies and to stimulate interest in remote sensing activities which play a critical role in understanding our changing environment, sustainable development and politics. At the end of the semester students will have a good understanding and basic skills of remote sensing.

## Required Texts:

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

ISBN-10: 0131889508; ISBN-13: 978-0131889507

## Assessment & Grading:

1. Midterm exam (30%)
2. Final exam (30%)
3. Lab work (9\*3=27%)
4. Final Project (13%)

## Grading Scale:

**Grade**

A

**Points**

4.0

**0-100% scale**

93-100%

A-	3.7	90-92.9%
B+	3.3	87-89.9%
B	3.0	83-86.9%
B-	2.7	80-82.9%
C+	2.3	77-79.9%
C	2.0	73-76.9%
C-	1.7	70-72.9%
D	1.0	60-69.9%
F	0.0	0-59.9%

### **Academic Integrity**

*Academic integrity is honest, truthful and responsible conduct in all academic endeavors.* The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care, and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy was adopted in Spring 2015, and can be accessed on the Provost's Office website at:

[http://www.slu.edu/Documents/provost/academic\\_affairs/University-wide%20Academic%20Integrity%20Policy%20FINAL%20%2006-26-15.pdf](http://www.slu.edu/Documents/provost/academic_affairs/University-wide%20Academic%20Integrity%20Policy%20FINAL%20%2006-26-15.pdf).

Additionally, each SLU College, School, and Center may have adopted its own academic integrity policies, available on their respective websites. All SLU students are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions, and appeals. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Dean/Director of the College, School or Center in which your program is housed.

### **Title IX**

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX coordinator, Anna R. Kratky (DuBourg Hall, room 36; [akratky@slu.edu](mailto:akratky@slu.edu); 314-977-3886) and share the basic fact of your experience with her. The Title IX coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK. To view SLU's sexual misconduct policy and for resources, please visit the following web address: <http://www.slu.edu/general-counsel-home/office-of-institutional-equity-and-diversity/sexual-misconduct-policy>

[www.slu.edu/here4you](http://www.slu.edu/here4you) .

### **Student Success Center**

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center assists students with academic and career related services, is located in the Busch Student Center (Suite, 331) and the School of Nursing (Suite, 114). Students can visit [www.slu.edu/success](http://www.slu.edu/success) to learn more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring services, university writing services, disability services, academic coaching, career services, and/or facets of curriculum planning).

### **Disability Services Academic Accommodations**

Students with a documented disability who wish to request academic accommodations **must** contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also **must** notify the course instructor that they wish to access accommodations in the course.

Please contact Disability Services, located within the Student Success Center, at [Disability\\_services@slu.edu](mailto:Disability_services@slu.edu) or 314.977.3484 to schedule an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services and viewed within Banner via the instructor's course roster.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact Disability Services.

### **Expectations (Basis of Participation & Commitment Score):**

- Attend *every* class; there is no room for random absences because each lecture builds on previous work. Attendance for the entire class period will form part of your class participation grade. Notify me if you anticipate missing class.
- Be on time. Punctuality will form part of your class participation grade.
- You are responsible for any missed material or changes in assignments, meeting times/dates, or due dates announced in class.
- Read assigned materials *before* class. This, as evidenced by the quality of your participation in class, will form the majority of your class participation grade.
- Be committed to the class discussions. Contribute to a collegial environment of the learning group.
- Simply talking does not equal participation. Participation can be silent as in active listening. Points raised should actively help move the conversation toward productive ends. If the ideas being discussed are banal or tiresome, actively steer the conversation.
- Submit all assignments at the *beginning* of class on the date due. Late work affects your grade.

- To maintain the learning environment, web browsing, texting, or other non-academic activity on electronic devices will not be allowed in class.
- Let the class know at the beginning if you anticipate an event (e.g., emergency phonecall, appointment) that will disrupt the group.

### Professional Writing & Presentations:

- All written work is expected to be polished and professional. Clarity of expression, organization of materials, absence of typographical errors, correctness of grammar and spelling, and other communication skills are considered in evaluating written assignments.
- Additionally, all work must be fully referenced with source material following proper citation format according the American Psychological Association or the Chicago Manual of Style.
- All oral presentations are expected to be well organized, practiced, professional, and with appropriate graphical or visual aids.

### Course Schedule

Week	Class Date	Lectures, Discussion & Readings
Course overview		
1	8/24	4:30PM – 6:50PM: Intro. to Remote Sensing. <b>Lab1.</b> Lab orientation; getting to know images
Electromagnetic Radiation Principles		
2	8/31	Reading: <b>Ch2</b>
Radiometric calibration and atmospheric correction		
3	9/07	<b>Lab2:</b> Image preprocessing I: conversion between digital numbers, radiance, top-of atmosphere (TOA) reflectance, DOS surface reflectance retrieval
Aerial photography & photogrammetry		
4	9/14	<b>Lab3:</b> Photo image interpretation Reading: <b>Ch4</b>
Field spectra, Drone Image Collection, Image interpretation		
5	9/21	<b>Field and drone image collection Remote Sensing spectra</b> <b>Lab4:</b> Exploring varies sensors and data sources, image resolutions Reading: <b>Ch5 &amp; Ch6</b>
Optical remote sensing systems		
6	9/28	<b>Lab5:</b> Application (1): Topographic modeling and vegetation analysis Reading: <b>Ch7</b>
Optical remote sensing systems		
7	10/05	<b>Lab6: Lab5 continues</b>
Mid-Term Exam		
8	10/12	review & Q/A <b>Mid-Term Exam</b>

<b>Thermal remote sensing</b>		
9	10/19	<b>Lab7:</b> Image processing II: land surface temperature retrieval Reading: <b>Ch8</b>
<b>Microwave remote sensing</b>		
10	10/26	<b>Lab8:</b> Understanding radar images; estimating soil moisture Reading: <b>Ch9</b>
<b>Microwave remote sensing</b>		
11	11/02	<b>Lab9:</b> Estimating soil moisture Reading: <b>Ch9</b>
<b>Image Classification</b>		
12	11/09	<b>Lab10:</b> Image processing III: classification techniques
<b>Remote sensing of vegetation</b>		
13	11/16	<b>Lab11:</b> Hyperspectral techniques for inventorying plant species Reading: <b>Ch10</b>
<b>Thanksgiving Break (Weds-Sat)</b>		
14	11/23	<b>NO CLASS</b>
<b>Remote sensing of mineral resources (optional topic)</b>		
15	11/30	<b>Lab12:</b> Hyperspectral techniques for mineral mapping Reading: <b>Ch14</b>
<b>Final Exam &amp; Classes End on Monday 12/07</b>		
16	12/07	<input type="checkbox"/> Q/A <input type="checkbox"/> <b>Final Exam</b> <input type="checkbox"/> <b>Project due on December 10 Sunday 11:59PM.</b> Thursday, December 15, 2016 - Fall Final Grades Due by 5:00 pm

### A Note on Plagiarism and Academic Honesty

*The following is the Center for Sustainability (CfS) policy on academic honesty:*

The University is a community of learning, whose effectiveness requires an environment of mutual trust and integrity. As members of this community, students share with faculty and administrators the responsibility to maintain this environment of academic integrity. Academic integrity is violated by any dishonesty in submitting for academic evaluation the assignments and tests required to validate the student's learning.

Where there is clear indication of such dishonesty, the faculty and/or administration have the responsibility of applying sanctions in order to protect the environment of integrity necessary for learning. While not all forms of academic dishonesty can be listed here, the following instances should be seen as actions that not only violate the mutual trust necessary between faculty and students, but also undermine the validity of the university's grading of students, and take unfair advantage of fellow students.

It is academically dishonest to solicit, receive or provide any unauthorized assistance in the completion of assignments and tests submitted for credit as part of a course. Examples of such unauthorized, and therefore academically dishonest assistance would be:

1. Copying from another student's test paper, lab report or assignment, or allowing another student to copy from one's self;
2. Copying from a textbook or class notes during a closed-book exam;
3. Submitting material authored by another person but represented as the student's own work;
4. Submitting as one's own work/material without permission of the instructor that has been subjected to editorial revision;
5. Copying a passage of text directly from a book or journal without indicating the source or without using a recognized style for citing sources;
6. Taking a test or writing a paper for another student;
7. Taking a course for another student or securing another student to take a course for oneself;
8. Securing or supplying in advance a copy of an exam without the knowledge or consent of the instructor.

Any violation of academic integrity should be handled using the following procedure:

1. The instructor should discuss the integrity issue with the student. If the instructor believes that there is a violation of academic integrity, then he/she should contact the Director of the Center for Sustainability.
2. The Director will interview both parties individually or together, documenting the situation. If the Director determines that there was a violation of academic integrity, then he/she will work with the instructor to determine appropriate sanctions. An official letter will be sent to the student and a copy will be placed in the student's file. A form letter will be used, but also will include the specifics of the situation and consequences.
3. A student may appeal the decision of the Director in writing to the Vice President for Graduate Education. The Vice President for Graduate Education, in collaboration with the Vice President for Academic Affairs, will investigate all aspects of the appeal and interview all the necessary parties individually or together, keeping records of the investigation for the student's file. The findings and sanctions imposed by the VP for Graduate Education and the VP for Academic Affairs for the individual violation shall be final.

If a student receives two violations of academic integrity while a CfS student, then a committee consisting of the Center Director, VP for Graduate Education and the VP for Academic Affairs will convene to review the case. A hearing will be held with the committee and the student. The committee and student may invite witnesses to the hearing as necessary. The student may bring a personal advisor, not an attorney, to the hearing as well. After the hearing, the student will be notified in one week of the decision of the committee. The findings and sanctions imposed by the committee shall be final.