GEOG 2750
REMOTE SENSING AND GIS

Course Description

This course gives students a fundamental understanding of the theories and techniques used to process and analyze satellite and drone data. Topics include image and sensor characteristics, satellite and drone data information, and image interpretation and analysis.

- Textbook | Resources Provided by Instructor
- Semester: Spring
- Additional Course Fee Required
- Prerequisite: GEOG 2500 Introduction to GIS

Course Student Learning Outcomes

- Distinguish between different types of remote sensing systems and unmanned aircraft systems.
- Identify the appropriate satellite and drone sensors for the application under consideration.
- Specify the strengths and limitations of various remote sensing systems and drones.
- Explain the basics of the electromagnetic spectrum.
- Preprocess and analyze remote sensing and drone data.
- Implement and interpret the results from unsupervised, supervised, and other object-based classification techniques.
- Assess and document the spatial and attribute accuracy of remote sensing and drone data.
- Construct and analyze 3D terrain and building models created with Light Detection and Ranging (LiDAR and drone data).

Communication Plan

I will respond to your emails within 48 hours and offer feedback on major assignments within one week of the due date. The best way to contact me is via the Canvas inbox, as I will prioritize this email over other modes of communication.

Additionally, I will participate in the discussion forums with you to share my perspective within the discipline and offer some nuances of interpretation that may not be present in your textbook.

Lastly, we'll hold small group Q&A sessions to learn from our peers (and faculty) on some of the more difficult units within the course.

Keys for Success

This syllabus represents an "agreement" between you and the instructor. It is designed to ensure course integrity and fairness and provides students with a clear understanding of course expectations. The instructor and students are expected to use the syllabus and schedule as a guide for the semester. Any deviation from the syllabus or schedule will be discussed and agreed upon by the instructor and students.

The course will take the entire Fall semester. Each week, you will have several assignments. These will include reading and answering quizzes on the readings, earning several ESRI Virtual Campus Certificates, learning map interpretation skills, creating or critiquing maps, participating in online discussions, and doing some professional career development.

It is designed to teach the information and skills required by discipline and to develop vital workplace skills, strategies, and skills for lifelong learning. Education is more than acquiring facts; it uses information meaningfully to enrich one's life.

While each course's subject is essential and valuable, we become genuinely educated by connecting such varied information with the different methods of organizing human experience practiced by different disciplines. Therefore, combined with other courses, this course will enable you to develop broader perspectives and deeper understandings of your community and the world and challenge previously held assumptions about the world and its inhabitants.

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Course Procedure

Active participation in activities is expected. You will be expected to interact with others during class and participate in group discussions. Most of the assignments you complete for the course will be submitted online using Canvas LMS. There are also Canvas apps available.

All the mapping assignments will be done electronically using Esri's ArcGIS platform. The classroom has a computer lab if you want to use it, or students are encouraged to bring their laptops. All students will gain access to ArcGIS to download on a personal computer.

It is HIGHLY recommended that you set up Canvas so it can send you messages to your email, cell phone, Facebook, or Twitter accounts. When your instructor sends out announcements, messages, and information on Canvas, you will be notified in the media you designate

Assignment Description

GIS Assignments

Each module will have a series of mapping activities to build your knowledge and skill sets in applying geographic information systems (GIS). The assignments will range in length and difficulty level, which will also determine the point structure for each assignment.

Module Quizzes

Each module will also have a quiz focusing on the learning objectives listed in that module. The open-book quizzes consist of ten randomly selected questions from an assessment database, and each quiz is worth ten points.

Professional Portfolio

GIS has always been a portfolio discipline where you provide potential employers with your best work. As GIS has become more web-based, you will learn how to create an electronic professional portfolio to link your web maps, ArcGIS Insights, and ArcGIS StoryMaps within this portfolio. The total points for the professional portfolio is 100 points.

Grading Scale

GRADE	SCORE RANGE
A	100-94 percent
A-	93-90 percent66
B+	89-87 percent
B	86-84 percent
B-	83-80 percent
C+	79-77 percent
C	76-74 percent
C-	73-70 percent
D+	69-67 percent
D	66-64 percent
D-	63-60 percent

E	Less than 60 percent

Incomplete Grade Policy

If circumstances make you unable to complete the course in the regular time frame, you may work with the instructor to take an incomplete. Students must be passing and have completed 75% of the course work to be granted an incomplete. Students are responsible for planning for successful course completion.

Assignment Schedule

Module 1 | Remote Sensing Fundamentals

- 1.1 Assignment | ArcGIS Accounts
- 1.2 Quiz | Module 1

Module 2 | Acquiring Remote Sensing Data

- 2.1 Assignment | Explore Dynamic Imagery of a Volcanic Eruption
- 2.2 Assignment | Download Imagery from an Online Database
- 2.3 Assignment | Getting Started with Imagery and Remote Sensing
- 2.4 Quiz | Module 2

Module 3 | Analyzing and Extracting Remote Sensing Data

- 3.1 Assignment | Assess Burn Scars with Satellite Imagery
- 3.2 Assignment | Prepare Imagery and Raster Data for Analysis
- 3.3 Assignment | Georeference Historical Imagery
- 3.4 Assignment | Learn the Fundamentals of Image Interpretation
- 3.5 Assignment | Introduction to Image Classification
- 3.6 Quiz| Module 3

Module 4 | Image Classification

- 4.1 Assignment | Calculate Impervious Surfaces from Spectral Imagery
- 4.2 Assignment | Assess Hail Damage in Cornfields with Satellite Imagery
- 4.3 Assignment | Classify Land Cover to Measure Shrinking Lakes
- 4.4 Assignment | Image Classification using ArcGIS
- 4.5 Assignment | Assess the Accuracy of a Perviousness Classification
- 4.6 Assignment | Performing Unsupervised Pixel-Based Image Classification
- 4.7 Assignment | Performing Supervised Object-Based Image Classification
- 4.8 Assignment | Performing Supervised Pixel-Based Image Classification
- 4.9 Assignment | Performing Accuracy Assessment for Image Classification
- 4.10 Quiz | Module 4

Module 5 | Three-Dimensional Remote Sensing Data

- 5.1 Assignment | Getting Started with 3D Basemaps

- 5.2 Assignment | Map Hurricane Storm Surges
- 5.3 Assignment | Estimate Solar Power Potential
- 5.4 Assignment | Using Lidar Data in ArcGIS Pro
- 5.5 Assignment | Extract 3D Buildings from Lidar Data
- 5.6 Quiz | Module 5

Module 6 | Drone Imagery and Analysis

- 6.1 Assignment | Get Started with ArcGIS Drone2Map
- 6.2 Assignment | ArcGIS Drone2Map Basics
- 6.3 Assignment | Evaluate the Accuracy of Ground Control Points
- 6.4 Assignment | Create 2D Products with ArcGIS Drone2Map
- 6.5 Assignment | Use Catalog Datasets in ArcGIS Drone2Map
- 6.6 Assignment | Monitor Wind Conditions for Oil Leasing Sites
- 6.7 Assignment | Monitor Forest Change Over Time
- 6.8 Assignment | Inspect Infrastructure with ArcGIS Drone2Map
- 6.9 Quiz | Module 6

Module 7 | Deep Learning with Remote Sensing and GIS

- 7.1 Assignment | Detect Objects with Text SAM
- 7.2 Assignment | Detect Palm Trees with a Deep Learning Pre-trained Model
- 7.3 Assignment | Improve a Deep Learning Model with Transfer Learning
- 7.4 Assignment | Deep Learning using ArcGIS Online
- 7.5 Assignment | Deep Learning using ArcGIS Pro
- 7.6 Assignment | Extracting Features with Deep Learning using ArcGIS Online
- 7.7 Assignment | Making Predictions from Multidimensional Data Using ArcGIS Online
- 7.8 Assignment | Analyze Imagery with Raster Functions Using ArcGIS Online
- 7.9 Assignment | Classifying Objects using Deep Learning in ArcGIS Pro
- 7.10 Quiz | Module 7

Module 8 | Leveraging the Power of GIS with Remote Sensing

- 8.1 Assignment | Analyzing Imagery with Raster Functions using ArcGIS Online
- 8.2 Quiz | Module 8

Transfer/Certification/Licensure/Employment Information

This course is required for those interested in the Earth and Environmental Science AS degree. The AS degree directly transfers to most four-year higher education institutions within Utah.

The Earth and Environmental Science Department also offers the following programs of study: GIS and Drones AAS, a GIS Certificate of Proficiency, and a Drones Certificate of Proficiency.

Institutional Policies

As members of our academic community, we would like to invite you to review the Institutional Syllabus, which covers important policies and procedures. This document contains important links for students on the code of student rights and responsibilities, academic integrity, grading policies, Title IX, and other important acknowledgments. By familiarizing yourself with this information, you can help us create a safe and respectful environment for everyone.

You can access the document by clicking on the following link: Institutional Syllabus

Learning Support and Tutoring Services

We are pleased to offer a range of tutoring and learning support services to help you achieve your academic goals. Whether you need assistance with a specific subject or want to improve your study skills, you have many options for tutoring or other support.

To learn more about the services we offer and how to access them, please visit the Institutional Syllabus under the Tutoring and Learning Support tab: Institutional Syllabus

We encourage you to use these resources to help you succeed in your studies. If you have any questions or would like to schedule a tutoring session, please don't hesitate to contact us. We are here to support you in any way we can.

Advising and Counseling Support Services

Our institution is committed to supporting your academic and personal growth. That's why we offer a range of advice and counseling services to help you navigate the challenges of college life. To learn more about the resources available to you and how to access them, please visit the Institutional Syllabus under the Advising and Counseling Support Services tab: Institutional Syllabus

Our advising team and the support centers across campus are here to help you achieve your goals and overcome any obstacles you may face.

Student Academic Calendar

As students, you should be aware of all important dates in the semester, such as the day that courses begin and end, as well as the drop date and the last day to withdraw. To learn more about those dates, navigate to the Student Academic Calendar: SLCC Student Academic Calendar