

GEOMECHANICS

(Civil – 402, 5 credits)

Course program – First Part: 9.09.24 – 7.11.24

Theory session: Monday, 11:15 – 14:00, room GR A3 30

Exercises, project session and workshops: Thursday, 17:15 – 19:00 rooms GC B3 30

Lecturers: **Alessio Ferrari** (AF, main lecturer), **Lyesse Laloui** (LL)

Assistants: Ziad Sahlab (ZS), Mathilde Métral (MM), Alessandro Parziale (AP)

W	Date	Room	Lecturer	Content
1	9.09.24	GRA330	LL	1. Course introduction Goal of the course Introduction to geomechanics A general overview of the program
	12.09.24	GCB330	AF	2. Basic concepts, stress paths, and stress-strain behaviour Effective stress concept Laboratory tests with particular focus on triaxial testing (set-up and stress paths) Stress-strain behaviour of geomaterials in drained and undrained conditions.
2				
	19.09.24	GCB330		Exercise 1: Processing triaxial tests data
3	23.09.24		AF	3. Elasticity Stress-strain constitutive frameworks (stress and strain variables, existing models) Linear and non-linear elasticity
	26.09.24			Exercise 2 - Elasticity / Project – Part 1: Elastic parameters from triaxial data
4	30.09.24		AF	4. Plasticity Plasticity principle and yield criteria for geomaterials Elastic-perfectly plastic models Applications of elastic-perfectly plastic models
	3.10.24			Exercise 3 - Perfect plasticity / Project – Part 2: Elastic-perfectly plastic models parameters
5	7.10.24		AF	5. Hardening elasto-plasticity Post-yield behaviour (flow rule, plastic potential, hardening rule) Elasto-plastic stress-strain constitutive frameworks
	10.10.24			Workshop 1: Dr. Aldo Madaschi (NESOL, CH)

6	14.10.24		LL	6. Critical state concept Definition of “critical state” Experimental evidence on normally and overconsolidated soils Critical state line (CSL) and critical state parameters Shear strength vs critical state
	17.10.24			Exercise 4: Critical state concept
7	28.10.24		AF	7. Modified Cam Clay (MCC): a hardening elasto-plastic constitutive model Equations Prediction of the mechanical behaviour according to the MCC model Example of application
	31.10.23			Exercise 5: Modified Cam-Clay Model / Project – Part 3: MCC parameters
8	4.11.24		LL	Mid-term written EXAM (weeks 1 to 7)
	07.11.24			Workshop 2: Dr. Khoa D.V. Huynh (NGI, Norway)

ECTS credits allocated to this course: 5

Evaluation:

- Final exam (written): 60% of the final mark
- Mid-term exam (written): 20% of the final mark
- Project report: 20% of the final mark

Additional details:

Communication

- This class is on Ed Discussion:  **Ed Discussion forum - Geomechanics - CIVIL-402**

Mid-term and Final exam

- A formulary associated with each lecture will be created; a collection of formularies will be provided during the written exam tests.

Continuous assessment

- At each workshop, a quiz will be given to the students at the beginning of the session and will be pick-up at the end of the session for the evaluation
- The project (groups of 3 students), has to be submitted by Friday 20th December 2024 on Ed Discussion as “private” in the correct folder

Exercise sessions

- Students should bring their laptops during the exercise sessions.