ASEN 5519 – Geodesy - Fall 2024
Cross listed with GEOL/PHYS/ASTR 6620

Material is preliminary and subject to change.

Instructor	Dr. Khosro Ghobadi-Far
Class Time	MW 3:00 PM – 4:15 PM
Class Location	AERO N240
Class Web Page	http://canvas.colorado.edu
Office Hours	Tuesday 12:00 PM – 1:00 PM via Zoom for remote students (Appointment required: contact me by email to set up a time) ~~Tuesday 1:00 PM – 2:00 PM for in-person students~~ Tuesday 11:00 AM – 12:00 PM for in-person students
Text	*Geodesy and Gravity* (lecture notes) by John Wahr *Physical Geodesy* by Heiskanen & Moritz (1967) *Geodesy: Treatise on Geophysics (Vol. 3)* by Tom Herring (2005)
Grading	Mid-Term (25%) Final Exam (25%) Homework (25%)* Research Project (25%) * Late homework assignments will only be accepted with prior approval by the instructor or under extenuating circumstances.
Lecture Material	Lecture slides will be posted on the class website.

❖ Course Overview

This course deals with the theory of geodesy (geodetic theory) and some related space-based geodetic techniques. Geodesy is one of the oldest branches of Earth and Space Sciences. It is the science of measuring and determining three fundamental properties of the Earth (as well as celestial and planetary bodies): its geometric shape, its gravity field, and its orientation in space, as well as the changes of these properties with time. Through measuring these fundamental properties of the Earth and their temporal variations, various physical processes in the Earth system can be studied. Therefore, geodesy offers a unique perspective on studying Earth and planetary bodies. A particular focus of the course is the space geodesy techniques used for measuring the Earth's static and time-variable gravity field and surface deformation, and the interpretation of their observation for various geophysical processes.

The students will do a research project in this course. This will help the students to get some hands-on experience with processing terrestrial and space geodesy measurements and their application for understanding physical processes. Each student will select a paper on geodesy (*approved by the instructor!*), will implement the theory and methodology described in the paper, and will try to reproduce (some) of the results. This will allow the students to see the application of theories learned during the lectures and will also prepare them for applying geodetic theory and techniques to their own research problems.

A basic knowledge of calculus and differential equations is required to follow the material presented for this course. With that being said, the instructor plans to approach each topic from a basic level, and develop all the theories staring from fundamental principles.

❖ Outline of the Course

- Potential Theory
- Earth Gravity Field
- Observation of Earth Gravity Field from Satellites
- Global and Regional Modelling of Earth Gravity Field from Satellite Data
- Earth System Mass Change from Satellite Gravimetry

- Earth Tides
- Earth's Variable Rotation: Theory, Causes and Consequences
- Strain/Stress Relations and Earth's Deformation
- Elastic Deformation of Earth due to Surface Loads

University Policies

Classroom Behavior

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy.

For more information, see the classroom behavior policy, the Student Code of Conduct, and the Office of Institutional Equity and Compliance.

Requirements for Infectious Disease

Members of the CU Boulder community and visitors to campus must follow university, department, and building health and safety requirements and all applicable campus policies and public health guidelines to reduce the risk of spreading infectious diseases. If public health conditions require, the university may also invoke related requirements for student conduct and disability accommodation that will apply to this class.

If you feel ill and think you might have COVID-19 or if you have tested positive for COVID-19, please stay home and follow the guidance of the Centers for Disease Control and Prevention (CDC) for isolation and testing. If you have been in close contact with someone who has COVID-19 but do not have any symptoms and have not tested positive for COVID-19, you do not need to stay home but should follow the guidance of the CDC for masking and testing.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.
If you have a required medical isolation for which you require adjustment, please contact Dr. Nerem to work out a plan as soon as possible.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those

preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: honor@colorado.edu, 303-492-5550. Students found responsible for violating the Honor Code will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit Honor Code for more information on the academic integrity policy.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits protected-class discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and offcampus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and support resources can be found on the OIEC website.

Please know that faculty and graduate instructors must inform OIEC when they are made aware of incidents related to these policies regardless of when or where something occurred. This is to ensure that individuals impacted receive outreach from OIEC about resolution options and support resources. To learn more about reporting and support for a variety of concerns, visit the Don’t Ignore It page.

Religious Accommodations

Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please communicate the need for a religious accommodation with Dr. Nerem in a timely manner.

See the campus policy regarding religious observances for full details.

Mental Health and Wellness

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact Counseling and Psychiatric Services (CAPS) located in C4C or call (303) 492-2277, 24/7.

Free and unlimited telehealth is also available through Academic Live Care. The Academic Live Care site also provides information about additional wellness services on campus that are available to students.