

Course on '**Advanced Soil Mechanics**' for the doctoral school in science of civil, environmental and architectural engineering (30 hours)

Elements of constitutive modelling of soils and parameter experimental evaluations (6h) – P. Simonini:

- field equations for porous media: balance equations, compatibility equations and constitutive modelling equations;
- linear elasticity for isotropic and cross anisotropic medium; Elastoplasticity, Tresca and Mohr-Coulomb failure criterion; yield surface and plastic potential; flow rule; isotropic-hardening constitutive models: Cam-Clay and Modified Cam Clay constitutive models.

Numerical modelling in geomechanics: basic concepts and advanced methods (6h) F. Ceccato:

- introduction on numerical modelling in geomechanics
- use of Finite Element Methods in Geomechanics
- use of mesh-less methods in geomechanics

Discrete element modelling for soils (6h) – F. Gabrieli:

- Introduction to Discrete Element Method
- From micro to macro: homogenization approaches
- Fluid-solid interaction in discrete element modelling
- Practical examples

Rheology and flow-type movement of soils (6h) - S. Cola

- Rheological model for geomaterials: Newton and Bingham models; Frictional, collisional and viscoplastic models; determination of viscosity in laboratory; calibration of numerical model used for analysis of flow-type movement of soils

Earth reinforcement (6h) - P. Carrubba:

- Processes involving strengthening and weakening of soil; Technologies for strengthening of geotechnical structure; performance of reinforced earth in static and dynamic conditions; advanced analysis of reinforced earth.