

Course Outline
Fundamentals of Geomechanics
CIVE 5506 (Winter 2024)

Department of Civil and Environmental Engineering
Carleton University

Instructor: Mehdi Pouragha
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Lectures: Wed 2:35-5:25 pm
Location: ME 3356 (may change)

Topics

- Introduction and Mathematical Preliminaries
Concept of coordinates; Basic vector and tensor calculus
- Equilibrium and Stress Tensor
Cauchy stress tensor; Equilibrium equations; Divergence theorem; Stress invariants; Deviatoric stress; Stress space and Lode angle
- Kinematics of continuum deformation
Lagrangian vs Eulerian description of motion; Displacement field and its derivatives; Deformation gradient and strain tensor
- Constitutive laws- Elasticity
Basic principles of local action, determinism, and frame indifference; Conservation laws, Energy conjugates; Homogeneity order, Incremental linearity, Anisotropy; Hyper-elasticity; Anisotropic elasticity
- Constitutive laws- Theory of Plasticity
Concept of plastic loading and path dependency; Hyper-plasticity, Yield and failure functions; Plastic flow rule; Associated vs non-associated plasticity
- Cam clay theory

Evaluation

- 50% Final, 30% Midterm, 20% Term paper (due at the end of the term)
- Midterm and final exams will be posted to the BrightSpace page on the 9:00 am of the exam date and the students will have until midnight (11:59 pm) of the same day to submit their answers.
- A minimum of 35% in the midterm and final exams is required to obtain a passing grade.

Deferred term work

Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work (including midterm exam) are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases. This must occur no later than three (3) days after the term work was due. In case of illness, a doctor note or a completed self-declaration form will be required (<https://carleton.ca/registrar/special-requests/deferral/>). The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. Consult Section 4.4 of the University Calendar.

Other Useful Information

Academic Integrity and Plagiarism

- Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures:
<https://carleton.ca/engineering-design/current-students/fed-academic-integrity>
Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or, expulsion.
- One of the main objectives of the Academic Integrity Policy is to ensure that the work you submit is your own. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source. Examples of violations of the policy include, but are not limited to:
 - any submission prepared in whole or in part, by someone else;
 - using another’s data or research findings without appropriate acknowledgment;
 - submitting a computer program developed in whole or in part by someone else, with or without modifications, as one’s own; and
 - failing to acknowledge sources of information through the use of proper citations when using another’s work and/or failing to use quotations marks.

Learning and Working Environment

The University and all members of the University community share responsibility for ensuring that the University’s educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone’s personal beliefs, choices, and opinions.

Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

- **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca.

You should request your academic accommodations in the Ventus Student Portal, for each course at the beginning of every term. For in-term tests or midterms, please request accommodations at least two (2) weeks before the first test or midterm. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

- **Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the Senate Policy on Accommodation for Student Activities (PDF).
- **Pregnancy Obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the Student Guide to Academic Accommodation (PDF).
- **Religious Obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the Student Guide to Academic Accommodation (PDF).
- **Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit the Sexual Violence Prevention & Survivor Support.