

Mechanics of Unsaturated Soils

Overview

Expansive soils, compacted soils, collapsible soils, and residual soils are typical examples of unsaturated soils. Conventional saturated mechanics principles are not applicable for soils that are typically in a state of unsaturated condition. This course provides a framework to understand the principles of mechanics for unsaturated soils in terms of two stress state variables (namely, net normal stress and matric suction). The focus will be mainly to understanding the fundamentals related to the mechanics of unsaturated soils, three key engineering properties of soils: coefficient of permeability, shear strength and volume change behaviour. In addition, principles for extending the mechanics of unsaturated soils in the design of foundations and estimating 1-D heave of expansive soils will be explained. Key concepts will also be introduced towards using the soil-water characteristic curve as a tool in the prediction of several unsaturated soil properties (shear strength, permeability, volume change and swelling pressure).

The primary objectives of the course are as follows:

- i. To provide background information of the role of stress state variables for interpreting the engineering behaviour of both saturated and unsaturated soils.
- ii. To provide an understanding of the fundamentals and the application of the mechanics of unsaturated soils for addressing several geotechnical engineering problems.
- iii. To provide an opportunity to research on a topic related to the course material and write a short note on the *State-of-the-art* technical paper using a standard format.

Dates for the course	10-20 December 2019
Host Institute	IIT Madras
No. of Credits	2
Maximum No. of Participants	50
You Should Attend If...	<ul style="list-style-type: none">▪ Students at all levels (B.Tech./ M.S./ M.Tech./ PhD).▪ Faculty from academic institutions and technical institutions.▪ Executives, engineers and researchers from private, service and government organizations including R&D laboratories.

Course Registration Fees	<p>The participation fees for taking the course is as follows:</p> <p>Participants from abroad : US \$500 plus 18% GST Student participants: Rs. 2,000 (no GST) Faculty participants: Rs. 5,000 plus 18% GST Research Organizations / Industry participants: Rs. 10,000 plus 18% GST (note: As per the Norms, The student participants are exempted from the GST) The above fee is towards participation in the course, the course material and refreshments.</p> <p>Modes of payment: Online transfer: Account Name: CCE IIT Madras Acc. No: 3640111110 Branch: SBI, IIT Madras Branch, Chennai IFSC Code: SBIN0001055 Swift Code: SBININBB453</p> <p>Note: The participants should be mentioned the purpose of GIAN while the transaction and have to send the transaction details to gian@iitm.ac.in</p> <p style="text-align: center;">OR</p> <p>Demand draft in favour of “CCE IIT Madras” payable at Chennai. The demand draft is to be sent to the course coordinator at the address given below.</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on availability, on payment basis. Request for hostel accommodation may be submitted through the link:</p> <p>http://hosteldine.iitm.ac.in/iitmhostel/</p>
Registration Procedure	<p>Please follow the following steps for the registration:</p> <ol style="list-style-type: none"> 1. Go to GIAN website (http://www.gian.iitkgp.ac.in/GREGN/index) First time users need to register and pay a one-time fee of INR 500 / 2. Enroll for the course: Mechanics of Unsaturated Soils. Once you enroll for the course, an Enrollment/ Application number will be generated, and the course coordinators will be notified.

Course Faculty



Professor Sai K. Vanapalli is a Professor in the Department of Civil Engineering, University of Ottawa. He has been actively involved with research activities related to mechanics of unsaturated soils over the past three decades. He is passionate about developing simple procedures that are useful for addressing geotechnical engineering problems of interest to the practicing engineers based on the mechanics of saturated soils.

Professor Vanapalli has been an author or co-author of over 250 research publications in peer-reviewed journals, refereed conferences and other conferences, including five book chapters, twenty keynote papers, and two state-of-the-art reports for international unsaturated soil conferences. He has supervised 40 graduate students, 30 undergraduate students, and 10 postdoctoral fellows. He received Dean's commendation for outstanding teaching evaluations for numerous occasions. He has received the Stermac Award for his outstanding contributions to the Canadian Geotechnical Society in 2010 and Glinski Faculty of Engineering University of Ottawa Award for his research contributions in 2015.



Dr. T. Thyagaraj is currently an Associate Professor at Department of Civil Engineering, Indian Institute of Technology Madras, Chennai. He received his B.E. (Civil) from Osmania University and M.Sc. (Engg.) and PhD from Indian Institute of Science, Bangalore. His major areas of research interests are unsaturated soil behaviour, ground improvement techniques, geoenvironmental engineering and use of waste materials in civil engineering applications. He has published 28 papers in reputed international journals. Dr. Thyagaraj received IGS-Professor Dinesh Mohan Award in 2016 from Indian Geotechnical Society.

Course Coordinator

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