CIVIL-530

Slope stability

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Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.
Civil engineering minor	E	Opt.
Mechanics		Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The course aims at providing future civil engineers with a comprehensive view on soil slope stability. It addresses landslide types and mass movement classification; slope failure mechanisms and methods for slope stability analysis are discussed; remedial measures and risk analysis are presented.

Content

• Mass movement classification and landslide activity

• Methods of slope stability analysis

- Limit equilibrium analysis
- Infinite slope analysis
- Methods for circular and non-circular slip surface
- Seismic slope stability

• Methods for modelling soil mass movements

- Coupled and un-coupled numerical analyses

• The role of pore water pressure

- Characterization of the pore water pressures in slopes
- Drained and undrained conditions
- Delayed failure
- Rapid drawdown
- Unsaturated conditions

• Failure mechanisms and choice of geotechnical parameters

- Shear strength of soils in unsaturated conditions
- Progressive failure

• Landslide instrumentation

- Measurement of displacements
- Location of the slip surface

- Measure of pore water pressures

• Methods for slope stabilisation

- Slope geometry modification and loads
- Drainage systems
- Retaining structures

• Basics of risk analysis and early warning systems

Keywords

Slopes, Landslides, Failure Mechanisms, Factor of Safety, Mitigation Strategies

Learning Prerequisites

Required courses

Soil mechanics and groundwater seepage

Recommended courses

Geomechanics

Learning Outcomes

By the end of the course, the student must be able to:

- Recognize type and occurrence of natural and man-made slope movements
- Assess / Evaluate the key geotechnical parameters that govern slope stability
- Use methods for slope stability assessment, modelling of slope movement and back-analysis of failed slopes
- Judge capabilities and limitations of slope stability analysis software.
- Recognize type and occurrence of natural and man-made slope movements
- Assess / Evaluate the key geotechnical parameters that govern slope stability
- Use methods for slope stability assessment, modelling of slope movement and back-analysis of failed slopes
- Judge capabilities and limitations of slope stability analysis software.

Transversal skills

- Take responsibility for environmental impacts of her/ his actions and decisions.
- Use a work methodology appropriate to the task.
- Access and evaluate appropriate sources of information.
- Use both general and domain specific IT resources and tools
- Set objectives and design an action plan to reach those objectives.

Teaching methods

Ex cathedra, exercises, case study analysis

Expected student activities

Participation in class, especially to discuss case studies. Participation in exercise sessions, for the resolution of slope stability problems using calculus and software.

Assessment methods

Written

Supervision

Office hours	Yes
Assistant.e.s	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Class notes, slides and exercises are distributed through the Moodle

Moodle Link

- https://go.epfl.ch/CIVIL-530