

**Department of GIS**  
**College of Arts and Sciences**  


**GIS 663ON – Remote Sensing and Image Analysis**  
**Spring 2025**

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<i>Instructor:</i>	<i>Dr. Ruijin Ma</i>
<i>Class Time:</i>	<i>Tuesday and Thursday 6:00pm ~ 8:00pm (Pacific Time) [28 hours]</i>
<i>Meeting Room:</i>	<a href="https://uredlands.zoom.us/j/ruijin.ma">https://uredlands.zoom.us/j/ruijin.ma</a>
<i>Office Hours:</i>	<i>Appointment between 4pm and 8pm (Pacific Time)</i>
<i>E-mail:</i>	<a href="mailto:ruijin_ma@redlands.edu">ruijin_ma@redlands.edu</a>

**Course Description:**

This course aims at introducing the fundamentals of remote sensing. It covers the subject of electromagnetic radiation principles, remote sensing sensor characteristics, image data structure and format, metadata, image interpretation, image processing principles, remote sensing image data classification, and photogrammetry. Students work on a progression of assignments focusing on data evaluation, image spectral and geometric transformation, and image processing. Students will perform a series remote sensing image analysis by writing their own computer programs using Python or their chosen programming language.

**Course Objectives:**

The goal of this course is to ensure that students have a solid foundation of basic remote sensing technology and advanced image analysis theory and skills that will be used to the development of their major individual project (MIP). By the conclusion of this course, students are expected to be able to: 1) understand the principle of EMR and spectral signature, 2) know different remote sensing sensor geometry types, 3) understand different sensor/image resolutions, 4) understand the principle of photogrammetry, and 5) perform image analysis by developing customized scripts.

**Recommended Texts:**

- Jensen, John R. (2015). *Introductory Digital Image Processing, A Remote Sensing Perspective* (4<sup>th</sup> edition), NJ: Pearson Prentice-Hall
- Jensen, John R. (2007). *Remote Sensing of the Environment, An earth Resource Perspective* (2<sup>nd</sup> edition). Upper Saddle River, NJ: Pearson Prentice-Hall
- Handouts and links at [Canvas](#) class web site.

**Prerequisites:** GIS667 or by permission of the instructor

**Statement About Intellectual Property, Video or Audio Recording, or Screenshots**

The content of the course is the intellectual property of the faculty member and should not be disseminated or reproduced without explicit consent. To protect the privacy of all class members, no video or audio recordings of any part of video- or audio-conferences should be made without the explicit prior consent of all

students and the instructor. To protect the privacy of all class members, no screenshots or still images of videoconferences should be taken without the explicit prior consent of all students.

### **Online Learning Etiquette:**

All students are expected to participate in class by videoconferencing in a professional manner. Cameras must be kept on at all times unless arranged in advance with the professor.

### **Assignments:**

Each student will complete a series of assignments that complement the lecture presentations. The focus of the assignments will be to reinforce the theoretical concepts introduced through lectures and discussions. The assignments will include image data structure, image quality assessment, spectral and geometric transformation, as well as customizing image analysis such as calculating spectral distance, calculating spectral reflectance and NDVI, orthorectifying aerial photographs, and performing image classification.

### **Assessment:**

In addition to the assignments, there will be a mid-term exam and a final project in this course. The exams will be close book and subjects covered in both lectures and labs will be tested on.

### **Academic Honesty:**

The University policy on academic honesty (University of Redlands Catalog) will be strictly enforced. You should read this. If you have any questions about what constitutes academic dishonesty on a particular assignment, ask the professor.

### **Grades:**

Course grades will be based on the following breakdowns:

Assignments [45 hours]	25%
Readings [45 hours]	25%
Quizzes [12 hours]	10%
Exam [14 hours]	15%
Final Project [36 hours]	20%
Participation	5%

Grading scale

0-60	60-63	63-67	67-70	70-73	73-77	77-80	80-83	83-87	87-90	90-95	95-100
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A
0	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7	4.0

## Tentative Class Schedule (Spring 2025)

Meeting	Subject	Reading
Jan. 7	EMR, Spectral Reflectance, and RS Applications	RSE: 1, 2, 7
	Lab 1: RS Applications of interest    Image acquisition	DIP: 6
Jan. 9	RS Sensors and Imaging Geometry	RSE: 4
	Lab 2: Set up Python for reading and writing image data	
Jan. 14	Image Data Representation	DIP: 1, 2, 5
	Lab 3: Data Format Transformation: Flip an image	
Jan. 16	Image Metadata and Assessment	DIP: 4
	Lab 4: Calculating image statistics and histograms	
Jan. 21 (6:30pm-8:00pm)	Image Geometric Transformation	DIP: 7
	Lab 5: Basic matrix calculation in linear algebra	
Jan. 23	Image Re-sampling	Handout
	Lab 6: Image Geo-referencing and re-sampling	
Feb. 4	Image Interpretation and Scientific Visualization	DIP: 5
	Lab 7: RGB Images in Spectral Space and Image Fusion	
Feb. 6	Exam Final project proposal due	
Feb. 11	Image Processing (I)	RSE: 7, 8
	Lab 8: Image Convolution ( <a href="#">Kernels</a> )	DIP: 8
Feb. 13	Image Processing (II)	RSE: 7, 8
	Lab 9: Spectral Distance and Angles	DIP: 8
Feb. 18	Image Classification (I)	DIP: 9
	Lab 10: K-Means Clustering	
Feb. 20	Image Classification (II)	DIP: 9
	Lab 11: Region-growing	
Feb. 25	Introduction to Photogrammetry	RSE: 3, 4, 6
	Lab 12: Image Orthorectification	
Feb. 27	Final Project Presentation	

# Statements

## Accommodations

If you are a student with a disability requesting reasonable academic accommodations in this course, please contact Academic Support and Accessibility (ASA). ASA is located in the Student Success Center on the ground floor of the Armacost Library. You can reach the office at 909-748-8069 or [asa@redlands.edu](mailto:asa@redlands.edu). All requests for reasonable accommodations require registration with ASA in advance of need. Faculty, students, and ASA will work together regarding classroom accommodations. You are encouraged to discuss approved accommodations with your faculty. More information is available on the [accessibility webpage](#).

## Office of Equity and Title IX

In order to provide a safe and equitable learning environment for all students, faculty, and staff, discrimination, harassment, retaliation, sexual misconduct, and sexual harassment (including sexual assault, dating or domestic violence, and stalking) are not tolerated at the University of Redlands. The University prohibits unlawful discrimination or harassment (as defined in the [Policy Prohibiting Discrimination, Harassment, Sexual Misconduct, and Retaliation](#)) on the basis of age, color, race, ethnicity, national origin, ancestry, sex, marital status, pregnancy, status as a complaining party of domestic violence, sexual orientation, gender, gender identity or expression, physical or mental disability, genetic information, religion/creed, citizenship status (except to comply with legal requirements for employment), military/veteran status, or any other characteristic protected by law. If you or someone you know has experienced or experiences any of these behaviors, know that you are not alone. You can contact the Office of Equity and Title IX for reporting options, supportive measures, and resources to support you.

Many faculty and staff at the University of Redlands are considered “Responsible Employees,” which means that if you tell me about a situation involving any of the above, I must report the matter to the Office of Equity and Title IX. Although I make that report, you are in control of how you would like to proceed, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of reporting options available to you and have access to the support and resources you need.

To report an incident directly, you can:

- Contact the Interim Director of Equity & Title IX, Christopher Jones, at 909-748-8289 or [titleix@redlands.edu](mailto:titleix@redlands.edu)
- [Report online](#) at: <https://www.redlands.edu/offices-directory/offices/office-of-equity-and-title-ix>

You can also report to local law enforcement at 909-798-7681, ext. 1. If you are ever in immediate danger, please call 911 or email/text [911@redlandspolice.org](mailto:911@redlandspolice.org) if you cannot call. To reach Public Safety on campus, call 909-748-8888 or use the [Rave Guardian](#) app.

If you wish to speak to someone confidentially (meaning not connecting with the Office of Equity and Title IX Office), you can contact the following resources:

Campus:

[Counseling Center](#): 909-748-8108 or 24-Hour Crisis Line: 909-748-8960

[TimelyCare](#), 24/7 emotional support; 12 free telehealth counseling sessions

Community:

[Partners Against Violence](#), 24-hour sexual assault crisis line: 909-885-8884

[Option House](#), 24-hour dating/domestic violence crisis line: 909-381-3471

Online:

<https://www.rainn.org/> (sexual assault);

<https://www.loveisrespect.org/>

For more information, visit [www.redlands.edu/titleixandequity](http://www.redlands.edu/titleixandequity)

## Writing Tutoring

Peer writing tutoring is available in-person and online throughout the semester. You can visit a tutor at multiple stages of your writing process for each project/ assignment/ essay/ etc. You and your tutor can have a brainstorming conversation if you aren't sure where to begin, and you can continue to meet throughout your drafting and revision process. Please note that tutors can assist with writing in ALL disciplines, not just the humanities.

You can schedule a tutoring session at <https://redlands.mywconline.com>.

You can contact the office of Academic Support and Accessibility at [asa@redlands.edu](mailto:asa@redlands.edu) or call 909-748-8069 if you have any questions. They're happy to help any time!

## Subject Tutoring

Peer subject tutoring is available in-person and online throughout the semester for many courses. You can select your specific course when you log in to the Subject Tutoring Fall 2024 schedule at <https://redlands.mywconline.com>. Select the tutor and time of your choice. All tutors are students who have taken the same course, often with the same instructor. You will need to book your tutoring session at least one day in advance and provide details about what you would like to work on to allow your tutor enough notice and preparation time.

You can meet with your tutor as little or as often as you'd like, up to two hours per week per course. Students at the UoR use tutoring to work on all academic goals, from better understanding difficult concepts to achieving a 4.0. Tutoring is individualized to each student.

You can contact the office of Academic Support and Accessibility at [asa@redlands.edu](mailto:asa@redlands.edu) or call 909-748-8069 if you have any questions. They're happy to help any time!

## Counseling Center

The Counseling Center provides free and confidential mental health services, including short-term individual therapy, group therapy, single-session therapy, consultations, and urgent appointments to all students with in-person or virtual options. Our Counseling Center is committed to inclusivity and to providing a supportive space for everyone. Please call 909-748-8108 to schedule an appointment or email [counseling\\_center@redlands.edu](mailto:counseling_center@redlands.edu). If a student is in crisis, please call 909-748-8960 for the 24/7 mental health crisis line. For more information on our resources, go [here](#). Another option for individual therapy for all students is [TimelyCare](#), which provides virtual therapy immediately (Talk Now) or up to 12 scheduled virtual therapy sessions per year. Students can choose their therapist from a list of providers for the scheduled therapy option.

## CARE Team

The University [CARE Team](#) exists to help provide support and resources to students that are overwhelmed, experiencing significant distress, or possibly present some risk to themselves or others. As a faculty member, I may reach out to students about whom I am concerned to talk individually, and/or refer them to the CARE Team. If you have concerns about a fellow student, consider sharing your concern with the CARE Team via their [online form](#). This is part of who we are as a caring, proactive community where we all look out for one another. Additionally, if you feel that you or someone else needs immediate mental health support, the University has a 24/7 mental health crisis line at 909-748-8960, and the [Timely Care](#) app, which offers on-demand emotional care. Both services connect to a live, licensed counselor.

## Emergency Student Loans:

Student Financial Services (SFS) administers a short-term, no-interest loan fund to assist students experiencing an emergency or cash-flow problem. Except in unusual circumstances, these loans do not exceed \$200 and are billed to the student's account. Evidence of repayment ability is a prerequisite for all short-term loans made to students. Students are eligible one emergency student loan per term.

**Contact:** [SFS@redlands.edu](mailto:SFS@redlands.edu) or x8047

## Student Food Support Pantry:

The Student Food Support Pantry is a resource available to all established full and part-time University of Redlands students facing food insecurities. The Pantry is located on the north side of North Hall (look for the banner with Bulldog on it). Hours of operation are Monday through Friday from 11:30 a.m. to 6:00 p.m. year-round. This space is an open, no-questions-asked space with dried and canned goods, and non-perishable items, as well as seasonal fresh produce from our sustainable farm and limited refrigerated goods. Food for this distribution is provided in partnership with Feeding America Riverside and San Bernardino. It is also funded through private donations and the Office of Community Service Learning. For more information, please contact [SURF@redlands.edu](mailto:SURF@redlands.edu)

## Conflict Resolution Center

Experiencing a conflict? Whether it's with a friend, roommate, another member of a student organization, or faculty or staff member, conflicts happen. Learning to navigate conflicts is

important to success in virtually any field, and a vital step in being a part of a community and having healthy, meaningful relationships with others. Please contact [crc@redlands.edu](mailto:crc@redlands.edu) for more information.

## Book Lending Program:

The Book Lending Program is an initiative to ensure the academic success of First-Generation students (students who are the first to go to college in their families and who meet a particular estimated family contribution [EFC] level). Funded through alumni donations, this program provides books and other classroom materials, when needed, for First-Generation students who could not otherwise afford to purchase them. Books are returned at the end of the course, to be used by other First-Generation students the next semester. The program works alongside the Library and faculty members to ensure the availability of books and classroom materials. For more information, see <https://www.redlands.edu/student-life/student-resources/diversity-on-campus/programs/book-lending-program>

**Contact:** [blp@redlands.edu](mailto:blp@redlands.edu)

## Technology Lending

The Armacost Library provides loans of laptops and other technology, including Bluetooth headphones, digital audio recorders, and smart pens, which can assist with note-taking and audio recording. For those needing ergonomic or accessibility devices, the library has ergonomic keyboards, high visibility keyboards, an ergonomic joystick, and an ergonomic trackball. These resources are accessible to all University of Redlands students on a first-come, first-served basis. For a full list and to check the availability of these items, please visit the [Armacost Library webpage](#) or call (909) 748-8022.

## Student Discretionary Fund:

The Student Discretionary Fund, managed by Student Affairs, is designed to support student success by addressing financial challenges that could otherwise lead a student to pause or discontinue their education. Divisional leadership will be informed of the student's need for financial assistance to access this fund. The support provided can cover a range of personal expenses, including utility bills, gas money, emergency travel home due to a family tragedy, off-campus counseling, medical costs, and occasionally mental health assessments. Grants from this fund are awarded based on the student's financial need. To apply, students can complete the Student Discretionary Fund Application, which is available at <https://forms.office.com/r/aX7dvAnbG2> or contact [student\\_affairs@redlands.edu](mailto:student_affairs@redlands.edu).

## Student Lounges:

Lounges for all students to sit, work, and eat can be found [here](#) on the University website.