

Itasca Pfc2d User Guide

The consequences of a large dam failing can be disastrous. However, predicting the performance of concrete dams during earthquakes is one of the most complex and challenging problems in structural dynamics. Based on a nonlinear approach, "Seismic Safety Evaluation of Concrete Dams" allows engineers to build models that account for nonlinear phenomena such as vertical joint slippage, cracks, and cavitation. This yields more accurate estimates. Advanced but readable, this book is the culmination of the work carried out by Tsinghua University Research Group on Earthquake Resistance on Dams over the last two decades. Nonlinearity characteristics of high concrete dams, seismic analysis methods, evaluation models A systematic approach to nonlinear analysis and seismic safety evaluation of concrete dams Includes nonlinear fracture of dam-water-foundation interaction system, dynamic fluid-structure and Covers soil-structure interactions, and meso-scale mechanical behavior of concrete are all international front issues of the field.

Rock dynamics has become one of the most important topics in the field of rock mechanics and rock engineering, and involves a wide variety of topics, from earthquake engineering, blasting, impacts, failure of rock engineering structures as well as the occurrence and prediction of earthquakes, induced seismicity, rock bursts to non-destructive testing and explorations. Rock dynamics has wide applications in civil and infrastructural, resources and energy, geological and environmental engineering, geothermal energy, and earthquake hazard management, and has become one of the most topical areas. 2019 Rock Dynamics Summit contains 8 keynote addresses and 128 regular full papers that were presented at the 2019 Rock Dynamics Summit (2019 RDS, Okinawa, Japan, 7-11 May 2019), a specialized conference jointly organized by the Rock Dynamics Committee of the Japanese Society of Civil Engineers (JSCE-RDC), the Japanese Society for Rock Mechanics (JSRM), and which was supported by the International Society for Rock Mechanics and Rock Engineering (ISRM) and the Turkish National Society for Rock Mechanics (TNSRM). The contributions cover a wide range of topics on the dynamic behavior of rock and rock masses and scientific and engineering applications, and include: - Laboratory tests on Dynamic Responses of Rocks and Rock Masses / Fracturing of Rocks and Associated Strong Motions - Estimation Procedures and Numerical Techniques of Strong Motions Associated with the Rupture of Earth's Crust and Some Strong Motion - Dynamic Response and Stability of Rock Foundations, Underground Excavations in Rock, Rock Slopes Dynamic Responses and Stability of Stone Masonry Historical Structures and Monuments - Induced Seismicity - Dynamic Simulation of Loading and Excavation - Blasting and machinery induced vibrations - Rockburst, Outburst, Impacts - Nondestructive Testing Using Shock Waves - Case Histories of Failure Phenomenon in Rock Engineering 2019 Rock Dynamics Summit contains the state-of-the-art in rock dynamics, and will be invaluable to professionals and academics interested in the latest advances in new techniques for experiments, analytical and numerical modelling as well as monitoring in dynamics of rocks and rock engineering structures.

The variety of applications of PFC has continued to increase in the ten years since the first release of these programs. This volume contains a collection of fifty-two papers selected for presentation at the 2nd PFC Symposium, held 27-29 October 2004, in Kyoto, Japan. These contributions cover a wide range of engineering applications and theoretica

The Discrete Element Method (DEM) has emerged as a solution to predicting load capacities of masonry structures. As one of many numerical methods and computational solutions being applied to evaluate masonry structures, further research on DEM tools and methodologies is essential for further advancement. Computational Modeling of Masonry Structures Using the Discrete Element Method explores the latest digital solutions for the analysis and modeling of brick, stone, concrete, granite, limestone, and glass block structures. Focusing on critical research on mathematical and computational methods for masonry analysis, this publication is a pivotal reference source for scholars, engineers, consultants, and graduate-level engineering students.

Since its inception two generations ago, oculoplastic surgery has constantly evolved. What was once dogma may now be passé. Procedures that were once passé may be resurrected and utilized again. Providing simplified solutions to complex problems, Atlas of Oculoplastic and Orbital Surgery is a practical, problem-orientated guide to the management of common oculoplastic and orbital disorders. Based on Dr. Spoor's thirty years of practice, the book emphasizes the more common oculoplastic conditions likely to present to a busy ophthalmologist. The text covers upper and lower eyelid surgery and repair, orbital surgery, and the prevention and treatment of potential complications. The procedures are described with surgical photos and illustrations in a casual, didactic fashion, as a senior doctor would use instructing a resident or fellow. The book is essential reading for ophthalmologists, oculoplastic surgeons, neuro-ophthalmologists and plastic surgeons. The main themes of this conference are experimental investigations into deformation properties - from very small strains to beyond failure, laboratory, in-situ and field observation interpretations, and behaviour characterization and modelling. Emphasis is placed on exploring recent investigations into time-related stresses, and on applying advanced geotechnical testing to real engineering problems.

This comprehensive technical book on highwall mining covers theory and practice coupled with practical examples and design aspects. It contains eight extensive chapters elaborating broad-spectrum functionalities of highwall mining and its operational aspects, covering world scenario, economic potential, methods of coal extraction, design methodology including empirical web pillar design, numerical modelling for stress analysis, safety factor for web pillars, panel and barrier design, small-and large-scale numerical modelling, multiple seam interaction and design, coal web pillar strength, equivalent width concept, laboratory testing, new web pillar strength formula, effect of weak bands in coal seam, slope stability, safety and ground monitoring, hazards and regulatory requirements, case examples, norms and guidelines for practice. It also summarizes the results of research carried out by the CSIR Central Institute of Mining and Fuel Research (CSIR-CIMFR), India and the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia on the subject. The book will equip readers in understanding the complex, multiple seam scenarios for highwall mining, and its design for maximum coal recovery from any given site with better economics, which will aid the mining companies in extracting locked-up coal following the safety norms to avoid hazards and minimise instability issues. A large number of case studies is included to illustrate the application of numerical modelling for prior estimation and viability of highwall mining operations under varying geomining conditions. The book will be of interest to professionals and academics in the field of mining engineering specifically, but will also interest civil, geomechanical and geological engineers as well as rock mechanics professionals.

The crust of the Earth records the deformational processes of the inner Earth and the influence of the overlying atmosphere. The state of the Earth's crust at any time is therefore the result of internal and external processes, which occur on different time and spatial scales. In recent years important steps forward in the understanding of such complex processes have been made by integrating theory and observations with experimental and computer models. This volume presents state-of-the-art analogue and numerical models of processes that alter the Earth's crust. It shows the application of models in a broad range of geological problems with careful documentation of the modelling approach used. This volume contains contributions on analogue and numerical sandbox models, models of orogenic processes, models of sedimentary basins, models of surface processes and deformation, and models of faults and fluid flow.

Reflecting the current research and advances made in the application of numerical methods in geotechnical engineering, this volume details proceedings of the Ninth International Symposium on 'Numerical Models in Geomechanics - NUMOG IX' held in Ottawa, Canada, 25-27 August 2004. Highlighting a number of new developments in the area, papers concentrate upon the following four main areas: * constitutive relations for geomaterials * numerical algorithms: formulation and performance * modelling of transient, coupled and dynamic problems * application of numerical techniques to practical problems. Representing the most advanced, modern findings in the field, Numerical Models in Geomechanics is a comprehensive and impeccably-researched text, ideal for students and researchers as well as practising engineers.

This book presents the latest advances in Discrete Element Methods (DEM) and technology. It is the proceeding of 7th International Conference on DEM which was held at Dalian University of Technology on August 1 - 4, 2016. The subject of this book are the DEM and related computational techniques such as DDA, FEM/DEM, molecular dynamics, SPH, Meshless methods, etc., which are the main computational methods for modeling discontinua. In comparison to continua which have been already studied for a long time, the research of discontinua is relatively new, but increases dramatically in recent years and has already become an important field. This book will benefit researchers and scientists from the academic fields of physics, engineering and applied mathematics, as well as from industry and national laboratories who are interested in the DEM.

This book is one out of 8 IAEG XII Congress volumes and deals with climate change affecting different natural processes and environments, such as slope dynamics, water courses, coastal and marine environments, hydrological and littoral processes and permafrost terrain. Due to climate change, major effects are also expected on territorial planning and infrastructure, particularly in extreme climate regions. The volume and its contents aim to analyze the role of engineering geology and the solutions it may offer with respect to the ongoing environmental changes. Contributions regard the modeling of both the factors and the effects induced by climate change. Potential impacts of the climate change on the common practice and routine work of engineering geologists are also analyzed, with particular attention to the risk assessment and mitigation procedures and to the adaptation measures adopted. The Engineering Geology for Society and Territory volumes of the IAEG XII Congress held in Torino from September 15-19, 2014, analyze the dynamic role of engineering geology in our changing world and build on the four main themes of the congress: environment, processes, issues and approaches. The congress topics and subject areas of the 8 IAEG XII Congress volumes are: Climate Change and Engineering Geology. Landslide Processes. River Basins, Reservoir Sedimentation and Water Resources. Marine and Coastal Processes. Urban Geology, Sustainable Planning and Landscape Exploitation. Applied Geology for Major Engineering Projects. Education, Professional Ethics and Public Recognition of Engineering Geology. Preservation of Cultural Heritage.

Numerical Modeling in Micromechanics via Particle Methods International PFC Symposium, Gelsenkirchen, Germany, 6-8 November 2002 Routledge

Collection of selected, peer reviewed papers from the 2013 2nd International Conference on Civil, Architectural and Hydraulic Engineering (ICCAHE 2013), July 27-28, 2013, Zhuhai, China. The 683 paper are grouped as follows: Chapter 1: Geological Engineering and Geotechnical Construction; Chapter 2: Structural Engineering; Chapter 3: Tunnel, Subway and Underground Facilities; Chapter 4: Coastal Engineering; Chapter 5: Bridge Engineering; Chapter 6: Road and Railway Engineering; Chapter 7: Seismic Engineering; Chapter 8: Hydrology and Irrigation; Chapter 9: Disaster Prevention and Mitigation; Chapter 10: Traditional Construction Materials; Chapter 11: Advanced Construction Materials; Chapter 12: Heating, Gas Supply, Ventilation and Air Conditioning; Chapter 13: Surveying Engineering and Measurement; Chapter 14: Cartography and Geographic Information System; Chapter 15: Construction Technology; Chapter 16: Computational Mechanics; Chapter 17: Construction Machinery and Equipment; Chapter 18: Project Management, Project Construction Cost and Engineering Management.

270 Expert contributions on aspects of landslide hazards, encompassing geological modeling and soil and rock mechanics, landslide processes, causes and effects, and damage avoidance and limitation strategies. Reference source for academics and professionals in geo-mechanical and geo-technical engineering, and others involved with research, des

The outer parts of collision mountain belts are commonly represented by fold and thrust belts. Major advances in understanding these tectonic settings have arisen from regional studies that integrate diverse geological information in quests to find and produce hydrocarbons. Drilling has provided tests of subsurface forecasts, challenging interpretation strategies and structural models. This volume contains 19 papers that illustrate a diversity of methods and approaches together with case studies from Europe, the Middle East and the Asia-Pacific region. Collectively they show that appreciating diversity is key for developing better interpretations of complex geological structures in the subsurface – endeavours that span applications beyond the development of hydrocarbons.

Frontiers in Offshore Geotechnics III comprises the contributions presented at the Third International Symposium on Frontiers in Offshore Geotechnics (ISFOG, Oslo, Norway, 10-12 June 2015), organised by the Norwegian Geotechnical Institute (NGI). The papers address current and emerging geotechnical engineering challenges facing those working in off

This contributed volume presents a multi-perspective collection of the latest research findings on oil and gas exploration and imparts insight that can greatly assist in understanding field behavior, design of test programs, and design of field operations. With this book, engineers also gain a powerful guide to the most commonly used numerical simulation methods that aid in reservoir modelling. In addition, the contributors explore development of technologies that allow for cost effective oil and gas exploration while minimizing the impact on our water resources, surface and groundwater aquifers, geological stability of impacted areas, air quality, and infrastructure assets such as roads, pipelines, water, and wastewater networks. Easy to understand, the book identifies equipment and procedural problems inherent to oil and gas operations and provides systematic approaches for solving them.

This richly-illustrated reference guide presents innovative techniques focused on reducing time, cost and risk in the construction and maintenance of underground facilities: A primary focus of the technological development in underground engineering is to ease the practical execution and to reduce time, cost and risk in the construction and maintenance of underground facilities such as tunnels and caverns. This can be realized by new design tools for designers, by instant data access for engineers, by virtual prototyping and training for manufacturers, and by robotic devices for maintenance and repair for operators and many more advances. This volume presents the latest technological innovations in underground design, construction, and operation, and comprehensively discusses developments in ground improvement, simulation, process integration, safety, monitoring, environmental impact, equipment, boring and cutting, personnel training, materials, robotics and more. These new features are the result of a big research project on underground engineering, which has involved many players in the discipline. Written in an accessible style and with a focus on applied engineering, this book is aimed at a readership of engineers, consultants, contractors, operators, researchers, manufacturers, suppliers and clients in the underground engineering business. It may moreover be used as educational material for advanced courses in tunnelling and underground construction.

This book presents recent research into developing and applying computational tools to estimate the performance and safety of hydraulic structures from the planning and construction stage to the service period. Based on the results of a close collaboration between the author and his colleagues, friends, students and field engineers, it shows how to achieve a good correlation between numerical computation and the actual in situ behavior of hydraulic structures. The book's heuristic and visualized style disseminates the philosophy and road map as well as the findings of the research. The chapters reflect the various aspects of the three typical and practical methods (the finite element method, the block element method, the composite element method) that the author has been working on and made essential contributions to since the 1980s. This book is an advanced continuation of Hydraulic Structures by the same author, published by Springer in 2015.

The 200 papers in this two-volume set are a selection of work by tunnel experts from Europe, Asia, and the USA, and also showcase the work of the host nation, Turkey. As the title implies, the scope of the book is enormous, covering every aspect of tunnelling from contract management to safety. The book is of special interest to researchers, scientist

An overview of recent developments in constitutive modelling, numerical implementation issues, and coupled and dynamic analysis. There is a special section dedicated to the numerical modelling of ground improvement techniques, with applications of numerical methods for solving practical boundary value problems, such as deep excavations, tunnels, shallow and deep foundations, embankments and slopes. These proceedings not only contain the latest scientific research, but also give valuable insight into the applications of numerical methods in solving practical engineering problems, thus narrowing the gap between advanced academic research and practical application.

This book is the second volume of the proceedings of the 4th GeoShanghai International Conference that was held on May 27 - 30, 2018. The book, entitled "Fundamentals of Soil Behaviours", presents the recent advances and technology in the understanding and modelling of fundamentals of soil's behaviours. The subject of this book covers a wide range of topics related to soil behaviours in geotechnical engineering, geoenvironmental engineering and transportation engineering. The state-of-the-art theories, methodologies and findings in the related topics are included. 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 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.

This volume contains the proceedings of the Fifth International Conference on the Micromechanics of Granular Media, Powders and Grains 2005. Powders and Grains is an international scientific conference held every 4 years that brings together engineers and physicists interested in the micromechanics of granular media. The book is a guide to the hotte

Particle methods have seen increasing use in several engineering and scientific fields, both because of their unique modelling capabilities and the availability of the necessary computational power. This title focuses on their theory and application.

Rock Mechanics: Achievements and Ambitions contains the papers accepted for the 2nd ISRM International Young Scholars' Symposium on Rock Mechanics, which was sponsored by the ISRM and held on 14–16 October 2011 in Beijing, China, immediately preceding the 12th ISRM Congress on Rock Mechanics. Highlighting the work of young teachers, researchers and practitioners, the present work provides an important stimulus for the next generation of rock engineers, because in the future there will be more emphasis on the use of the Earth's resources and their sustainability, and more accountability of engineers' decisions. In this context, it is entirely appropriate that the Symposium venue for the young scholars was in China — because of the rock mechanics related work that is anticipated in the future. For example, in the Chinese Academy of Sciences report, "Energy Science and Technology in China: A Roadmap to 2050", it is predicted that China's total energy demand will reach 31, 45, 61 and 66 x 10⁸ tce (tonnes of coal equivalent) in 2010, 2020, 2035, 2050. The associated per capita energy consumption for the same years is estimated at 2.3, 3.1, 4.1 and 4.6 tce. This increasing demand will be met, inter alia, by the continued operation and development of new coal mines, hydroelectric plants and nuclear power stations with one or more underground nuclear waste repositories, all of which will be improved by more modern methods of rock engineering design developed by young scholars. In particular, enhanced methods of site investigation, rock characterisation, rock failure understanding, computer modelling, and rock excavation and support are needed. The topics in the book include contributions on: - Field investigation and observation - Rock constitutive relations and property testing - Numerical and physical modeling for rock engineering - Information technology, artificial intelligence and other advanced techniques - Underground and surface excavation and reinforcement techniques - Dynamic rock mechanics and blasting - Predication and prevention of geo-environmental hazard - Case studies of typical rock engineering Many of the 200 papers address these topics and demonstrate the skills of the young scholars, indicating that we can be confident in the continuing development of rock mechanics and rock engineering, leading to more efficient, safer and economical structures built on and in rock masses. Rock Mechanics: Achievements and Ambitions will appeal to professionals, engineers and academics in rock mechanics, rock engineering, tunnelling, mining, earthquake engineering, rock dynamics and geotechnical engineering.

Rehabilitation of heritage monuments provides sustainable development and cultural significance to a region. The most sensitive aspect of the refurbishment of existing buildings lies in the renovation and recovery of structural integrity and public safety. The Handbook of Research on Seismic Assessment and Rehabilitation of Historic Structures evaluates developing contributions in the field of earthquake engineering with regards to the analysis and treatment of structural damage inflicted by seismic activity. This book is a vital reference source for professionals, researchers, students, and engineers active in the field of earthquake engineering who are interested in the emergent developments and research available in the preservation and rehabilitation of heritage buildings following seismic activity.

Civil and environmental engineers work together to develop, build, and maintain the man-made and natural environments that make up the infrastructures and ecosystems in which we live and thrive. Civil and Environmental Engineering: Concepts, Methodologies, Tools, and Applications is a comprehensive multi-volume publication showcasing the best research on topics pertaining to road design, building maintenance and construction, transportation, earthquake engineering, waste and pollution management, and water resources management and engineering. Through its broad and extensive coverage on a variety of crucial concepts in the field of civil engineering, and its subfield of environmental engineering, this multi-volume work is an essential addition to the library collections of academic and government institutions and appropriately meets the research needs of engineers, environmental specialists, researchers, and graduate-level students.

Principles is the first volume of the five-volume set Rock Mechanics and Engineering and contains twenty-four chapters from key experts in the following fields: - Discontinuities; - Anisotropy; - Rock Stress; - Geophysics; - Strength Criteria; - Modeling Rock Deformation and Failure. The five-volume set "Comprehensive Rock Engineering", which was published in 1993, has had an important influence on the development of rock mechanics and rock engineering. Significant and extensive advances and achievements in these fields over the last 20 years now justify the publishing of a comparable, new compilation. Rock Mechanics and Engineering represents a highly prestigious, multi-volume work edited by Professor Xia-Ting Feng, with the editorial advice of Professor John A. Hudson. This new compilation offers an extremely wideranging and comprehensive overview of the state-of-the-art in rock mechanics and rock engineering and is composed of peer-reviewed, dedicated contributions by all the key experts

worldwide. Key features of this set are that it provides a systematic, global summary of new developments in rock mechanics and rock engineering practices as well as looking ahead to future developments in the fields. Contributors are worldrenowned experts in the fields of rock mechanics and rock engineering, though younger, talented researchers have also been included. The individual volumes cover an extremely wide array of topics grouped under five overarching themes: Principles (Vol. 1), Laboratory and Field Testing (Vol. 2), Analysis, Modelling and Design (Vol. 3), Excavation, Support and Monitoring (Vol. 4) and Surface and Underground Projects (Vol. 5). This multi-volume work sets a new standard for rock mechanics and engineering compendia and will be the go-to resource for all engineering professionals and academics involved in rock mechanics and engineering for years to come.

The objective of these proceedings is to encourage engineering professionals, academics and researchers to exchange views, results, ideas and experiences concerning chemical, materials and metallurgical engineering. The work is divided into the chapters: Chemical Engineering Measurement and Instrumentation, Transport Processes of Chemical Engineering, Chemical Separation Engineering, Industrial Catalysis, Chemical Systems Engineering, Inorganic and Organic Chemical Engineering, Biochemical Industry, Electrochemical Engineering, Green Chemical Processing Technology and Chemistry Science and Applied Chemistry. It constitutes a comprehensive guide to these subjects.

Porous Rock Failure Mechanics: Hydraulic Fracturing, Drilling and Structural Engineering focuses on the fracture mechanics of porous rocks and modern simulation techniques for progressive quasi-static and dynamic fractures. The topics covered in this volume include a wide range of academic and industrial applications, including petroleum, mining, and civil engineering. Chapters focus on advanced topics in the field of rock's fracture mechanics and address theoretical concepts, experimental characterization, numerical simulation techniques, and their applications as appropriate. Each chapter reflects the current state-of-the-art in terms of the modern use of fracture simulation in industrial and academic sectors. Some of the major contributions in this volume include, but are not limited to: anisotropic elasto-plastic deformation mechanisms in fluid saturated porous rocks, dynamics of fluids transport in fractured rocks and simulation techniques, fracture mechanics and simulation techniques in porous rocks, fluid-structure interaction in hydraulic driven fractures, advanced numerical techniques for simulation of progressive fracture, including multiscale modeling, and micromechanical approaches for porous rocks, and quasi-static versus dynamic fractures in porous rocks. This book will serve as an important resource for petroleum, geomechanics, drilling and structural engineers, R&D managers in industry and academia. Includes a strong editorial team and quality experts as chapter authors Presents topics identified for individual chapters are current, relevant, and interesting Focuses on advanced topics, such as fluid coupled fractures, rock's continuum damage mechanics, and multiscale modeling Provides a 'one-stop' advanced-level reference for a graduate course focusing on rock's mechanics

Given that for centuries, the standard tool to understand diseases in tissues was the microscope and that its major limitation was that only excised tissue could be used, recent technology now permits the examination of diseased tissue in vivo. Optical coherence tomography (OCT) has promising potential when applied to coronary artery disease. OCT has the capability to identify coronary plaque and to distinguish between plaques that are stable and unstable. If the plaques are stable then OCT can direct percutaneous intervention (angioplasty or stenting). Optical coherence tomography is a light-based imaging technology that allows for very high resolution imaging in biological tissues. It has been first applied in ophthalmology, where it soon became the golden standard for the assessment of (epi-) retinal processes. The unique imaging capabilities have raised the interest of researchers and clinicians in the field of cardiovascular disease, since OCT offers unique possibilities to study atherosclerosis pathophysiology in vivo. With over 1.1M Americans having a heart attack this year because of unstable plaque rupture, OCT may have an increasingly important role in the early diagnosis of coronary artery disease. This unique publication offers the reader the basic background to OCT and its role in the diagnosis and management of coronary artery disease. The Handbook of Optical Coherence Tomography in Cardiovascular Research introduces the cardiovascular application of this technology. Clinicians, biologists, engineers and physicist are discussing different aspects of cardiovascular OCT application in a multidisciplinary approach. The handbook offers the readership a concise overview on the current state of the art of vascular OCT imaging and sheds light on a variety of exciting new developments. The physics, technical principles of OCT and its application in a broad spectrum of cardiovascular research areas are summarized by highly recognized specialists. The potential of OCT in peripheral and coronary arteries and in developmental cardiology are described. Each research area is introduced by a clinical expert in the field followed by discussion of different aspects from an engineering, biomedical and clinical perspective. Specifically, the current capabilities for plaque characterization, detection of vulnerable plaque, guidance of interventional procedures, Doppler-assessment, and molecular contrast imaging are being described. The Handbook of Optical Coherence Tomography in Cardiovascular Research targets researchers and clinicians involved in the field of atherosclerosis. The summary of basic physics, engineering solutions, pre-clinical and clinical application covers all relevant aspects and will be a valuable reference source.

Rock Characterisation, Modelling and Engineering Design Methods contains the contributions presented at the 3rd ISRM SINOROCK Symposium (Shanghai, China, 18-20 June 2013). The papers contribute to the further development of the overall rock engineering design process through the sequential linkage of the three themes of rock characterisation, model

This book is the international edition of the proceedings of IS-Seoul 2011, the Fifth International Symposium on Deformation Characteristics of Geomaterials, held in Seoul, South Korea, in September 2011. The book includes 7 invited lectures, as well as 158 technical papers selected from the 182 submitted. The symposium explored ideas about the complex load-deformation response in geomaterials, including laboratory methods for small and large strains; anisotropy and localization; time-dependent responses in soils; characteristics of treated, unsaturated, and natural geomaterials; applications in field methods; evaluation of field performance in geotechnical structures; and physical and numerical modeling in geomechanics. These topics were grouped under a number of main themes, including experimental investigations from very small strains to beyond failure; behavior, characterization and modeling of various geomaterials; and practical prediction and interpretation of ground response: field observation and case histories. Both the symposium and this book represent an important contribution to the exchange of advanced knowledge and ideas in geotechnical engineering and promote partnership among participants worldwide.

Rock Slope Engineering covers the investigation, design, excavation and remediation of man-made rock cuts and natural slopes, primarily for civil engineering applications. It presents design information on structural geology, shear strength of rock and ground water, including weathered rock. Slope design methods are discussed for planar, wedge, circular and toppling failures, including seismic design and numerical analysis. Information is also provided on blasting, slope stabilization, movement monitoring and civil

engineering applications. This fifth edition has been extensively up-dated, with new chapters on weathered rock, including shear strength in relation to weathering grades, and seismic design of rock slopes for pseudo-static stability and Newmark displacement. It now includes the use of remote sensing techniques such as LiDAR to monitor slope movement and collect structural geology data. The chapter on numerical analysis has been revised with emphasis on civil applications. The book is written for practitioners working in the fields of transportation, energy and industrial development, and undergraduate and graduate level courses in geological engineering.

Proceedings of the Third International Conference on Discrete Element Methods, held in Santa Fe, New Mexico on September 23-25, 2002. This Geotechnical Special Publication contains 72 technical papers on discrete element methods (DEM), a suite of numerical techniques developed to model granular materials, rock, and other discontinua at the grain scale. Topics include: DEM formulation and implementation approaches, coupled methods, experimental validation, and techniques, including three-dimensional particle representations, efficient contact detection algorithms, particle packing schemes, and code design. Coupled methods include approaches to linking solid continuum and fluid models with DEM to simulate multiscale and multiphase phenomena. Applications include fundamental investigations of granular mechanics; micromechanical studies of powder, soil, and rock behavior; and large-scale modeling of geotechnical, material processing, mining, and petroleum engineering problems. The topics discussed in this text range from quasi-static problems to dynamic problems, and are divided into 15 groups, such as: cohesion/cracking; wave propagation; and quasi-static behaviour. Each group contains theoretical, experimental and computational approaches by researchers.

Geomechanics from Micro to Macro contains 268 papers presented at the International Symposium on Geomechanics from Micro and Macro (IS-Cambridge, UK, 1-3 September 2014). The symposium created a forum for the dissemination of new advances in the micro-macro relations of geomaterial behaviour and its modelling. The papers on experimental investigati

"Soils and rocks are complex natural geomaterials that exhibit a wide range in strength, stiffness, state of stress, structure, and flow characteristics. Geotechnical & Geophysical Site Characterization provides eleven keynote state-of-the-art papers, including the Mitchell Lecture. A total selection of 219 technical papers and theme reports address methods of site exploration related to ground exploration for civil engineering and construction works. These two volumes represent a collection of experience & knowledge regarding various methods of in-situ testing, geophysical techniques, innovative devices, improved interpretation algorithms, and statistical treatment of field data for the characterization of soils, rocks, and other geomaterials. The papers represent the written records and documented efforts from international experts from industry, academe, and government who participated in the Second International Conference on Site Characterization held in Porto, Portugal on September 20-22, 2004. Topics include the utilization of rotary drilling, sampling, and coring techniques. Of particular interest is the variety of in-situ tests, including standard penetration, cone penetration, flat dilatometer, pressuremeter, vane shear, piezocone, dynamic probes, and specialized tools, as well as geophysical approaches: resistivity surveys, surface waves, crosshole, downhole, electromagnetic conductivity, and ground penetrating radar. A careful and proper site evaluation is required in the analysis and design of new structures, construction monitoring, and forensic studies that require remediation. Many of the contributions relate to case studies of projects that involve shallow foundations, drilled shafts, pilings, slope stability, excavations, earth dams, tunnels, and mining. Several papers discuss a combined approach using multiple methods and/or complementary set of geotechnical & geophysical tests to ascertain the characteristics of the ground."--back cover.

This book presents some fundamental concepts behind the basic theories and tools of discrete element methods (DEM), its historical development, and its wide scope of applications in geology, geophysics and rock engineering. Unlike almost all books available on the general subject of DEM, this book includes coverage of both explicit and implicit DEM approaches, namely the Distinct Element Methods and Discontinuous Deformation Analysis (DDA) for both rigid and deformable blocks and particle systems, and also the Discrete Fracture Network (DFN) approach for fluid flow and solute transport simulations. The latter is actually also a discrete approach of importance for rock mechanics and rock engineering. In addition, brief introductions to some alternative approaches are also provided, such as percolation theory and Cosserat micromechanics equivalence to particle systems, which often appear hand-in-hand with the DEM in the literature. Fundamentals of the particle mechanics approach using DEM for granular media is also presented. · Presents the fundamental concepts of the discrete models for fractured rocks, including constitutive models of rock fractures and rock masses for stress, deformation and fluid flow · Provides a comprehensive presentation on discrete element methods, including distinct elements, discontinuous deformation analysis, discrete fracture networks, particle mechanics and Cosserat representation of granular media · Features constitutive models of rock fractures and fracture system characterization methods detailing their significant impacts on the performance and uncertainty of the DEM models

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