



3-day course

Energy geostructures analysis and design

March 20 to 22, 2018

Target audience

Professionals and scientists who want to acquire knowledge on the energy, geotechnical and structural performance of energy geostructures.

The course will be valuable for civil and energy engineers, architects and urban project managers who have **no experience** with energy geostructures as well as for those who have been already involved in a project including energy geostructures.

The course will be given in English.

Requirements

Basic knowledge of soil and structural mechanics.

Participants should bring their own laptop (for use during the practical application exercises).

Dates and schedule

- Tuesday, March 20, 2018
- Wednesday, March 21, 2018
- Thursday, March 22, 2018

from 9 am to 5 pm

Certification

A certificate of attendance will be delivered at the end of the course.

Course venue

EPFL, Lausanne, Switzerland

Organisation

Laboratory of Soil Mechanics (LMS), Swiss Federal Institute of Technology Lausanne (EPFL)

Overview

The application of environmentally friendly technologies that exploit renewable energy sources is key to follow international agreements for the development of carbon neutral buildings and infrastructures.

Energy geostructures are an innovative, multifunctional technology that can be used to address the aforementioned challenge. By coupling the role of the ground structures with that of the geothermal heat exchangers, energy geostructures can serve as structural supports as well as heating and cooling elements for buildings and infrastructures.

The analysis and design of energy geostructures require the integrated knowledge of various aspects in the broad field of engineering. How can energy geostructures be analysed and designed from an energy point? What will be the energy performance of energy geostructures over time? How can energy geostructures be analysed and designed from a geotechnical and structural point of view? How can the coupled action of thermal and mechanical loads be considered through current standards and latest international recommendations?

Objectives

- Understand the thermal and mechanical behaviour of energy geostructures, with reference to the latest scientific achievements
- Be able to perform the energy, geotechnical and structural analysis and design of energy geostructures
- Learn how to exploit current standards available at the European level (e.g., the so-called “Eurocodes”) for the analysis and design of energy geostructures
- Be able to perform all of the key steps involved in the analysis and design process of energy geostructures with practical application exercises

Energy geostructures analysis and design

Register on www.formation-continue-unil-epfl.ch

Course fee

1900.- Swiss Francs, including:

- Course material
- Three-month license of academic version of the Thermo-Pile software
- Launches and refreshments

10% special discount for contributing members of EPFL Alumni

Registration deadline

February 1, 2018

Programme Directors

- **Prof. Lyesse Laloui, Ph.D.**
Professor and head of Soil Mechanics Laboratory, EPFL
- **Mr. Alessandro F. Rotta Loria, P.E.**
Researcher at Soil Mechanics Laboratory, EPFL

Invited speakers

- **Dr. Stefan Wehinger**
Enercret
- **Dr. Sebastian Homuth**
Züblin Spezialtiefbau GmbH
- **Mr. Tony Amis**
GI-Energy

Teaching approach

- Optimum balance between theory and practice (application sessions including analytical and numerical simulation exercises)
- Teaching based on cutting-edge scientific achievements
- Case studies based on real energy geostructure projects, for which the Programme Directors worked as expert consultants



Programme

PART A - Introduction (Day 1)

- Renewable energy exploitation for a sustainable development
- Energy geostructures: the technology

PART B - Energy aspects (Day 1)

- Heat transfer in the context of energy geostructures
- Analytical and semi-analytical modelling of steady state heat transfer
- Analytical and semi-analytical modelling of time-dependent heat transfer
- Estimation of thermal potential of sites and design parameters
- *Application exercises: Analysis of the results of a thermal response test and a heat transfer laboratory test; Energy design of an energy geostructure*

PART C - Geotechnical and structural aspects (Days 2 & 3)

- Thermo-mechanical behaviour of single and groups of energy piles
- Thermo-mechanical behaviour of energy walls and energy tunnels
- Thermo-hydro-mechanical behaviour of soils
- Thermo-mechanical behaviour of soil-concrete interfaces
- Performance-based design in the framework of Eurocodes
- *Application exercises: Analysis and design of the thermo-mechanical behaviour of single and group of energy piles; Geotechnical and structural performance-based design of an energy geostructure*
- *Visit of laboratory experimental facilities*

PART D - Integrated energy, geotechnical and structural design (Day 3)

- Development of projects of energy geostructures
- *Application exercises: Integrated energy, geotechnical and structural design of energy geostructures*

Detailed programme on the website