COURSE IN SOIL MODELING September 5-9, 2016

Introduction:

NTNU's Geotechnical Division offers a PhD Course in Soil Modelling from September 5 to 9, 2016.

Background:

Finite element based computer codes for geotechnical analyses are frequently used in design by consulting engineers. This course provides a background for development and application of the soil models used in such computer codes. The course focuses on soil behaviour, elasto-plastic theory, selected material models and their parameters. The course aims at providing a general theoretical framework for interpretation of the mechanical behaviour of soils. A short summary of relevant continuum mechanics theory is given in the first lectures followed by a detailed presentation of simple models based on Tresca and Coulomb. The main principles are discussed with emphasis on distortional hardening in combination with dilatancy control. Further, models based on Critical State Soil Mechanics with volumetric and distortional hardening are covered. An introduction to more advanced models is given together with a discussion of current research topics. The course will be composed of intensive lecturing in combination with guided exercises during the week and homework assignments.

Lecturers:



Professor Steinar Nordal NTNU	Professor David Muir Wood, University of Dundee, UK	Professor Gustav Grimstad NTNU

Target Audience

The course is at postgraduate/PhD level. It is based on a combined mathematical and graphical approach but is designed to give a platform for practical application in geotechnical design. The course does not require any background in finite element methods, but knowledge of conventional soil mechanics is a prerequisite. The course is taught in English.

Exam and ECTS credits

The course is a registered PhD course at NTNU: http://www.ntnu.edu/studies/courses/BA8304 . A written exam is offered in December 2016. Only candidates who complete the homework assignments handed out during the course are admitted to the exam. The course with exam gives 10 ECTS credits. The examination may also be held the same day at other European Universities.

Registration and fees:

The total number of participants for the PhD course is limited to 35. Registrations will be accepted in the order they are received. Registration fee is NOK 2500 and includes lecture notes and coffee in the breaks. In order to get access to the exam, participants from outside NTNU must also register as students at NTNU and pay an administrative semester fee in the order of NOK 500.

Course material

Lecture notes will be available. The following text books by David Muir Wood are recommended:

- Soil behaviour and critical state soil mechanics. Cambridge University Press 1990
- Geotechnical modelling. Spon Press 2004.
- Soil mechanics: a one-dimensional introduction. Cambridge University Press 2009

Preliminary Schedule

PhD course in Soil Modelling (BA8304)

Mon. 05.09.16, 10:00 – 18:00 BASIC CONCEPTS OF STRESS AND STRAIN TENSORS, ELASTICITY AND PLASTICITY
Stress invariants and yield criteria. Stress and strain measures. Elasticity. Elasto-plasticity, flow and hardening rules with the Tresca criterion as an example.

Tue. 06.09.16, 8:15 – 18:00 ELASTO PLASTICITY USING THE COULOMB CRITERION
Derivation and discussion of a simple isotropic hardening model for effective stress analysis.
Dilatancy and contractancy during distortional hardening controlled by a nonassociated flow rule.

Wed. 07.09.16, 8:15 – 18:00 MORE ON DISTORTIONAL HARDENING
Derivation of the Mohr-Coulomb stiffness matrix from geometrical reasoning. Extending to pre-failure nonlinearity and strength varying with density and stress level, (Severn-Trent sand).

Thu. 08.09.16, 18:15 – 18:00 MODELS BASED ON VOLUMETRIC HARDENING
From adding a cap on the Mohr-Coulomb model to Cam Clay as a fully volumetric hardening model. Adding pre-yield plasticity by kinematic hardening, adding structure and damage.

Fri. 09.09.16, 8:15 – 16:00 NUMERICAL IMPLEMENTATION
Implicit and explicit integration algorithms for soil models. Implementation in PLAXIS, or codes with a similar interface. "Hands on the computer" implementation exercise.

Hotels / Accommodation

Special NTNU rates are offered if you register through marit.skjak-brak@ntnu.no for staying at the following three hotels:

- Augustin (www.hotel-augustin.no)
- Comfort Hotel Park (www.choice.no)
- Thon Hotel (www.thonhotels.no/trondheim)

A hostel is available: www.trondheim-vandrerhjem.no

Venue:

NTNU – Gløshaugen
Lerkendalbygget,
Room 1-101,
Høgskoleringen 7a,
Trondheim,
Norway.

Contact and Registration

For questions on course contents please contact Steinar Nordal steinar.nordal@ntnu.no or Gustav Grimstad gustav.grimstad@ntnu.no.
For registration, hotel reservation and all practical matters please contact Marit Skjåk-Bræk marit.skjak-brak@ntnu.no.

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