*10 janvier 2023*

# Homework
# Computational geomechanics - Civil 423

October 31, 2022

**Deliverables**  The deliverable of the homework is a short 7 pages maximum report (including figures, but not including bibliography) and the matlab scripts used for your calculation. The whole must be delivered as a zip file containing all the matlab codes necessary to run the script.

The report must be formatted with 10 points font minimum, and a 2cm margins. It must have the following structure

1. Summary - 1 page maximum (can be shorter)

2. Problem description and method of solution [this include geometry, material properties, initial and boundary conditions, type of analysis ]

3. Results and discussion

In all case, I encourage you to present your results in a dimensionless form - i.e. scaling appropriately the problem (by a proper characteristic lengthscale, pressure/stress scale, displacement scale and timescale).

## 1  Pressurization of a fracture in a poroelastic medium (impermeable walls vs permeable walls )

In this homework, we will model the case of a fracture (of fixed length - i.e. not propagating) at depth pressurized by a fluid. We will not model the wellbore (e.g. we consider it small enough compared to the fracture). The rock will be assumed homogeneous and of infinte extent. We focus on a plane strain configuration, and you will leverage the symmetry of the problem in its numerical solution. *→ une ligne ?, (1∂)*
Two sub-problems will be considered:

1. the case where the "walls" of the fracture are impermeable - such that only a mechanical pressure is applied to the fracture walls.

2. the case where the "walls" of the fracture are permeable - such that both a mechanical and a pore pressure are applied to the fracture walls.

In both cases, we will investigate the undrained and then transient response toward the drained/long term response. We will investigate the stress around the fracture (and check with well-known elastic solutions - caution the stress are singular at the tip). We will also pay particular attention to the time evolution of fracture width in both cases, as well as the amount of fluid leak-off in the medium for the second case.