Advanced Constitutive Models for Geomaterials

Module-No./Abbreviation CE-W06/ACMG	Credits 6 CP	Workload 180 h	Term 2nd Sem.	Frequency Summer term	Duration 1 Semester
Courses Advanced Constitutive Models for Geomaterials			**Contact hours** 4 SWS (60 h)	**Self-Study** 120 h	**Group Size:** No Restrictions

Prerequisites

Fundamental knowledge in soil mechanics and numerical simulation in Geotechnics

Learning goals / Competences

After successfully completing the module, the students are able to

- model the material behavior of soil using suitable, advanced constitutive models,
- select suitable numerical methods and constitutive models for practical questions and assess limitations according to the selected approaches,
- calibrate the parameters of the advanced constitutive models and evaluate the model performance based on single integration point simulations

Content

The course deals with the introduction of advanced soil mechanical behavior and appropriate constitutive models allowing to capture advanced effects. Model formulations and parameter calibration for different soil model families are taught. In addition, an introduction to single integration point finite element simulations with Incremental Driver (ID) is provided and simulations of different laboratory tests are conducted with ID using different elasto-plastic and hypoplastic constitutive models.

Advanced soil mechanics:

- Critical state soil mechanics
- Crushable soil mechanics
- Unsaturated soil mechanics
- Soil memory effects and their modelling
- Clay structure and small-strain stiffness anisotropy
- Influence of temperature on soil behavior and its modelling

Sophisticated constitutive models for soils:

- Modified Cam-Clay model
- Sanisand
- Hypoplasticity with Intergranular Strain
- Clay Hypoplasticity
- Hypoplasticity for crushable soils
- Visco-hypoplasticity
- Barcelona Basic Model

Teaching methods / Language

Lectures (4 h/week) / English

Mode of assessment

- Final written exam (180 min.)
- Optional homework to achieve bonus points for the written exam

Requirement for the award of credit points

Passed final written exam

Module applicability
Master Computational Engineering, Master Civil Engineering
Weight of the mark for the final score
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Module coordinator and lecturer(s)
Prof. Dr.-Ing. habil. T. Wichtmann (coordinator), Dr.-Ing. M. Tafili, Dr.-Ing. C. Schmüdderich
Further information