Unsaturated Soil Mechanics

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PRE-REQUISITES : Knowledge of basic “soil mechanics”
INTENDED AUDIENCE : Academicians
INDUSTRIES APPLICABLE TO : www.maccaferri.com

COURSE OUTLINE :

The knowledge of soil behavior is very important in the Geotechnical engineering practice. The soil behavior in saturated state is widely taught in the undergraduate and graduate programs, all over. The existence of air-phase in natural soils prompts the soil to behave differently from the saturated soils. The present course would provide the fundamental principles, mechanisms, and behavior of partly saturated soils.

ABOUT INSTRUCTOR :

Prof. T Venkata Bharat is currently Professor of Civil Engineering at IIT Guwahati. He has received both his M.Sc. (Eng.) and Ph.D. from the Indian Institute of Science (IISc), Bangalore, in 2004 and 2009, respectively. Prior to this, he worked as a visiting fellow and post-doctoral fellow during 2009 – 2012 at the University of Saskatchewan, Canada. Dr. Bharat has nearly a 20 years of research experience and 12 years of teaching experience in India and Canada. Dr. Bharat is currently associated with both Center for Disaster Management & Research and Center for Indian Knowledge Systems at IIT Guwahati and guiding Ph.D. students. He has received numerous awards in India and abroad for his contribution to computational Geomechanics and Geoenvironmental research. Dr. Bharat is the Associate Editor of the Clays and Clay Minerals (the official journal of Clay Minerals Society) and editorial board member of the Indian Geotechnical Journal (the official journal of Indian Geotechnical Society) and is an active reviewer of over 30 peer-reviewed journals. Dr. Bharat’s research interests are Waste management, Mitigation of rainfall-induced landslides, and Geotechnical and Architectural aspects of Heritage structures.

COURSE PLAN :

Week 1: Introduction; Application areas; Basic parameters

Week 2: Basic parameters; Phase equilibrium

Week 3: Concept of water retention; Soil water characteristics (SWCC); Hysteresis; Mechanisms

Week 4: Measurement of state variables

Week 5: Measurement of state variables; Theoretical SWCC

Week 6: Demonstration of software for fitting SWCC; Pedo-Transfer functions (PTF)

Week 7: Hydraulic Conductivity; Measurement; Predictive models

Week 8: Hydraulic Conductivity prediction; Capillary barriers; Software demonstration

Week 9: Steady-state flow; Absence and influence of gravity

Week 10: Transient flow

Week 11: Analytical methods for transient flow; Shear strength

Week 12: Shear strength; Swell and Collapse behavior