

Slope Stability
EPFL / ENAC / GC section – Master semester 2 and 4 – 2024-2025

Course info

- Schedule: Monday 8.15 – 11.00
- Language: English
- Lecturer: Alessio FERRARI (AF)
- Assistants: Mathilde Métral (MM), Sofie ten Bosch (StB)
- ECTS credits allocated to this course: 3
- Required prior knowledge: Soil mechanics and Groundwater seepage.
- Type of teaching: ex cathedra, exercises, case studies analyses.
- References: Course notes
- Evaluation: Closed-book written form with theoretical questions and exercises; some exercises require the use of software.
- You can ask questions regarding the course and exercises on the Ed Discussion platform (link on Moodle)

Course Program

S	Date	Room	C	E	Lect.	Topics
1	17/02/2025	GCA330	3		AF	Introduction to the course. Limit equilibrium method (LEM). Stability analysis of single blocks.
2	24/02/2025	GCA330	2		AF	Mass movement classification and landslide activity.
		CM1111		1	MM/StB	<i>Ex. 1: Block stability analysis.</i>
3	03/03/2025	GCA330	2		AF	LEM for planar slip surfaces.
		CM1111		1	MM/StB	<i>Ex. 2: Infinite-slope analysis.</i>
4	10/03/2025	GCA330	2		AF	Methods of slices for circular slip surfaces.
		CM1111		1	MM/StB	<i>Ex. 3: Limit equilibrium analyses – simplified Bishop method.</i>
5	17/03/2025	GCA330	2		AF	Rigorous LEMs for circular and non-circular slip surface. Identification of the critical surface.
		CM1111		1	MM/StB	<i>Ex. 4.a: LEM software application.</i>
6	24/03/2025	GCA330	2		AF	Failure mechanisms classification, progressive failure, determination of geotechnical parameters. Localization of the slip surface.
		CM1111		1	MM/StB	<i>Ex. 4.b: LEM software application.</i>
7	31/03/2025	GCA330	2		AF	Characterization of pore water pressure for slope stability analyses, failure in drained and undrained conditions. Pore water pressure measurements.
		CM1111		1	MM/StB	<i>Ex. 5: Seepage and stability analyses.</i>
8	07/04/2025	GCA330	2		AF	Filling a reservoir, rapid drawdown, excavation in a saturated clay.
		CM1111		1	MM/StB	<i>Ex. 6: Stability analysis of a dam under different hydraulic boundary conditions.</i>
9	14/04/2025	GCA330	2		AF	Seismic slope stability, quasi-static and dynamic approaches.
		CM1111		1	MM/StB	<i>Ex. 7: Pseudostatic stability assessment and displacement analysis with Newmark method.</i>
10	28/04/2025	GCA330	3		AF	Basics of unsaturated soil mechanics. Shear strength and hydraulic behavior of soils in unsaturated conditions.
11	05/05/2025	GCA330	2		AF	Methods for slope stabilization I: modification to slope geometry and loading effects, retaining structures.
		CM1111		1	MM/StB	<i>Ex. 8.a: Design of a mitigation work.</i>
12	12/05/2025	GCA330	2		AF	Methods for slope stabilization II: drainage, other methods.
		CM1111		1	MM/StB	<i>Ex. 8.b: Design of a mitigation work.</i>
13	19/05/2025	CM1111		3	MM/StB	<i>Ex. 9: Stability evolution of unsaturated slopes during rainfall infiltration (FEM analysis).</i>
14	26/05/2025	CM1111		3	MM/StB	<i>Q&A session.</i>