

## **SSCI 588, Remote Sensing for GIS**

### *Syllabus*

**Units:** 4

**Term:** Fall 2025

**Day Time:** Mon/Thu, 2:00-3:50pm

**Location:** AHF 145D (Section 35719D) and DEN@Dornsife (Section 35720D)

**Instructor:** Yi Qi, PhD

**Office:** AHF B55J

**Office Hours:** TBD

**Contact Info:** [yi.qi@usc.edu](mailto:yi.qi@usc.edu), 213-821-1589

**Library Help:** Andy Rutkowski

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**Office Hours:** By Appointment

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu)

**IT Help:** Spatial Support

**Contact Info:** [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu)

## **Course Scope and Purpose**

SSCI 588: *Remote Sensing for GIS* is a required course in the Spatial Data Management track of the Geographic Information Science and Technology (GIST) M.S., the Human Security and Geospatial Intelligence M.S., and the Remote Sensing for Earth Observation Graduate Certificate program. This class also counts as an elective in the Coding and Apps and Analytics track of the GIST M.S. and the GIST and Geospatial Intelligence Certificate Programs.

This course serves those who have prior background in GIS and want to harness their expertise in the remote sensing as a cornerstone in geospatial world. The first part of the course focuses on the principles in remote sensing with specific focus on the earth observation remote sensing missions and the key components in optical remote sensing systems and image characteristics. The second part of the course will focus on the integration of remote sensing and GIS including the remote sensing project design and management, digital imagery management, digital elevation model and terrain analysis, and key image analytic processes.

This a graduate level course, so you should expect this class to be both academically robust and intellectually challenging. As graduate students you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. The instructor's role is that of a guide who keeps you on this path of discovery and you will find that you will learn much from your fellow classmates.

## ***Learning Objectives***

When you have completed this course, you will be able to:

- Explain the principles of remote sensing and the technical characteristics and constraints of Earth Observation missions.
- Design, implement and critically evaluate methods of digital image processing ranging from preprocessing to image classification, field data collection and accuracy assessment.
- Generate geographical information by processing digital remotely sensed data and critically evaluate its use for human security and/or environmental applications.
- Critically evaluate the opportunities and available methods for integrating remote sensing and GIS.

Students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.

**Prerequisite(s):** None

**Co-Requisite (s):** None

**Concurrent Enrollment:** None

**Recommended Preparation:** SSCI 581: Concepts for Spatial Thinking

## **Class Conduct**

**Harassment, sexual misconduct, interpersonal violence, and stalking** are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations you may contact the Title IX Coordinator directly (titleix@usc.edu or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours)

**Diversity and Inclusion** – It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful to everyone, and you are also expected to respect of others regardless of their race, ethnicity, gender identity and expressions, cultural beliefs, religion, sexual orientation, national origin, age, abilities, ideas and perspectives, or socioeconomic status. Your suggestions are encouraged and appreciated. Feel free to let me know ways to improve the effectiveness of the course for you personally or for other students.

## **Course Structure**

All course materials will be organized through Brightspace and will generally unfold on a weekly basis, with the week's material posted at the start of the week. The main theoretical concepts will be provided through course notes and assigned readings, and at times recorded video presentations. Hands-on practical exercises will use various software products accessible over the Internet. Assignments will give you an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments require student interaction; all will benefit from it.

*Workload* – This is a four credit, one semester graduate level course. Students should expect to spend 10-15 hours per week to complete the work in this class.

## **Technological and Communication Requirements**

All software this course will use is provided online via the GIST Server; hence, you do not need to install it on your own computer. Instead, every student must have the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone for use whenever a presentation or meeting is scheduled.
- An up-to-date web browser to access the server

A limited number of computers with all the necessary software is available in the SSI Suite (AHF B55) during regular business hours, Monday through Friday 9 am to 5 pm. To reserve a computer, please use this link: <https://calendly.com/usc-ssi/the-ssi-suite-ahf-b55-student-computers-1?month=2024-09>. These computers are available to any student in an SSCI or GSEC course and can be used as a resource if you experience difficulties in accessing the SSI server or using the GIS software on your personal computer.

If a student does not have access to any of these, please speak with the instructor at the start of the semester. Also, see the USC ITS Student Toolkit here:

<https://keepteaching.usc.edu/students/student-toolkit/>

*Brightspace* – This course will utilize the Brightspace learning management system which allows students to access course content, upload assignments, participate in discussion forms, among other learning experiences. The Brightspace platform provides flexibility in the learning experience where students can participate in the course residually or remotely, synchronously (meeting together at the same time) or asynchronously (accessing videos and course content outside of class).

*SSI Server and Tech Support* – This course utilizes the SSI Server which is a virtual desktop giving access to many different professional software. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to SSI Tech Support at [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), making sure to copy (cc) me on the email.

*Communications* – All assignments given and all materials to be handed in will be submitted via Brightspace. The instructor will also create and monitor discussion forums through which students can discuss issues and assignments as needed. Students should read all email sent from Brightspace or from course instructor(s) as soon as possible. Also, students who do not regularly use their USC email accounts should double-check to be sure that mail sent from both the Brightspace accounts and the instructor's account (noted above) to your USC account is forwarded to an address used regularly and does not go into junk mail. The instructor will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case that an instructor is off-line for an extended period of time, an announcement will be posted to the class Brightspace site. Due to the synchronous and asynchronous nature of this course, it is each student's responsibility to stay informed and connected with others in our course. In addition to email, students are expected to login to Brightspace regularly to check for announcements.

*Discussion forums* – On the Brightspace site, I will post a series of discussion threads relevant to

various sections of the course. Discussions provide a key means for student-to-student discussion and collaboration that can replicate the face-to-face contact you may have experienced in traditional classrooms. Here students can provide support to each other while working on your assignments, sharing hints and helpful tips, as you would in a classroom laboratory. Please post your questions about assignments there, as you would ask them publicly in the classroom. I monitor the discussion threads and offer comments when necessary, but more importantly, consider the discussion board a key way to connect with your classmates and share your discoveries.

## **Required Readings and Supplementary Materials**

Textbooks – There are textbooks for this course. The first book by Campbell is required and can be purchased from online outlets such as Amazon, accessed via VitalSource.com or purchased from the USC Bookstore. The second book by Parece and McGee is optional and can be purchased on Amazon either as a paperback or a Kindle version. Some contents are available on the website: <https://pressbooks.lib.vt.edu/remotesensing/>

- Campbell, J.B., 2023. *Introduction to Remote Sensing*, 6<sup>th</sup> edition. New York, Guilford Press.
- Parece, T.E. and McGee, J.A. *Remote Sensing with ArcGIS Pro: 2nd Edition*.

These textbooks will be supplemented with Course Notes and a mixture of readings from academic journals, professional reports, and authoritative websites which will be posted to Brightspace.

## **Description and Assessment of Assignments**

### ***Weekly Assignments***

There are several different kinds of assignments with at least one due weekly. These are described in the Weekly Folders on Brightspace. Due dates are shown in the summary that follows.

*Resume Assignment – 1 worth 3 points.* We require all current students to post and maintain a public resume, short biography and recent photo on the shared SSI Student Hub on Brightspace . With your permission, your photo and resume will be posted to the Spatial Sciences Institute website and your resume will be included in the GIST Resume Book. The latter is compiled annually and along with our web presence used to promote our programs and more importantly, your skills, experience, and professional aspirations.

*Reading Assignments – 5 worth a total of 15 points* – Each student is required to complete ten reading assignments for this class. The reading assignments will focus on the theory portion of the course as presented in the weekly readings. The objective of the reading is to help you evaluate and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work and some will be individual efforts.

*Lab - 5 worth a total of 40 points* – These will be scheduled throughout the semester and will require you to work through individual chapters of the Parece and McGee (2023) workbook during the weeks they are assigned. To demonstrate that you have completed each chapter, you will turn in a quick copy of some digital output or brief text answers from the final part of the exercise such as a .jpg of the map produced at the final step.

*Mid-Term Exam – 1 worth of a total of 10 points.* The mid-term will cover material learned in the first half of the semester. It may be mixed format and may consist of multiple choice, short answer, and hands-on calculations.

*Final Exam – 1 worth a total of 10 points.* The final exam will cover material learned over the duration of the semester. It may be mixed format and may consist of multiple choice, short answer, and hands-on calculations.

*Class Activities – 1 worth a total of 3 points.* The class activities will include in-class exercises, online discussions, and various forms that promote active engagement and participation.

### **Final Project**

The final project will provide you the opportunity to integrate learning from various aspects of the course through the practice of a more in-depth assignment. The final project will require independent case study where you design and complete a full chain of analysis using remotely sensed data. More detailed instruction on the final project will be discussed in the class.

*Presentation - 3 worth a total of 9 points.* 3 separate presentations are required to report the status of important milestones.

*Research Report - 10 points.* The final report is a professional writing of your finished research project or literature review.

### **Grading Breakdown**

Careful planning and a serious, consistent commitment will be required for you to successfully navigate the various deliverables in this course. The table below summarizes the SSCI 588 course assignments and their point distribution:

Assignments	Number	Points Per Assignment	Total Points
Lab	5	8	40
Reading Assignments	5	3	15
Resume Assignment	1	3	3
Final Project Written Report	1	10	10
Final Project Oral Presentations	3	3	9
Mid-Term Exam	1	10	10
Final Exam	1	10	10
Class Activities	1	3	3
<b>Totals</b>	<b>18</b>		<b>100</b>

## Grading Scale

Assignments in this and other SSCI courses, are graded on the letter grade scale where A is exemplary, B is very good, C is satisfactory, D is unsatisfactory, and F needs improvement. Final grades use the same letter grade scale with C being the minimum passing grade for credit at the graduate level. The grading scale follows:

A	> 93 points		B-	80-82 points		D+	67-69 points
A-	90-92 points		C+	77-79 points		D	63-66 points
B+	87-89 points		C	73-76 points		D-	60-62 points
B	83-86 points		C-	70-72 points		F	<60 points

### Assignment Submission Policy

Unless otherwise noted, all assignments must be submitted via Brightspace by 11:59 pm Pacific Time (PT) on due dates specified in the Course Schedule below. Your attention to on-time assignment submission is essential if I am to meet my goal to return comments on your submitted assignments before the next one is due. Sometimes this is impossible, so I will post a notice on anticipated delays if needed.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 25% points/day up to FOUR days late. No points will be given for submissions more than FOUR days late.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of classes.

Any exceptions to these turn-in assignments are only made by me in coordination with individual students. An example of an exception would be a student's illness or injury that reasonably prohibits course involvement/participation.

### SSI Policy on the Creation of Original Work and Use of Generative AI

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. Students may not have another person or entity complete any substantive portion of an assignment or reuse work prepare for courses without obtaining written permission from the instructor(s). Developing strong competencies in research, writing, and the technical execution of geospatial technologies are foundational to SSI academic programs that are designed to prepare you for success in the workplace. Therefore, using generative AI tools – unless explicitly specified otherwise – is strictly prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

## Grading Timeline

My goal is to provide grading and feedback on each course assignment no later than two weeks after the assignment was submitted.

## Learning Experience Evaluations

Please note Learning Experience Evaluations for the course take place at the end of the semester and are facilitated by the University. These evaluations provide an important review of student experiences in the course.

## Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposed other than individual or group study is prohibited. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which has been distributed to students or in any way has been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

## Course Schedule

Week	Topic	Readings	Deliverables
Module 1: Principles in Remote Sensing			
Week 1 8/25	<b>Remote Sensing Principles:</b> Examination of the history and modern-day scope of remote sensing.	Campbell 1, 2	



<b>Week 2</b> 9/1 *Monday, 9/1 is university holiday (Labor Day)	<b>Image Acquisition – Optical Sensors:</b> Examination of the fundamentals involved in image acquisition, digital photographic sensor systems, the role and importance of digital data, the typical steps that would be involved in transforming these digital data into information (i.e. image interpretation), and the various Earth observation missions launched thus far.	Campbell 3, 4, 5, 6	Resume Assignment (9/5)
<b>Week 3</b> 9/8	<b>Image Acquisition – Optical Sensors:</b> Examination of the fundamentals involved in image acquisition, digital photographic sensor systems, the role and importance of digital data, the typical steps that would be involved in transforming these digital data into information (i.e. image interpretation), and the various Earth observation missions launched thus far.	Campbell 7, 8, 9	Reading Assignment # 1 (9/12)
<b>Week 4</b> 9/15	<b>Image Acquisition – Active Sensors:</b> Examination of the various contributions provided by microwave, LiDAR as well as the role of image resolution in projects when integrating remote sensing and GIS.	Campbell 10	Lab # 1 (9/19)
<b>Week 5</b> 9/22	<b>Image Resolution:</b> Continuation of the examination of the importance of the different components of resolution: spatial, spectral, radiometric and temporal.	Campbell 10	Reading Assignment # 2 Final Project Presentation #1 (9/26)
<b>Module 2: Remote Sensing Image Analysis</b>			
<b>Week 6</b> 9/29	<b>Analysis – Preprocessing:</b> Examination of the typical remote sensing for GIS workflow that starts with one or more forms of preprocessing (i.e. feature extraction, radiometric, and geometric corrections).	Campbell 11	Lab # 2 (10/2)
<b>Week 7</b> 10/6 *10/9-10/10 is university holiday (Fall Recess)	<b>Image Classification, Part I:</b> Continuation of the examination of the typical remote sensing for GIS workflow that includes with the process of assigning pixels to classes using one or more forms of digital image classification.	Campbell 12	Reading Assignment # 3 (10/10)

<b>Week 8</b> 10/13	<b>Image Classification, Part II:</b> Continuation of the examination of the typical remote sensing for GIS workflow that includes with the process of assigning pixels to classes using one or more forms of digital image classification.	Campbell 12	Lab # 3 (10/17)
<b>Week 9</b> 10/20	<b>Image Classification, Part III:</b> Continuation of the examination of the advanced image classification that include deep learning and artificial intelligence	Campbell 13, 14	Mid-term (10/23)
<b>Week 10</b> 10/27	<b>Field Data &amp; Accuracy Assessment:</b> Conclusion of the typical remote sensing for GIS workflow that is completed with the collection and use of field data for model calibration and accuracy assessment.	Campbell 15	Reading Assignment # 4 (10/31)
<b>Module 3: Integrating GIS and Remote Sensing</b>			
<b>Week 11</b> 11/3	<b>Integrating GIS and Remote Sensing, Part I:</b> Conclusion of the course involves looking at the various ways in which GIS and remote sensing have been integrated.	Notes	Lab # 4 Final Project Presentation #2 (11/7)
<b>Week 12</b> 11/10 *Tuesday, 11/11 is university holiday (Veterans Day)	<b>Integrating GIS and Remote Sensing, Part II:</b> Continuation of the evaluation of integrating remote sensing and GIS.	Notes	Reading Assignment # 5 (11/4)
<b>Week 13</b> 11/17	<b>Integrating GIS and Remote Sensing, Part III:</b> Demonstration of the many applications of Remote Sensing and GIS – Part I.	Campbell 17, 18	Lab # 5 (11/21)
<b>Week 14</b> 11/24 *11/26-11/28 is a university holiday (Thanksgiving)	<b>Gallery of Applications:</b> Demonstration of the many applications of Remote Sensing and GIS.	Campbell 19, 20	

<b>Week 15</b> 12/1	<b>Course Review</b>	Campbell 21	Final Report Final Project Presentation #3 (12/5)
<b>Final Exams</b> 12/10-12/17	Final Exam Date (TBD)		

## Statement on Academic Conduct and Support Systems

### ***Academic Integrity***

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

### ***Students and Disability Accommodations***

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a

Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](https://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu)

### **Support Systems**

**Counseling and Mental Health** - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

**988 Suicide and Crisis Lifeline** - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

**Relationship and Sexual Violence Prevention Services (RSVP)** - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

**Office for Equity, Equal Opportunity, and Title IX (EEO-TIX)** - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

**Reporting Incidents of Bias or Harassment** - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

**The Office of Student Accessibility Services (OSAS)** - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

**USC Campus Support and Intervention** - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

**Culture Journey**- (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

**USC Emergency** - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

**USC Department of Public Safety** - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

### ***Resources for Online Students***

The Course Brightspace page and the SSI Student Hub on Brightspace have many resources available for distance students enrolled in our graduate programs. In addition, all registered students can access electronic library resources through the link <https://libraries.usc.edu/>. Also, the USC Libraries have many important resources available for distance students through the link: <https://libraries.usc.edu/faculty-students/distance-learners>. These include instructional videos, remote access to university resources, and other key contact information for distance students.