ALERT-Geomaterials organizes since 2009 Local Doctoral Courses, which are all dedicated to the memory of Prof. Olek Zienkiewicz, one of the founders of ALERT. These courses are mainly designed for postgraduate students, but they are open also to researchers and practitioners.

This year, the ALERT Olek Zienkiewicz course will take place at the University of Grenoble (France) and will deal with the discrete mechanics of geomaterials.

The fundamental understanding of the behavior of geomaterials begins by recognizing their particulate nature and its immediate implications: the interplay between particle characteristics, inter-particle arrangement and interconnected porosity, inherently non-linear inelastic contact phenomena, and particle forces.

The course will consist of lectures and practical sessions, providing the participants with an overview of state-of-the-art research on this subject. Including theoretical aspects, numerical methods, and advanced experimental techniques.

Organizers:
Bruno Chareyre (Grenoble INP, 3SR lab)
Cino Viggiani (UJF Grenoble, 3SR lab)

Secretary:
Emanuele Catalano (Grenoble INP, 3SR lab)

Lecturers:
Bruno Chareyre (Grenoble INP, 3SR lab)
Virginie Marry (UPMC Paris 6, PECSA)
François Nicot (Cemagref)
Farhang Radjaï (CNRS, Univ. Montpellier, LMGC)
Jean-Noël Roux (Institut Navier, Paris)
Carlos Santamarina (Georgia Tech., Atlanta)
Luc Sibille (Univ. Nantes, GeM)
Antoinette Tordesillas (Univ. Melbourne)
Cino Viggiani (UJF Grenoble, 3SR)

Practical Lectures Instructors:
Edward Andò (UJF Grenoble, 3SR lab)
Pierre Bésuelle (CNRS, 3SR lab)
Emanuele Catalano (Grenoble INP, 3SR lab)
Gaël Combe (UJF Grenoble, 3SR lab)
Jacques Desrues (CNRS, 3SR lab)
Nejib Hadda (Cemagref)
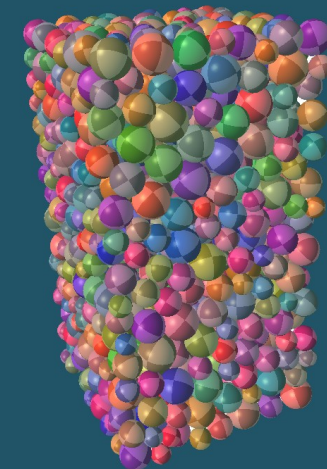Steve A. Hall (Lund Univ. - Sweden)

Olek Zienkiewicz Course 2011

Discrete Mechanics of Geomaterials

June 27th- July 1st, 2011

Grenoble, France

Registration

The course is open to all students, researchers and engineers.

The registration form is available at Alert's website:

http://alert.epfl.ch/local doctoral courses/local.htm

Registrations should be sent by email at:

oz_course_secretary@hmg.inpg.fr

The number of participants is limited to 40 persons. In order to selectively accept candidacy, we ask candidates to provide a short CV together with the registration form. An email from the supervisor will be also most welcome for students.

The final acceptation of registration will be notified on June 6th.

Registration fees
Members of Alert Geomaterials : free
Non members: 500€

Online registration form and information
http://alert.epfl.ch/local doctoral courses/local.htm
**contact**: oz_course_secretary@hmg.inpg.fr

Closing of online registration: 05/30/2011

ALERT GEOMATERIALS

3SR
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Grenoble INP
ENSE³

UNIVERSITE
JOSEPH FOURIER
SCIENCES, TECHNOLOGIE, SANTÉ

cnrs

Olek Zienkiewicz Course 2011

Discrete Mechanics of Geomaterials

The course includes lectures in plenary sessions and practical training in parallel sessions.
The lectures will be given in the morning, each day from 8:30 to 13:00.
The practical training will be organized in parallel sessions the afternoon from 14:00 to 18h00, with an experimental session for one half of the group and a numerical session for the other half. Each participant will attend two experimental and two numerical sessions.
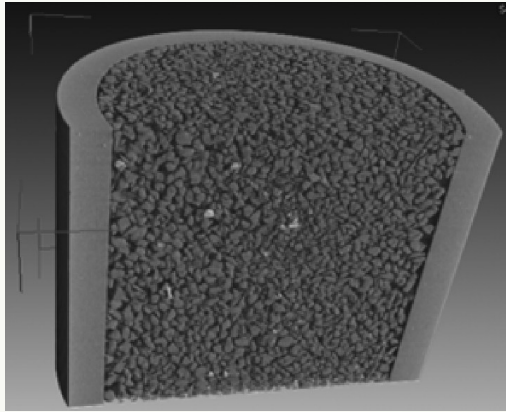
Program

Monday, June 27th

08:30-09:00	Introduction
09:00-10:45	Small scale physics of geomaterials
10:45-11:15	Coffee break
11:15-13:00	Mathematical modeling of granular materials
13:00-14:00	Lunch
14:00-18:00	Parallel sessions: Experimental I / Numerical I

Tuesday, June 28th

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08:30-10:15	Experimental micromechanics - Digital Image Correlation - Particle Tracking
10:15-10:30	Coffee break
10:30-12:00	D_{EM} modeling (I): - numerical methods - constitutive modeling of particles interactions - generation of packings
12:00-13:00	Micromechanical modeling of clays: molecular dynamics
13:00-14:00	Lunch
14:00-18:00	Parallel sessions : Numerical I / Experimental I
19:30	Banquet (downtown Grenoble)

Wednesday, June 29th

08:30-09:30	Statistical descriptors of the microstructure
09:30-10:15	D_{EM} modeling (IIa): - Dimensional analysis and micro-macro relations
10:15-10:30	Coffee break
10:30-11:30	D_{EM} modeling (IIb): - Control parameters
11:30-13:00	Directional stress-strain probing for the determination of elasto-plastic response
13:00-14:00	Lunch
14:00-18:00	Parallel sessions : Experimental II / Numerical II

Thursday, June 30th

08:30-10:00	Fabric evolution and induced anisotropy at large strains
10:00-10:15	Coffee break
10:15-11:00	Cohesive-frictional interactions
11:00-12:00	Fluid-grains interactions in three-phase materials
12:00-12:30	Modeling fluid-grains interactions in two-phase materials (an overview)
12:30-14:00	Lunch
14:00-18:00	Parallel sessions : Numerical II / Experimental II
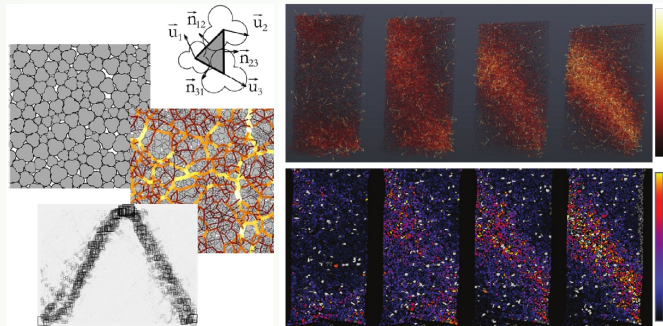
Friday, July 1st

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08:30-10:00	Homogenization models for granular materials
10:00-10:30	Coffee break
10:30-11:45	D_{EM} models for large scale geotechnical problems
10:45-11:15	Presentation of the results from practical sessions
11:15-12:00	Contributions by students
12:00-12:15	Closure Lecture
12:15-13:30	Lunch

Practical Sessions:

The experimental sessions will give an overview of advanced techniques used for measuring micro-scale quantities in geomaterials. The students will analyze the results of tests on 2D analogue materials and natural granular materials, using image analysis. They will highlight micro-scale features of strain in granular materials, including strain localization.

Experimental Session I (days 1/2)
- 2D shear apparatus $1\gamma2\epsilon$
- 3D X-ray tomography
- Image analysis

Experimental Session II (days 3/4)
- Particle Tracking and measurement of grain kinematics
- Digital Image Correlation
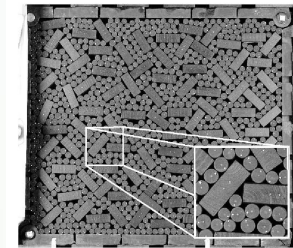
Numerical Sessions:

The numerical sessions will be entirely based on the open source DEM code Yade (**http://yade-dem.org**). The students will learn how to set-up simulations with this software and will get an overview of algorithms used, contact laws, and boundaries controls, in close relation with the topics of lecture sessions. They will investigate the mechanical response of numerical samples and analyze the results in terms of elasto-plastic behaviour. The two-phase and three-phase models implemented in Yade will be introduced and applied in simple test cases.

Numerical Session I (days 1/2)
- Introduction of Yade-DEM open source code
- Packings generation
- Constitutive modeling of contacts
- Boundary conditions and loading path
- Simulation of stress-strain behavior
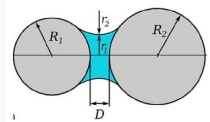
Numerical session II (days 3/4)
- Incremental loadings with elastoplastic analysis
- Hydromechanical couplings (unsaturated materials)
- Hydromechanical couplings (saturated materials)