

# Introduction To Soil Mechanics Experiments

A logical, integrated and comprehensive coverage of both introductory and advanced topics in soil mechanics in an easy-to-understand style. Emphasis is placed on presenting fundamental behaviour before more advanced topics are introduced. The use of S.I. units throughout, and frequent references to current international codes of practice and refereed research papers, make the contents universally applicable. Written with the university student in mind and packed full of pedagogical features, this book provides an integrated and comprehensive coverage of both introductory and advanced topics in soil mechanics. It includes: worked examples to elucidate the technical content and facilitate self-learning a convenient structure (the book is divided into sections), enabling it to be used throughout second, third and fourth year undergraduate courses universally applicable contents through the use of SI units throughout, frequent references to current international codes of practice and refereed research papers new and advanced topics that extend beyond those in standard undergraduate courses. The perfect textbook for a range of courses on soils mechanics and also a very valuable resource for practising professional engineers. This book is the second volume of the proceedings of the 4th GeoShanghai International Conference that was held on May 27 - 30, 2018. This conference showcased the recent advances and technology in geotechnical engineering,

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geoenvironmental engineering and transportation engineering. This volume, entitled “Multi-physics Processes in Soil Mechanics and Advances in Geotechnical Testing”, covers a wide range of topics in soil mechanics, focusing on the behaviours of partially saturated soils, combined effects of multi-physics processes in geological materials and systems, and emerging methods and techniques in geotechnical in-situ testing and monitoring. This book may benefit researchers and scientists from the academic fields of soil and rock mechanics, geotechnical engineering, geoenvironmental engineering, transportation engineering, geology, mining and energy, as well as practical engineers from the industry. Each of the papers included in this book received at least two positive peer reviews. The editors would like to express their sincerest appreciation to all of the anonymous reviewers all over the world, for their diligent work.

Now in its sixth edition, Soil Mechanics Laboratory Manual is designed for the junior-level soil mechanics/geotechnical engineering laboratory course in civil engineering programs. It includes eighteen laboratory procedures that cover the essential properties of soils and their behavior under stress and strain, as well as explanations, procedures, sample calculations, and completed and blank data sheets. Written by Braja M. Das, respected author of market-leading texts in geotechnical and foundation engineering, this unique manual provides a detailed discussion of standard soil classification systems used by engineers: the AASHTO Classification System and the Unified Soil Classification System, which both conform to recent ASTM specifications. To improve

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ease and accessibility of use, this new edition includes not only the stand-alone version of the Soil Mechanics Laboratory Test software but also ready-made Microsoft Excel(r) templates designed to perform the same calculations. With the convenience of point and click data entry, these interactive programs can be used to collect, organize, and evaluate data for each of the book's eighteen labs. The resulting tables can be printed with their corresponding graphs, creating easily generated reports that display and analyze data obtained from the manual's laboratory tests. Features . Includes sample calculations and graphs relevant to each laboratory test . Supplies blank tables (that accompany each test) for laboratory use and report preparation . Contains a complete chapter on soil classification (Chapter 9) . Provides references and three useful appendices: Appendix A: Weight-Volume Relationships Appendix B: Data Sheets for Laboratory Experiments Appendix C: Data Sheets for Preparation of Laboratory Reports"

This book provides an introduction to classical soil mechanics and foundation engineering, and applies these principles to agricultural engineering situations. Theoretical design formulae are given, plus tables and graphs dealing with bearing capacity factors, wall pressure factors, soil cutting numbers and soil mechanical properties. Many example problems of design and analysis are solved in the text, and there are unsolved problems given for each chapter. The text begins with descriptions of soil origins and classification systems, including agricultural classification schemes,

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and then introduces classical concepts of soil strength and strength measurement techniques in the laboratory and in the field. Soil mechanics is applied to the design of shallow foundations, and the design formulae as well as tables of bearing capacity factors for design use are provided. New research and design findings in the specialized area of tall and heavy farm silos are also given, in addition to deep pile foundation design for heavy structures on very soft soils. Water flow in soils is treated, together with stability of ditch bank slopes and small earth dams, design of retaining walls and pressure pressures in bins and silos, soil erosion and protection methods, soil cutting and tillage design methods, soil compaction analysis, the use of geotextiles and problems of soil freezing. The book is directed primarily at professional university students in Agricultural Engineering, but will also be of interest to scientists working in other engineering branches, landscape architecture, soil physics and the like. Soil Mechanics Lab Manual prepares readers to enter the field with a collection of the most common soil mechanics tests. The procedures for all of these tests are written in accordance with applicable American Society for Testing and Materials (ASTM) standards. Video demonstrations for each experiment available on the website prepare readers before going into the lab, so they know what to expect and will be able to complete the tests with more confidence and efficiency. Laboratory exercises and data sheets for each test are included in the Soil Mechanics Lab Manual.

This book presents the collection of technical papers which includes research on two

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important topics in geotechnical engineering; the characterization of unsaturated soils. The papers in this collection are representative of local challenges facing geotechnical engineers in the Middle East, but their contributions can also be extended to other regions of the world.

Doctoral Thesis / Dissertation from the year 2010 in the subject Engineering - Geotechnology, course: Civil Engineering, language: English, abstract: With growing infrastructure developments in hilly areas and due to economical constraints of using locally available rockfill materials for construction of embankments, practicing engineers must be acquainted with geotechnical response of non-conventional granular soils. These materials are most likely to disintegrate with time due to physical and chemical weathering. In general, the laboratory investigations on durability characteristics of such materials are only made through simple slaking tests. However, studies examining the effects of slaking-induced disintegration of soil grains on the geotechnical engineering analysis and design parameters are rather limited. This is essentially due to the reason that the grains of standard laboratory sands are mostly durable and hence, the stress-strain response is considered to be unaffected by the presence of water. In order to explore the possible effects of deterioration of soil grains on static and dynamic properties of granular soils, a series of consolidated drained torsional shear tests on various crushed soft rocks were performed under saturated and dry conditions and compared with a well reported Toyoura silica sand consisting of durable grains. Due to

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the sensitivity of crushed rockfill to deteriorate upon water-submergence, test under dry conditions represented the response of a soil with intact grains, whereas a similar test under saturated condition simulated the potential reduction in strength and stiffness of the soil with time. From the grain size distributions determined after each test, a degradation index was defined to quantify the degree of disintegration of grains. Strength and deformation properties determined from monotonic as well as cyclic shear tests were then compared with this index. Possible c

These proceedings document the various papers delivered and partially presented at the International Conference “From experimental evidence towards numerical modeling of unsaturated soils,” which was held in Weimar (Germany) during 18-19 September 2003. The conference was organized under the auspices of the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) and the National German Geotechnical Society (DGGT). The need to understand the behavior of unsaturated soils is becoming exclusively essential for the geotechnical engineers and designers. In the last three decades many researchers have made significant contribution to the understanding of the unsaturated soil mechanics. Nevertheless, application of the subject to variety of new problems still requires our attention. This International conference is a mere attempt to unite researchers and engineers in geotechnical

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engineering and to discuss about the problems associated with the unsaturated soils. Doing so the objectives of these lecture notes are as follows: - to promote unsaturated soil mechanics for practical application, - to exchange experiences in experimental unsaturated soil mechanics and numerical modeling, - to discuss application of unsaturated soil mechanics to variety of problems. In other words, we could also name these two volumes as “From theory to daily practice”. I would like to extend my deep sense of appreciation as the editor and the Head of the organizing committee, to many persons who have contributed either directly or indirectly to organize the International conference and to finalize these proceedings.

Fundamentals of Continuum Mechanics of Soils provides a long-needed general scheme for the study of the important yet problematic material of soil. It closes the gap between two disciplines, soil mechanics and continuum mechanics, showing that the familiar concepts of soil mechanics evolve directly from continuum mechanics. It confirms concepts such as pore pressures, cohesion and dependence of the shear stress on consolidation, and rejects the view that continuum mechanics cannot be applied to a material such as soil. The general concepts of continuum mechanics, field equations and constitutive equations are discussed. It is shown how the theory of mixtures evolves from these equations

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and how, along with energetics and irreversible thermodynamics, it can be applied to soils. The discussion also sheds light on some aspects of mechanics of materials, especially compressible materials. Examples are the introduction of the Hencky measure of strain, the requirement of dual constitutive equations, and the dependence of the spent internal energy on the stored internal energy.

Researchers in engineering mechanics and material sciences may find that the results of experiments on soils can be generalized and extended to other materials. The book is a reference text for students familiar with the fundamentals of mechanics, for scholars of soil engineering, and for soil scientists. It is also suitable as an advanced undergraduate course in soil mechanics.

This volume presents the work of postgraduate and postdoctoral researchers on unsaturated soil mechanics. Topics covered include: innovative experimental techniques; new experimental data on compacted, collapsible and swelling soils; and advances in constitutive modelling.

The currently available soil mechanics textbooks explain theory and show some practical applications through solving abstract geotechnical problems.

Unfortunately, they do not engage students in the learning process as students do not "experience" what they study. This book employs a more engaging project-based approach to learning, which partially simulates what practitioners do in real



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life. It focuses on practical aspects of soil mechanics and makes the subject "come alive" through introducing real world geotechnical problems that the reader will be required to solve. This book appeals to the new generations of students who would like to have a better idea of what to expect in their employment future. This book covers all significant topics in soil mechanics and slope stability analysis. Each section is followed by several review questions that will reinforce the reader's knowledge and make the learning process more engaging. A few typical problems are also discussed at the end of chapters to help the reader develop problem-solving skills. Once the reader has sufficient knowledge of soil properties and mechanics, they will be offered to undertake a project-based assignment to scaffold their learning. The assignment consists of real field and laboratory data including boreholes and test results so that the reader can experience what geotechnical engineering practice is like, identify with it personally, and integrate it into their own knowledge base. In addition, some problems include open-ended questions, which will encourage the reader to exercise their judgement and develop practical skills. To foster the learning process, solutions to all questions are provided to ensure timely feedback. Topics of this book span the range from spatial and temporal discretization techniques for contact and impact problems with small and finite deformations

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over investigations on the reliability of micromechanical contact models over emerging techniques for rolling contact mechanics to homogenization methods and multi-scale approaches in contact problems.

Ideal for undergraduates of geotechnical engineering for civil engineers, this established textbook sets out the basic theories of soil mechanics in a clear and straightforward way; combining both classical and critical state theories and giving students a good grounding in the subject which will last right through into a career as a geotechnical engineer. The subject is broken down into discrete topics which are presented in a series of short, focused chapters with clear and accessible text that develops from the purely theoretical to discussing practical applications. Soil behaviour is described by relatively simple equations with clear parameters while a number of worked examples and simple experimental demonstrations are included to illustrate the principles involved and aid reader understanding.

This special issue collects selected contributions (excluding general lectures) of a Symposium on "Micro to MACRO Mathematical Modelling in Soil Mechanics", which took place at the University of Reggio Calabria, Italy, from May 29th to June 1st, 2018. The Symposium provided an opportunity to enhance the scientific debate on the construction of mathematical models for the description

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of the physical behaviour of soils, as well as on the suggestions provided by the micro-mechanical observation of the matter. The focus was on the comparison between the appropriateness of models and the need of mathematics to obtain rigorous results, which involves know-how from applied mathematical physics, geotechnical engineering and mechanics of solids. The contributions were selected by the Editors and the other Members of the Scientific Committee of the Symposium: Gianfranco Capriz (Pisa, Roma), Claudio di Prisco (Milan), Wolfgang Ehlers (Stuttgart), James T. Jenkins (Cornell), Stefan Luding (Twente), David Muir Wood (Dundee), Kenichi Soga (Berkeley).

Introduction to Soil Mechanics Laboratory TestingCRC Press

This work presents the experimental results of the strength of sands and clay soils in the following conditions: plane shear, triaxial stress state, with passive and active loading. The obtained experimental results are compared with existing theories of strength and the reasons for their non-conformity are identified.

Experimental data on the determination of the position of shear surfaces with active and passive resistance of soils is analysed. A new concept of the theory of soil strength is considered, which allows to take into account the fundamental parameters of the strength of soils: the angle of internal friction, specific adhesion, and lateral pressure ratio. Given analytical expressions allow one to

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determine the stress state at the sites rejected with respect to the main stresses. The definition of the physical essence of the concept of lateral pressure coefficient for soils is given. Also described are the results of experiments to determine the critical load on soil having the shape of a truncated cone, where the angles of deflection of the shear surfaces have been experimentally determined, on the basis of which analytical expressions have been obtained that allow prediction of the critical load. The book provides methods for solving various geotechnical problems using the theory of soil strength proposed by the authors. The book is intended for professionals working in the fields of soil mechanics and geotechnics, as well as for students and academics in engineering, earth and soil sciences and construction.

Manual of Geotechnical Laboratory Soil Testing covers physical, index, and engineering properties of soils, including compaction characteristics (optimum moisture content), permeability (coefficient of hydraulic conductivity), compressibility characteristics, and shear strength (cohesion intercept and angle of internal friction). Further, this manual covers data collection, analysis, computations, additional considerations, sources of error, precautionary measures, and the presentation results along with well-defined illustrations for each of the listed tests. Each test is based on relevant standards with pertinent

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references, broadly aimed at geotechnical design applications. FEATURES Provides fundamental coverage of elementary-level laboratory characterization of soils Describes objectives, basic concepts, general understanding, and appreciation of the geotechnical principles for determination of physical, index, and engineering properties of soil materials Presents the step-by-step procedures for various tests based on relevant standards Interprets soil analytical data and illustrates empirical relationship between various soil properties Includes observation data sheet and analysis, results and discussions, and applications of test results This manual is aimed at undergraduates, senior undergraduates, and researchers in geotechnical and civil engineering. Prof. (Dr.) Bashir Ahmed Mir is among the senior faculty of the Civil Engineering Department of the National Institute of Technology Srinagar and has more than two decades of teaching experience. Prof. Mir has published more than 100 research papers in international journals and conferences; chaired technical sessions in international conferences in India and throughout the world; and provided consultancy services to more than 150 projects of national importance to various government and private agencies.

A simplified approach to applying the Finite Element Method to geotechnical problems Predicting soil behavior by constitutive equations that are based on

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experimental findings and embodied in numerical methods, such as the finite element method, is a significant aspect of soil mechanics. Engineers are able to solve a wide range of geotechnical engineering problems, especially inherently complex ones that resist traditional analysis. Applied Soil Mechanics with ABAQUS® Applications provides civil engineering students and practitioners with a simple, basic introduction to applying the finite element method to soil mechanics problems. Accessible to someone with little background in soil mechanics and finite element analysis, Applied Soil Mechanics with ABAQUS® Applications explains the basic concepts of soil mechanics and then prepares the reader for solving geotechnical engineering problems using both traditional engineering solutions and the more versatile, finite element solutions. Topics covered include: Properties of Soil Elasticity and Plasticity Stresses in Soil Consolidation Shear Strength of Soil Shallow Foundations Lateral Earth Pressure and Retaining Walls Piles and Pile Groups Seepage Taking a unique approach, the author describes the general soil mechanics for each topic, shows traditional applications of these principles with longhand solutions, and then presents finite element solutions for the same applications, comparing both. The book is prepared with ABAQUS® software applications to enable a range of readers to experiment firsthand with the principles described in the book (the software

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application files are available under "student resources" at [www.wiley.com/college/helwany](http://www.wiley.com/college/helwany)). By presenting both the traditional solutions alongside the FEM solutions, Applied Soil Mechanics with ABAQUS® Applications is an ideal introduction to traditional soil mechanics and a guide to alternative solutions and emergent methods. Dr. Helwany also has an online course based on the book available at [www.geomilwaukee.com](http://www.geomilwaukee.com).

Soil Mechanics and Foundation Engineering, 2e Presents the principles of soil mechanics and foundation engineering in a simplified yet logical manner that assumes no prior knowledge of the subject. It includes all the relevant content required for a sound background in the subject, reinforcing theoretical aspects with comprehensive practical applications.

With the application of the effective stress concept, the strength and volumetric behavior of saturated materials was clearly understood. For the case of unsaturated materials, a universally accepted effective stresses equation is still under debate. However, the use of the effective stress concept to develop constitutive models for unsaturated soils is becoming increasingly popular not only because the hydro-mechanical coupling observed in these materials is implicit in the formulation but also because simpler and more precise models can be established. Towards A Unified Soil Mechanics Theory demonstrates that the

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same strength and volume change equations used in saturated soil mechanics can be used for the case of unsaturated soils. In other words, the constitutive models developed for saturated soils can be used for unsaturated materials once the effective stress equation has been defined. In this book, an analytical equation for the effective stress for unsaturated soils is established. This equation requires the knowledge of the superficial area of solids affected by the capillary phenomenon. In other words, we need to know how water distributes in the pores of the soil. This distribution can be modeled using a solid-porous model built on a regular network. However, the size of the network required to correctly simulate the structure of a small soil sample cannot be managed with a common PC. For that reason, a probabilistic porous-solid model is developed. This model uses the pore size distribution in the form of a probabilistic function which in addition to the Laplace equation and the principle of continuity can be expressed as the probability of a pore of certain size to be filled or dry at suction during a wetting or drying path, respectively. In this way, the soil-water retention curves can be simulated and the effective stress at any suction during wetting or drying processes can be determined. Based on this approach, it is shown that unsaturated soils behave under the same principles for strength and volumetric behavior as saturated soils. This revised edition brings additional information



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about an elastoplastic framework for expansive soils, hydro-mechanical coupling and a fully coupled model. The additional chapters also cover the experimental parameters used to derive the models. An updated set of references and a list of abbreviations is also included in this edition. Towards A Unified Soil Mechanics Theory paves the way for a universal theory of soil mechanics. The volume will be a valuable reference to civil engineers, earth scientists and hydrologists interested in soil mechanics at both academic and professional levels.

The field of experimental unsaturated soil mechanics has grown considerably over the last decade. In the laboratory and in the field, innovative techniques have been introduced into mechanical, hydraulic, and geo-environmental testing. Normally, this information is widely dispersed throughout journals and conference proceedings and it is often difficult to identify suitable equipment and instrumentation for research or professional purposes. In this volume, however, the authors bring together the latest research in laboratory and field testing techniques, and the equipment employed, and examine the current state-of-the-art in a forum devoted solely to experimental unsaturated soil mechanics. The papers published in the proceedings were peer-reviewed by internationally-recognized researchers. The topics tackled by the papers include suction measurement, suction control, mechanical and hydraulic laboratory testing, geo-

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environmental testing, and field-testing.

A selection of papers by Professor AW Skempton, aiming to show his breadth of achievement in the field of soilmechanics. The chosen papers are reproduced chronologically, most of them falling into three subject groups: soil properties, stability of slopes, and foundations. This collection is useful to engineers, research workers, and students.

It is critical to quantify the various properties of soil in order to predict how it will behave under field loading for the safe design of soil structures. Quantification of these properties is performed using standardized laboratory tests. This lab manual prepares readers to enter the field with a collection of the most common of these soil mechanics tests. The procedures for all of these tests are written in accordance with applicable American Society for Testing and Materials (ASTM) standards.

These proceedings are a continuation of the series of International Conferences in Germany entitled "Mechanics of Unsaturated Soils." The objective is to discuss and understand unsaturated soil behaviour, so that engineered activities are improved in terms of judgement and quality. In addition to knowledge of classical concepts, it is a challenge to adapt convincing new concepts and present them in such a way that they can be used in engineering practices.

Knowledge of the behavior of soil mechanics is essential for forecasting the internal displacements and actions of any construction. This book, although theoretical at first

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glance, also offers a more practical scope, giving readers adequate tools to plan geotechnical projects correctly.

This manual for civil and structural engineers aims to simplify as much as possible a complex subject which is often treated too theoretically, by explaining in a practical way how to provide uncomplicated, buildable and economical foundations. It explains simply, clearly and with numerous worked examples how economic foundation design is achieved. It deals with both straightforward and difficult sites, following the process through site investigation, foundation selection and, finally, design. The book: includes chapters on many aspects of foundation engineering that most other books avoid including filled and contaminated sites mining and other man-made conditions features a step-by-step procedure for the design of lightweight and flexible rafts, to fill the gap in guidance in this much neglected, yet extremely economical foundation solution concentrates on foundations for building structures rather than the larger civil engineering foundations includes many innovative and economic solutions developed and used by the authors' practice but not often covered in other publications provides an extensive series of appendices as a valuable reference source. For the Second Edition the chapter on contaminated and derelict sites has been updated to take account of the latest guidelines on the subject, including BS 10175. Elsewhere, throughout the book, references have been updated to take account of the latest technical publications and relevant British Standards.

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Dynamic Behavior of Materials, Volume 1: Proceedings of the 2013 Annual Conference on Experimental and Applied Mechanics, the first volume of eight from the Conference, brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Experimental Mechanics, including papers on: General Dynamic Material Properties Novel Dynamic Testing Techniques Dynamic Fracture and Failure Novel Testing Techniques Dynamic Behavior of Geo-materials Dynamic Behavior of Biological and Biomimetic Materials Dynamic Behavior of Composites and Multifunctional Materials Dynamic Behavior of Low-Impedance materials Multi-scale Modeling of Dynamic Behavior of Materials Quantitative Visualization of Dynamic Behavior of Materials Shock/Blast Loading of Materials

Covering the undergraduate course in geotechnical engineering for civil engineers, this work sets out the basic theories of soil mechanics in a clear, simple way, combining both classical and critical state theories. By using short, focused chapters, the author ensures an accessible text while maintaining a continuous thread running through the book as theory develops into application. The treatment of soil mechanics is essentially theoretical but it is not highly mathematical and soil behaviour is represented by relatively simple equations with clearly defined parameters. The theory is supported by worked examples and simple experimental demonstrations.

A step-by-step text on the basic tests performed in soil mechanics, Introduction to Soil

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Mechanics Laboratory Testing provides procedural aids and elucidates industry standards. It also covers how to properly present data and document results. Containing numerical examples and figures, the information presented is based on American Society f

Unsaturated soil mechanics is now increasingly recognized as an integral part of mainstream soil mechanics, and the importance and relevance of unsaturated soil mechanics for the broad field of geotechnical engineering no longer needs to be emphasized. The two volumes making up Unsaturated soils include papers from the 4th Asia Pacific Confere

In recent years the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), the International Association for Engineering Geology and Environment (IAEG), and the International Society for Rock Mechanics (ISRM) have concluded a Cooperation Agreement, leading to the foundation of the Federation of International Geo-engineering

A comprehensive guide to the most useful geotechnical laboratory measurements Cost effective, high quality testing of geo-materials is possible if you understand the important factors and work with nature wisely. Geotechnical Laboratory Measurements for Engineers guides geotechnical engineers and students in conducting efficient testing without sacrificing the quality of results. Useful as both a lab manual for students and as a reference for the practicing geotechnical engineer, the book covers thirty of

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the most common soil tests, referencing the ASTM standard procedures while helping readers understand what the test is analyzing and how to interpret the results. Features include: Explanations of both the underlying theory of the tests and the standard testing procedures The most commonly-taught laboratory testing methods, plus additional advanced tests Unique discussions of electronic transducers and computer controlled tests not commonly covered in similar texts A support website at [www.wiley.com/college/germaine](http://www.wiley.com/college/germaine) with blank data sheets you can use in recording the results of your tests as well as Microsoft Excel® spreadsheets containing raw data sets supporting the experiments

This textbook offers a superb introduction to theoretical and practical soil mechanics. Special attention is given to the risks of failure in civil engineering, and themes covered include stresses in soils, groundwater flow, consolidation, testing of soils, and stability of slopes. Readers will learn the major principles and methods of soil mechanics, and the most important methods of determining soil parameters both in the laboratory and in situ. The basic principles of applied mechanics, that are frequently used, are offered in the appendices. The author's considerable experience of teaching soil mechanics is evident in the many features of the book: it is packed with supportive color illustrations, helpful examples and references. Exercises with answers enable students to self-test their understanding and encourage them to explore further through additional online material. Numerous simple computer programs are provided online as Electronic

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Supplementary Material. As a soil mechanics textbook, this volume is ideally suited to supporting undergraduate civil engineering students. "I am really delighted that your book is now published. When I "discovered" your course a few years ago, I was elated to have finally found a book that immediately resonated with me. Your approach to teaching soil mechanics is precise, rigorous, clear, concise, or in other words "crisp." My colleagues who share the teaching of Soil Mechanics 1 and 2 (each course is taught every semester) at the UMN have also adopted your book." Emmanuel Detournay Professor at Dept. of Civil, Environmental, and Geo-Engineering, University of Minnesota, USA

A step-by-step text on the basic tests performed in soil mechanics, Introduction to Soil Mechanics Laboratory Testing provides procedural aids and elucidates industry standards. It also covers how to properly present data and document results. Containing numerical examples and figures, the information presented is based on American Society for Testing and Materials (ASTM) standards, and US Army Corps of Engineers engineering manuals. The authors discuss the different methods of in situ field methods and ex situ laboratory methods of soil description and identification. They present equations for the physical properties of soil and laboratory methods of soil classification. They also discuss tests for the interaction of soil and water, and hydraulic conductivity and consolidation. These tests produce information useful in the identification and characterization of soil samples and their engineering behaviors. A

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comprehensive resource, the book describes the evaluation of physical properties of soils, including mass, weight, unit weight, and mass density of the soil mass and its component phases. These properties are then expanded to define a number of weight and volumetric relationships. The book also discusses tests used in the evaluation of the density-water content relationships in soils and in the evaluation of the quality of compaction operations. These features and more make this book an excellent guide for testing soils.

This book contains technical papers, presented in a discussion session at the XI International Conference on Soil Mechanics and Foundation Engineering held in San Francisco in 1985, on the role of centrifuge in geotechnical testing, with descriptions of test facilities.

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