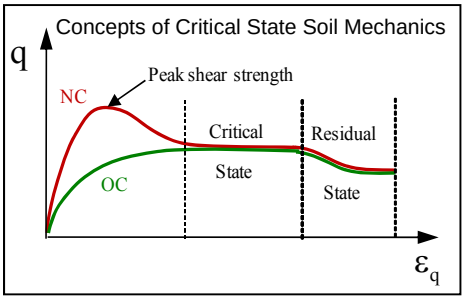
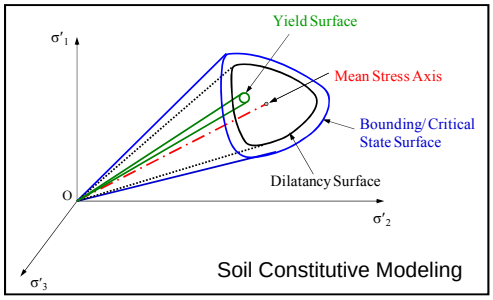
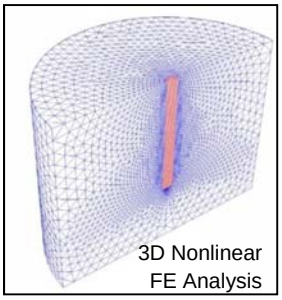
Plasticity and Constitutive Modeling of Soil with Applications in Finite Element Analysis

Overview

India is currently undergoing a transformation in infrastructure development with significant growth in the civil construction sector. Construction of road and railway embankments, bridges and flyovers, underground metro-rail facilities, offshore structures like offshore oil platforms and offshore wind turbines requires significant knowledge of soil mechanics and geotechnical engineering to ensure that these structures and facilities are founded on or in competent ground. Analysis and design of these structures often do not follow routine approach based on the standard codes of practice. Rather, they require sophisticated characterization of soil, detailed analysis considering different possible failure scenarios, and innovative design approaches that closely follow the analysis results. For complicated infrastructure problems, finite element analysis is now considered an essential numerical tool for obtaining solution. However, when dealing with soil mechanics and soil-structure interaction problems, it is important to characterize the soil adequately. Because soil exhibits high nonlinearity in its stress-strain-volume change response, it is critically important to incorporate this nonlinear behaviour in the finite element analysis before design solutions are proposed. In fact, modeling the nonlinear (elasto-plastic) constitutive behaviour of soil is rather complex and has not yet been a part of mainstream geotechnical engineering practice. Incorporation of the elasto-plastic soil constitutive models in finite element analysis is also rather involved. The proposed course aims to disseminate knowledge regarding both these challenging aspects of geotechnical engineering – soil constitutive modeling and elasto-plastic finite element analysis of geotechnical engineering problems.







Modules	**Plasticity and Constitutive Modeling of Soil with Applications in Finite Element Analysis: December 18 - December 22 2017** • Overview of Continuum Mechanics • Fundamentals of Plasticity Theory • Advanced Mechanics of Soil • Soil Constitutive Models • Computational Aspects of Constitutive Modeling • Basics of Finite Element Analysis • Elasto-Plastic Finite Element Analysis • Implementation of Nonlinear Finite Elements in Standard Software • Problems on Nonlinear Soil Mechanics • Problems on Nonlinear Finite Element Analysis **Number of participants for the course will be limited to fifty.**
Who Can Attend	• Executives, engineers, and researchers from civil construction and design firms, private consultants and contractors, government officials and engineers including those from R&D laboratories. • Students at all levels (BE/BTech/MSc/MTech/ME/PhD). • Faculty from reputed academic and technical institutions.
Fees	The participation fees per person for taking the course is as follows: • **Participants from abroad : US $200** • **Industry/ Research Organizations: Rs. 15,000** • **Academic Institutions, Faculty: Rs.10,000** • **Academic Institutions, Student: Rs. 5,000** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges. The participants will be provided with accommodation on payment basis.

Course Outline

This course is organized over five days. The primary objectives of this course are (i) exposing participants to the fundamentals of continuum mechanics and plasticity theory applicable to soil mechanics, (ii) providing knowledge about available soil constitutive models, (iii) exposing participants to the fundamentals of nonlinear (elasto-plastic) finite element modeling, (iv) determination of soil constitutive model parameters, (v) implementation of soil constitutive models in finite element analysis, (vi) finite element analysis of geotechnical boundary value problems, model verification and validation, (vii) building in confidence and capability amongst the participants in using soil constitutive models through user subroutines in finite element analysis, and (viii) providing exposure to practical problems and their solutions through hands-on experience.

Course participants will learn these topics through lectures and hands-on experiments. Also, case studies and assignments will be shared to stimulate research motivation of participants.

The Participation fees for the CEP programmes under GIAN will be accepted only through Demand Drafts drawn in favour of “IITD CEP Account” or e-transfer/RTGS/NEFT and Taxes as applicable on participant fee. Bank detail as under

Bank Account No.	36819334799
Bank Address	State Bank of India, IIT Delhi, Hauz Khas New Delhi-16
MICR Code	110002156
Beneficiary	IITD CEP ACCOUNTS
IFSC Code	SBIN0001077
Account Type	Saving

The Faculty

Dr. Dipanjan Basu is in the faculty of University of Waterloo, Canada. His research interests include energy geomechanics, foundation engineering, soil structure interaction, constitutive modeling, analytical and numerical methods, dynamics of blast in geo-structures, sustainability in geotechnical engineering, and ground improvement.

Dr. Tanusree Chakraborty is in the faculty of Indian Institute of Technology (IIT) Delhi. Her research interests include blast and impact engineering, material characterisation under high loading rate, energy geotechnical engineering, soil and rock plasticity and constitutive modelling, underground constructions in soil and rock, and foundation engineering.

Course Co-ordinator

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