UE Experimental Methods in Geomechanics

ECTS
6 credits

Component
UFR PhITEM (physique, ingénierie, terre, environnement, mécanique)

Semester
Automne

- **Teaching language(s):** English
- **Open to exchange students:** Yes
- **Code d'export Apogée:** PAX9CEAQ

Presentation

Description

This course aims to provide the fundamental elements necessary to understand and perform an experiment in Geomechanics, as well as to provide an overview of some of the key “traditional” and emerging approaches and tools available.

The course is structured in 6 blocks covering:

1. Introduction to experimental mechanics
2. Classical tests in Geomechanics
3. Physical modeling
4. Full-field techniques (e.g., x-ray tomography)
5. Waves for and in geomaterials
6. Rapid dynamics

1.1 Course structure
Lectures: 30h
Practical sessions: 12h
Block one: Introduction to experimental mechanics
The theoretical classes will cover:
• Working principles of the components of experiments (e.g., motors, encoders, transducers, cameras ...)
• Elements of calibration and metrology
Practical sessions: Construction of a simple testing apparatus from scratch.

Block two: Classical tests in Geomechanics
• Traditional tests in geomechanics (e.g., Triaxial, oedometer ...)
• Stress/strain paths and practical aspects
Practical sessions: the practical session will be either one four-hour session or two two-hour sessions.
Block three: Physical modeling
To be defined
Block four: Full-field techniques
The theoretical classes will cover:
• Working principle of cameras and elements of optics
• Fundamentals of generation, transport and detection of ionising radiation (x-ray, neutrons..)
• Tomography, reconstruction and its applications in geomechanics
• Diffraction and Small Angle Scattering
Practical sessions: Study of a practical 2D full-field test with the 1#2# apparatus
Block five: Waves for and in geomaterials
The theoretical classes will cover: To be defined
Practical sessions
Measurement of stress waves in a slender bar (Hopkinson bar). Different loading scenarios. Retrieving elastic properties of the bar thanks to the strain measurement, build the Lagrange diagram of the different tests.
Block six: Rapid dynamics
The theoretical classes will cover:
• The specificity of the instrumentation in the transient dynamic loading experiments.
• The use of ultra high speed imaging sensors
• The adaptation of the full field measurement techniques to this environment

Practical sessions
Continuity of the practical realised in block five. A test will be done on a geomaterial using Hopkinson bar, ultra high speed sensor, advanced instrumentation. The test will have to be processed based on the experience aquired in the practical of block five.

Course parts

UE Experimental Methods in Geomechanics - CM	Lectures (CM)	30h
TP	Practical work (TP)	12h

Period : Semester 9

Useful info

Campus

› Grenoble - University campus