GEOSCIENCES (GEO) 2200/4200: GEOSPATIAL DATA ACQUISITION

SPRING SEMESTER 2020

NOTE: Dual-listed courses: Lower-division (blue) and upper division courses (green) are color-coded to indicate unique information related to each course.

Meeting Time:	TO BE DETERMINED
Location	TO BE DETERMINED
Instructor:	Michael W Hernandez, Ph.D. Department of Geosciences
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Communication:	**WSUOnline – Canvas messaging system (preferred)** mhernandez@weber.edu (alternate)
Office Hours:	TO BE DETERMINED OR by appointment

REQUIRED MATERIALS

Kaplan, Elliott D., Hegarty, Christopher. (2017) *Understanding GPS/GNSS: Principles and Applications, 3rd Edition.* Artech House. ISBN-13: 978-1630810580.

ADDITIONAL MATERIAL

There will be multiple readings related to ***GNSS / smartphone data collection methods, drone data processing, and field campaign planning*** assigned by the instructor throughout the semester.

COURSE DESCRIPTION & OBJECTIVES

- This applied geospatial course introduces students to primary data collection methods in the field, with emphasis on GPS/GNSS, sUAS (drone), and smartphone/tablet operations. The main objective is to provide students with the knowledge and skills needed to successfully plan and execute field campaigns that result in the accurate collection and processing of geospatial data that can be used in a variety of applications. After successful completion of this course, you will know the fundamental techniques needed to effectively and accurately collect and process the most common types of geospatial field data

- *The specific objectives of the course are:*
    1) Provide students with fundamental understanding of satellite positioning using GPS and other satellite constellations (GNSS).
    2) Expose students to the collection, processing, and evaluation of data acquired from drones (small Unmanned Aerial Vehicles).
    3) Introduce students to "best practices" for planning field campaign to collect geospatial data (e.g., defining objectives, selection of proper equipment, training of staff, setting up geospatial data dictionary, etc.).

4) Introduce students to field data collection using other instruments/supporting software (e.g., smartphones/tablets, laser range finders, total stations, etc.).
5) Evaluate student learning through completion of a final project. Students will design and implement a field data acquisition campaign that addresses a real-world application.
6) Evaluate student communication skills through presentation of their final project results in both a professional 10-minute talk and an online forum (e.g., ESRI Story Map).

STUDENT LEARNING OUTCOMES (SLOS)
By the end of the course, students are expected to:

1. Understand the different methods for collecting geospatial data in the field and other inputting data into a GIS.
2. Understand the fundamentals of GNSS (i.e., GPS, GLONASS, Galileo, etc.) positioning, including errors, biases, and correction methods.
3. Apply, analyze, and evaluate basic geospatial data collection techniques using GNSS.
4. Understand the fundamental concepts of drone operations, including flight planning, data collection, FAA regulations.
5. Apply, analyze, and evaluate drone-collected data for generation of 3D-point clouds and surface models.
6. Understand, apply, and analyze field data collected using geospatial software on smartphones/tablets.
7. Create a plan for a geospatial field campaign using some methods discussed in SLOs 1 – 6.
8. Apply the concepts, field techniques, and instrument operations to complete a field campaign designed in SLO 7 to solve a geospatial problem.

PREREQUISITE:
- GEO 1720: GEO 1710
- GEO 3720: GEO 3710

LAB FEES
- $50
- The fees in this course are used to purchase expendables such as printer paper and color printer cartridges used for student printing in the lab. The remaining funds are pooled with funds from other courses to help pay for nonexpendable items such as field equipment (drones, GNSS units, tablets, etc.), annual software license fees (e.g., ESRI ArcGIS, ENVI, Trimble, etc.) and replacement of computer workstations.

COURSE POLICIES

Methods of Evaluation: Grades are based on overall performance, measured by the scores earned from **exams, lab exercises, and a final project** assigned during the semester. This course will use the standard +/- grade scale in accordance with university policy. Final grades will be awarded using the following percentage scale that is based on the total number of points earned divided by the total number of available points.

A	93.0+%	B-	79.0-81.9%	D+	66.0-68.9%
A-	89.0-92.9%	C+	76.0-78.9%	D	63.0-65.9%
B+	86.0-88.9%	C	72.0-75.9%	D-	60.0-62.9%
B	82.0-85.9%	C-	69.0-71.9%	E	<60.0%

2 Exams (30% of grade)
10 Labs (30% of grade)
1 Final Project (40%)

Upper Division Course Credit Requirements

This is a **dual-listed course** where lower division or upper division credit is earned with successful completion of the course, earning a grade of C or better. ***Students enrolled in the upper division section of the course will have additional requirements that demonstrate a higher level of learning*** on **labs** (e.g., *challenge problems*), **exams** (e.g., *essay questions*), and **the final project** (i.e., *different project with more comprehensive objectives*).

Methods of Instruction: Instruction may include, but not limited to, the following methods:

- Lecture / Discussion
- Outdoor Field Work
- Class Demonstrations
- Learning Modules (online)
- Audio-Visual Material (e.g., online videos)
- Collaborative Learning
- Computer Assisted Instruction
- Lab Exercises

COURSE OUTLINE

Week	Date	UNITS	SLOs (number)	Labs Due
1		UNIT 1: Introduction to Geospatial Data Collection		
		Lab 1:		
2		UNIT 2: Fundamentals of GPS / GNSS		
		No Lab		Lab 1
3		Fundamentals of GPS / GNSS (cont'd)		
		Lab 2		---
4		UNIT 3: GNSS Data Collection		
		Lab 3:		Lab 2

5		GNSS Data Collection (cont'd)		
		Lab 4:		Lab 3
6		UNIT 5: GNSS Positional Accuracy Assessment		
		Lab 5:		Lab 4
7		UNIT 6: Introduction to Drones (sUAS)		
		No Lab		Lab 5:
8		UNIT 7: Processing / Analyzing Drone Imagery		
		Lab 6:		---
9		Processing / Analyzing Drone Imagery (cont'd)		
		Lab 7:		Lab 6
10		UNIT 8: Smartphone/Tablet field data collection		
		Lab 8:		Lab 7
11		UNIT 9: Planning a Geospatial Project Field Campaign		
		Lab 9:		Lab 8
12		UNIT 10: Geospatial Field Project		
		Lab: Final Project		Lab 9
13		Geospatial Field Project (cont'd)		
		Lab: Final Project		---
14		Geospatial Final Project (cont'd)		
		Lab: Final Project		---
15		*Geospatial Final Project (cont'd)* **EXAM**		
		Lab: Final Project		Final Project

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