
Unsaturated soil mechanics is a relatively new discipline developed during the past 40 years from classical soil mechanics, which deals with stress, strength, and deformation of water-saturated soils to solve foundation and stability related civil engineering problems. Originating in the field of civil engineering, unsaturated soil mechanics has strong ties to soil physics and hydrology. This is reflected in the extension of models for deformation behavior for saturated soils to partially saturated soils using basic concepts of water flow and storage, developed earlier within the soil physics community, albeit under the assumption of a rigid solid matrix.

Until recently, Soil Mechanics for Unsaturated Soils by Fredlund and Rahardjo (D.G. Fredlund and H. Rahardjo, 1993, John Wiley & Sons Inc., New York) was the only book providing a comprehensive overview of theory, measurement techniques, and applications in the mechanics of unsaturated soils. Unlike Fredlund and Rahardjo’s (civil-) engineering perspective on the topic, the new book of Lu and Likos offers broader, more general and scientific perspectives.

The authors begin with an introduction of soil formation, water content, fluid pressure, and stress in soils, followed by four major sections entitled (i) Fundamental Principals, (ii) Stress Phenomena, (iii) Flow Phenomena, and (iv) Material Variable Measurement and Modeling. Section I addresses fundamental properties of the soil’s solid, water, and air phases; their interface stresses and equilibrium states; and consequences, for example, for the relative humidity of air or capillarity of water in soil. Section II introduces effective stress in unsaturated soil using both macro- and micromechanical conceptualization. Special emphasis is given to the role of hysteresis in effective stress. Subsequently, shear strength and extended Mohr–Coulomb criteria for unsaturated soil are introduced. Section II ends with the influence of suction on earth pressure profiles, with emphasis on active and passive earth pressures. Section III begins with steady-state water and air flow through saturated and unsaturated soil, introducing the concepts of potential, permeability, and effects of grain size distribution, water potential on hydraulic conductivity are discussed as steady-state water infiltration, evaporation, a capillary barrier. The section closes with a chapter flow by treating the problems of infiltration and unsaturated soils. The book concludes with measurement techniques to characterize suction conductivity, and the soil water characteristic of. Throughout the text and at the end of each calculations illustrate use of the theory proves understanding of the material and its world problems.

Soil physicists will find a range of topics in standard textbooks but with new insights on interfacial equilibrium and the physics principles. The book offers a sound introduction of stress and strength in unsaturated soils, which is rarely addressed in soil physics textbooks. Understanding unsaturated soil mechanics, we missed a challenge of water content and potential on soil behavior, a topic of great interest to many soil engineers dealing with compaction and restoration.

In summary, Lu and Likos’ book is a valuable university-level classes on unsaturated soil mechanics as a valuable reference for soil scientists and seeking an introduction into the topic. The stress lies in combining civil engineers’ and soil physicists’ on stress, strength, and fluid flow of unsaturated easy-to-read language, and its thorough definitions of key processes and material properties of unsaturated soil from first principles. Less emphasis is given to models for unsaturated soil, which underlines the character of the book. For readers with a general vadose zone hydrology, this book provides the physics of soil solid skeleton and fluid, understanding of soil as a deformable porous

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