Proposed course: Introduction to Breakage Mechanics

Course outline

Abstract: Constitutive models provide the mean with which one can predict future behaviour of materials given imposed loading conditions. These models are routinely employed by geotechnical engineers in their design and analysis of soil problems. Grain crushing is a phenomenon that leads the behaviour of brittle granular soils under compaction. This course will teach its students a new state-of-the-art theory, called Breakage Mechanics, with which grain crushing may be predicted and connected to the material’s constitutive behaviour. Project based assignments will be offered for students to establish essential background.

Timeline

This is a one-week course, involving the following topics. It will be offered at the end of June to early July. Students, however, will have to carry out a project on topics 2 and 3.

Topics

(1) Introduction: focus on the micro-structure of granular media;
(2) Conventional constitutive modelling framework: elasticity and plasticity [project based];
(3) Short account of damage mechanics [project based];
(4) Physical reasons to abandon the notion of plastic strain;
(5) Breakage mechanics (BM): physics and models;
(6) Example solutions with BM: laws of comminution, cavity expansion, compaction bands, and some FE results.