

Title: **GEO-EV Intensive course on Geomechanics of Failures**

Time: 4.9.2017 - 8.9.2017, organized only once (plus possible session related to pre-requisites and feedback session)

Place: Otaniemi Rakentajanaukio 4 (rooms to be defined later)

Teachers: Núria Pinyol (Universitat Politècnica de Catalunya, BarcelonaTech)
Wojciech Solowski (Aalto University, responsible teacher)

Credits: 2 ECTS

Prerequisites: General knowledge on Soil Mechanics and Geotechnical Engineering. General knowledge related to Mohr-Coulomb model, consolidation theory, limit equilibrium and upper bound solution. However, the mentioned concepts will be revised during the course.

Ability to perform FEM calculations with available geotechnical software (Optum G2 or Plaxis 2D).

Description and contents:

This is an original course of Geotechnical Engineering which shows how the application of fundamental concepts of Soil Mechanics can be used as “forensic” tools in the investigation of geotechnical failures.

The course will describe some selected geotechnical failures:

- The differential settlements of Mexico City Cathedral, Mexico
- Vajont landslide, Italy.
- Caisson failure of Barcelona Harbour, Spain

Each case will be analyzed using relatively simple approaches based on basic concepts on Soil and Rock Mechanics, which will be explained and revised previously. The analysis will be described step by step and without using commercial numerical programs with the aim of emphasizing the understanding of the phenomena and relevant mechanisms causing the failures.

Finally, the students should analyze numerically cases analyzed analytically in class.

Learning outcomes:

After the course the students will be aware of historical errors leading to costly failures, as well as factors contributing to those failures.

They will review and apply Soil Mechanics concepts (settlements, bearing capacity and liquefaction) to real cases, instead of doing it through academic examples as typically done in conventional courses. This training will be extended to other topics such as numerical methods and continuous media.

The course teaches how learn and isolate the essential aspects associated with complex real situation.

The students will be able to perform simple numerical calculations to reproduce the situations previously analyzed in class in a simplified manner. Similarities and differences will be highlighted.

Course participants should be able to identify similar risk in their future engineering practice. The students will be able to perform simple numerical calculations related to the studied problem.

Course material: Handouts

Bibliography: Puzrin A., Alonso E.E. & Pinyol N.M. (2010) *Geomechanics of Failures*. Springer

Alonso E.E., Pinyol N.M. & Puzrin A. (2010) *Geomechanics of Failures. Advanced Topics*. Springer

Course schedule:

August: possible pre-requisite session

Monday 4th Sep	Introduction to the course, etc. (1h WS)
	The differential settlements of Mexico City Cathedral, Mexico (2h)
Tuesday 5th Sep	Vajont landslide (3h)
Wednesday 6th Sep	Vajont landslide (2h)
	Homework description / exercises (2h WS)
Thursday 7th Sep	Barcelona harbour (3h)
Friday 8th Sep	Barcelona harbour (2h)
	Homework description / exercises (2h WS)

Friday the 14th of September: deadline for submitting the exercises

Total 17h of contact teaching

Total workload for the course for the students:

1. Contact teaching 17h
2. Book study & preparation for the exercises 11h
3. Homework (graded) 2x 15h

Total 54h of work, corresponding to 2cr.