

MG2815

Industrial Processing of Soils and Granular Materials

Professor: Jean-Marie Fleureau

Language of instruction: French – **Number of hours:** 36 – **ECTS:** 3

Prerequisites: None

Period: S8 Elective 10 February to June IN28IE3, SEP8IE3

Course Objectives

The objective is to highlight the importance of problems related to the processing of granular materials used in most branches of industry, e.g. civil engineering, and to show the relation between empirical practices and rational scientific knowledge. The course includes a mini-project, lab work, and bibliographical investigations.

On completion of the course, students should be able to

- understand the bases of the mechanical behaviour of granular materials and of modeling, of the effect of capillarity and cementation
- know the tests used to characterize this behaviour at different scales
- gain a more precise knowledge of the behaviour of soils and concrete from the theoretical and practical points of view

Course Contents

1. Characterization of granular materials
 - ✧ Characterization of solid grains
 - ✧ Characterization of the assembly of grains
 - ✧ Parameters of empirical characterization
2. Specificity of the constitutive law of granular materials
 - ✧ Effect of the stress path (quasi-static, cyclic, by vibrations, dynamic, with or without rotation of the principal stress tensor)
 - ✧ Effect of grain size distribution, of the behavior of grains (rigid, brittle, ductile, etc.)
 - ✧ Effect of water content, optimum, relation with negative pore pressure
 - ✧ Effect of the mechanical properties (viscosity, brittleness, etc.) of the binder; influence of temperature
 - ✧ Effect of wetting
3. Examples of application to various materials : Scientific and industrial problems
 - ✧ Soils
 - ✧ Concretes
 - ✧ and also: Pharmaceutical products; Carbon agglomerates; Ceramics, etc.
4. Different approaches of constitutive modeling
 - ✧ Non-linear elastic model
 - ✧ Elasto-plastic model
 - ✧ Micro-macro approaches

Course Organization

Lectures: 12 hr, Tutorials: 9 hr, Labwork: 12 hr, Exam: 3 hr

Teaching Material and Textbooks

ppt of the presentations

Evaluation

Oral defense of the project and laboratory sessions (3 hr).