6th ALERT Olek Zienkiewicz Course
on
Numerical Modelling in Geomechanics

Objectives

The main goal of this course is to provide PhD students with a sound knowledge of computational Geomechanics. The course will include lectures at four levels:

(1) Basic: providing the fundamentals of the numerical techniques used
(2) Advanced and research: the students will learn special techniques to deal with non linear problems, dynamics, integration of constitutive equations...We aim too to present current research within ALERT in this field.
(3) Applications to practical cases
(4) Practical. We believe that practise is fundamental when learning a computational technique. Therefore, we will provide a group of sessions where the students, with the help of instructors will practise with the finite element code GeHoMadrid.

We have also allocated time for PhD students attending the course to participate, making a short presentation of their work.

Contents

(1) Basic

- Introduction to FEM: Elliptic problems. Elasticity (MP)
- Seepage: transient problems of parabolic type   (MP)
- Practical aspects of FEM computations   (JAFM)
- Introduction to Computational Plasticity   (PM)
- Alternative formulations in Dynamics   (MP)
- Constitutive modelling in plasticity   (CT)
- Hydro-mechanical coupling in saturated materials (LS)

(2) Advanced and Research topics

- Hydro-mechanical coupling in unsaturated materials   (LS)
- Computational Plasticity: advanced methods   (PM)
- Implicit Integration of constitutive equations   (CT)
- Material Point Model techniques   (JAFM)
- SPH techniques   (MP)
- FEM modelling of water saturated and unsaturated soils   (LS)
- Viscoplasticity in soils   (CdP)
- Generalized Plasticity for unsaturated soils   (DM)
- Beyond Geomaterials (closure lecture)   (BS)

(3) Application to practical cases

- Mechanical effects of Chemical degradation of bonded geomaterials (RC)
- Finite element modelling of landslides   (JAFM)
- Propagation of fast catastrophic landslides   (MP/SC)
- Analysis of marine structures foundations including liquefaction   (PC/MMS)

(4) Practical sessions

- Introduction to GeHoMadrid. Pre and Post processing
- Choosing the right element: element technology. Bending and locking
- Introduction to Plasticity: plastification of an homogeneous specimen
- Introduction to localization. Formation of a shear band in a simple 2D specimen
- Vertical slope. Factor of Safety (FoS)
- Footing on a purely cohesive soil layer. Initial conditions. FoS
- Water in soil. 1D consolidation
- Footing on an elastic saturated soil
- Failure of slopes.
- Modelling of tunnels.

Organizers

Manuel Pastor
Claudio Tamagnini
Pablo Mira

Secretary: Diego Manzanal

Lecturers

Manuel Pastor	(MP)	(UPM)
Bernardo Schrefler	(BS)	(Univ.Padova)
Claudio di Prisco	(CdiP)	(Politecnico di Milano)
Claudio Tamagnini	(CT)	(Univ.Perugia)
Pablo Mira	(PM)	(UPM and CEDEX)
Lorenzo Sanavia	(LS)	(Univ.Padova)
Riccardo Castellanza	(RC)	(Politecnico di Milano)
Jose Antonio Fernández Merodo	(JAFM)	(IGME and UPM)
Diego Manzanal	(DM)	(UPM)
Miguel Martín Stickle	(MMS)	(UPM)
Pablo Cuéllar	(PC)	(BAM Berlin)
Paola Dutto	(PD)	(UPM)

Teaching material

Students will be provided with handouts.
The course will be based also on the book "Computational Geomechanics", by
Zienkiewicz, Chan, Pastor, Schrefler and Shiomi.

Practical details

The course will take place from 02nd to 06th June, at the Escuela Técnica Superior de
Ingenieros de Caminos de Madrid

Organization will provide advice on cheap hotels and student accommodation in
Madrid. We estimate the cost as 70 euros per day including meals and accommodation.

The course will take place during a week, Monday to Friday. Lectures will be arranged
having 4 lectures in the morning devoted to theory and a 3 practical sessions in the
afternoon. There will be 2 coffee breaks, in the morning and the afternoon. Estimated
time for lunch is 13:30, and students could use the university facilities (estimated cost
below 10 euros). Cost of full breakfast is less than 3 euros, a coffee or a tea less than 1
euro.

Students are advised to get a central Madrid bus and underground pass valid for a week,
estimated cost 15 euros.

Inscription form
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NC61uJlpvG3c/viewform