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Course dates: Online June 30-July 13; Workshop-style* course July 14-25
*Will include optional in-person field demos in compliance with CDHE COVID-19 guidelines

Prerequisites for Undergraduates: Junior level class standing and completion of one of the following: GEOG 210-Introduction to GIS & GPS, GEOG 307-Geographic Information Science, GEOG 449-Remote Sensing of the Environment, ESCI 330-Earth Science Statistical Analysis, GEOL 460-Geomorphology, ESCI 474-Principles of Hydrology or consent of instructor.

Course Description:
Students will use high-resolution topography to understand Earth surface processes.

Catalog Description:
Analysis and investigation of contemporary issues and development of research skills in the field of earth sciences, atmospheric sciences, environmental sciences, or geosciences. The course may include extensive field work.

Course Overview & Objectives:
In recent years, high-resolution topographic acquisition methods have exploded, expanding geoscientists’ ability to study earth surface processes. Previously, time-consuming survey methods (e.g., total station) or expensive airborne Light Detection and Ranging (LiDAR) were the most common methods employed. With the increase in accessibility of ground-based LiDAR (also known as terrestrial laser scanning; TLS) and structure from motion (SfM), high-resolution topography can be collected by geoscientists with the proper training at a
Reduced cost compared to airborne LiDAR, and at a much higher resolution compared to traditional methods. This course will spend June 30-July 13 with online readings and discussions (~1 hr/day) about topographic data collection methods and protocols as well as the scientific applications of each. The workshop-style full-time (~8 hrs/day) component of the course will give students hands-on training July 14-25. The objective of the course is to train students in manual and remote sensing methods of topographic data collection, including 1) GPS/GNSS surveys, 2) structure from motion (SfM), and 3) ground-based (terrestrial laser scanning, TLS) and airborne LiDAR.

**Upon completion of the course, the student will be able to:**

1. Justify which survey tools and techniques are most appropriate for a scientific question.
2. Make necessary calculations to determine the optimal survey parameters and survey design based on site and available time.
3. Integrate GNSS targets with ground-based LiDAR and SfM workflows to conduct a geodetic survey.
4. Process raw point cloud data and transform a point cloud into a digital elevation model (DEM).
5. Conduct an appropriate geomorphic analysis, such as geomorphic change detection.

**Accessibility:**
Remote sensing techniques offer a great opportunity for individuals with limited mobility. Much of the work of a field scientist is collecting and post-processing data. Even the most rugged field scientist conducts analyses back in the lab. **This course is a great way for individuals with limited mobility to be involved in topographic data collection, post-processing, and analysis!**

**Tentative Schedule:**
June 30-July 13: Online readings and discussions (Canvas)
July 14 – July 19: Structure from Motion (SfM) Session
   Day 1 (July 14): Orientation and introduction to GPS/GNSS surveying
   Day 2 (July 15): Site planning and GNSS target survey and drone demo
   Day 3 (July 16): SfM processing and GNSS topographic survey
   Day 4 (July 17): Topographic data post-processing workflow
   Day 5 (July 18): SfM data post-processing workflow
   Day 6 (July 19): Report writing (Part 1)
July 20 – July 25: Terrestrial Laser Scanning (TLS) and LiDAR Session
   Day 7 (July 20): Introduction to ground-based (TLS) and airborne LiDAR
   Day 8 (July 21): TLS data post-processing workflow
   Day 9 (July 22): LiDAR data sources and tools
   Day 10 (July 23): Data analysis and work day
   Day 11 (July 24): Presentations and course wrap up
   Day 12 (July 25): Finish report writing (Part 2)
Tentative Assigned Readings:


Course Communication:
Documents and assignments related to the class will all be posted on Canvas https://www.unco.edu/canvas/. Look around on the course site to familiarize yourself and locate all the items you will need. You can set your notifications as you prefer (did you know you can get text message notifications via Canvas?). Any updates/announcements will be made through Canvas and your bears.unco.edu email. Please make sure you check Canvas and your bears.unco.edu email regularly. https://www.unco.edu/current-students/. You can even access Office 365 from Canvas! The online portion of the course will use Canvas for discussion posts.

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Course Evaluation:
Reading discussion posts (~6 posts) 20%
Practice problems (~2 data-sets) 10%
Notebooks (daily notes for duration of workshop portion) 10%
Professionalism and participation 10%
Projects (~2) 50%

Graduate students will have additional readings; the field projects will count for 30% and a final project will be for 20%.

Field Etiquette/Conduct:
When in the field, it is imperative that everyone behave in a safe and respectful manor. In addition to following UNC’s Student Code of Conduct and COVID-19 rules and our Exemption Plan Protocol, you are expected to be a team player, help others, and generally contribute to a good morale for the class. If you are behaving in a rude, disrespectful, or unsafe manner, you will be kicked out of the course. Since you will be participating in a course, these rules from the Student Code of Conduct are good reminders:

The following behaviors are prohibited:
• Violation of federal, state, or local law.
• Use, possession, manufacturing, providing, or distribution of marijuana, heroin, narcotics, other controlled substances, and/or paraphernalia except as expressly permitted by law and university regulations.
• Public intoxication, use, possession, manufacturing, providing, or distribution of alcoholic beverages except as expressly permitted by University regulations or by law. Alcoholic beverages may not, in any circumstance, be used by, possessed by or distributed to any person under twenty-one (21) years of age. This means you may NOT become intoxicated while attending the class. Intoxication will be grounds for being kicked out and failing the course.

Equipment/What to Bring:
You will need a computer with administrative rights for program installation to complete this course. If you are in the Greeley area, I will have laptops available for check out. For field demos (if they occur and if you participate in them), you will need a field notebook, back-up pencils, and a calculator. You are encouraged to wear pants in the field and you absolutely must have sturdy hiking shoes. Do no wear sports/tennis shoes! These are not very good for walking around off trail. You will need a hat, water bottle, backpack, sunscreen, bug spray, and anything else to make you comfortable outside.

Student Support and Resources:
What should I do to be successful in this course?
• Complete all assignments.
• Be proactive about seeking help and clarity—this is one of the most important things you can do.
• Expect to put time into this course.
• Practice good study skills http://www.unco.edu/university-101/study-skills/.

What should I do if I need help?
• You will likely run into situations where you are confused by concepts, assignments, or what is expected of you. I want you to get the help you need to be successful in this course and beyond.

Additional student resources:
• Some students may be aware of factors that adversely affect their learning and will be familiar with requesting accommodations. Others may not know they can ask for accommodation to improve their success. It is the policy and practice of the University of Northern Colorado to create inclusive learning
environments. If there are aspects of the instruction or design of this course that present barriers to your inclusion or to an accurate assessment of your achievement (e.g. time-limited exams, inaccessible web content, use of videos without captions), please communicate this with your professor and contact Disability Resource Center (DRC) to request accommodations. Office: (970) 351-2289, Michener Library L-80. Students can learn more about the accommodation process at https://www.unco.edu/disability-resource-center/.

- If you don’t qualify for DRC support, there are still things you can do to be proactive about seeking what you need. Students face both academic and personal issues while at UNC. Sometimes, personal issues become intense and may interfere with school performance and personal happiness. The Counseling Center provides a place for students to talk about issues or concerns that are important to them. Counseling services are free to UNC students. Call (970) 351-2496 or visit https://www.unco.edu/counseling-center/ to find out more. Additionally, the Student Outreach and Support (SOS) office fosters student development, engagement, and success by assisting students during difficult circumstances that may include medical, mental health, personal or family crisis, illness or injury. SOS can help communicate with me issues that may arise and coordinate additional resources for you. Visit http://www.unco.edu/dean-of-students/offices-resources/student-outreach-support/.

- **Late Policy:** If you have an excusable absence or other circumstance, you may contact Student Outreach and Support http://www.unco.edu/dean-of-students/offices-resources/student-outreach-support/. Your instructor will work with SOS and you to discuss appropriate action. Without an excusable absence, late work will not be accepted.

- **Extra Credit:** No extra credit will be given so please do not ask.

- **Academic Integrity:** One of the student responsibilities at UNC is to act in accordance with commonly accepted standards of academic conduct. You are expected to practice academic honesty in every aspect of this course. Students who engage in academic misconduct are subject to grading consequences with regard to this course and/or university disciplinary procedures through the Office of Community Standards and Conflict Resolution. If you are found to be cheating or plagiarizing, you will receive a zero for the assignment in question. Depending upon the nature of the infraction, you may also receive a grade of F for the course and be referred to the University for disciplinary action. Texting (or with other methods/technology) questions and answers is cheating. Copying work is cheating. Do your own work and write things in your own words.

- **Statement on Equity and Inclusion:** The University of Northern Colorado embraces the diversity of students, faculty, and staff, honors the inherent dignity of each individual, and welcomes their unique perspectives, behaviors, and worldviews. In this course, people of all races, religions, national origins, sexual orientations, ethnicities, genders and gender identities, cognitive, physical, and behavioral abilities, socioeconomic backgrounds, regions, immigrant statuses, military or veteran statuses, size and/or shapes are strongly encouraged to share their rich array of perspectives and experiences. Course content and campus discussions will heighten your awareness to each other’s individual and intersecting identities. If you would like to report an incident or learn more about identity-based discrimination/harassment, please visit www.unco.edu/institutional-equity-compliance. If you are perceived to inflict an oral or physical threat or altercation to someone based on any of the above criteria, you will be asked to leave, and I may take official action through the Office of Community Standards and Conflict Resolution. If you have a preferred name, or a preferred pronoun, please let me know.

**Policies & Additional Information:**

**Sexual Misconduct:** The University of Northern Colorado is committed to providing a safe learning environment for all students that is free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or
experiences any of these incidents, know that you are not alone. UNC has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware all UNC faculty and most staff members are “responsible employees,” which means that if you tell a faculty member about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, they must share that information with the Title IX Coordinator, Larry Loften. Larry or a trained staff member in the Office of Institutional Equity and Compliance (OIEC) will contact you to let you know about accommodations and support services at UNC as well as your options for pursuing a process to hold accountable the person who harmed you. You are not required to speak with OIEC staff regarding the incident; your participation in OIEC processes are entirely voluntary.

If you do not want the Title IX Coordinator notified, instead of disclosing this information to your instructor, you can speak confidentially with the following people on campus and in the community. They can connect you with support services and help explore your options now, or in the future.

- UNC’s Assault Survivors Advocacy Program (ASAP): 24 Hr. Hotline (970) 351-4040 or www.unco.edu/asap
- UNC Counseling Center: (970) 351-2496 or www.unco.edu/counseling
- UNC Psychological Services: (970) 351-1645 or www.unco.edu/cebs/psych_clinic

If you are a survivor or someone concerned about a survivor, or if you would like to learn more about sexual misconduct or report an incident, please visit www.unco.edu/sexual-misconduct or contact the Office of Institutional Equity and Compliance (970) 351-4899. OIEC is located on the third floor of the University Center in room 3060.

Student Conduct Code:

Student Rights and Responsibilities:
http://www.unco.edu/dean-of-students/offices-resources/student-rights-responsibilities/

Student Support:
Research shows that college students experience food insecurity at higher rates than the American household rate, and that food insecurity can negatively impact academic performance and persistence. In recognition of this problem, UNC offers assistance to students facing food insecurity through an on-campus food pantry. The Bear Pantry is located in University Center 2166 and is open for regular hours throughout the semester. Please visit www.unco.edu/bear-pantry for more information.

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is also urged to contact Student Outreach and Support (SOS) for assistance. SOS can assist students during difficult circumstances which may include medical, mental health, personal or family crisis, illness or injury. SOS can be reached at sos@unco.edu or via phone at (970) 351-2796.

Short Term Courses:
Special Term Courses do not meet during a typical semester (begin or end earlier or later). These courses have different add/drop/withdrawal dates. It is the responsibility of the student to be aware of these dates. Please refer to “special term/short course deadlines” from this link: http://www.unco.edu/registrar/current-students/course-
add-drop.aspx, to learn the dates for this course. To drop or withdraw, you must contact the Registrar’s Office at 970-352-2231.

**Requesting Transcripts:**
There are two options for requesting transcripts. For an unofficial transcript on your Student tab in URSA, choose “Unofficial transcript” located under the “Grades” heading. For an official transcript, go to http://www.unco.edu/registrar/etranscripts.aspx.

**Billing:**
You will be billed via UNC’s Bear e-mail. You will have needed to activate your Bear e-mail to access the billing statement. You will not receive a paper bill in the postal mail.