Sustainable Civil Infrastructures

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Sustainable Infrastructure impacts our well-being and day-to-day lives. The infrastructures we are building today will shape our lives tomorrow. The complex and diverse nature of the impacts due to weather extremes on transportation and civil infrastructures can be seen in our roadways, bridges, and buildings. Extreme summer temperatures, droughts, flash floods, and rising numbers of freeze-thaw cycles pose challenges for civil infrastructure and can endanger public safety. We constantly hear how civil infrastructures need constant attention, preservation, and upgrading. Such improvements and developments would obviously benefit from our desired book series that provide sustainable engineering materials and designs. The economic impact is huge and much research has been conducted worldwide. The future holds many opportunities, not only for researchers in a given country, but also for the worldwide field engineers who apply and implement these technologies. We believe that no approach can succeed if it does not unite the efforts of various engineering disciplines from all over the world under one umbrella to offer a beacon of modern solutions to the global infrastructure. Experts from the various engineering disciplines around the globe will participate in this series, including: Geotechnical, Geological, Geoscience, Petroleum, Structural, Transportation, Bridge, Infrastructure, Energy, Architectural, Chemical and Materials, and other related Engineering disciplines.

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Advances in Numerical Methods in Geotechnical Engineering

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About the Editors

Founding President, General Secretary and Treasurer of the International Association for Computer Methods and Advances in Geomechanics (IACMAG)

Chandrakant S. Desai is a Regents’ Professor (Emeritus), Department of Civil Engineering and Engineering Mechanics, University of Arizona, Tucson, Arizona. He has made original and significant contributions in basic and applied research in material-constitutive modeling, laboratory testing, and computational methods for a wide range of problems in civil engineering related to geomechanics/geotechnical engineering, structural mechanics/structural engineering, mechanical engineering, and electronic packaging. His research on the development of the new and innovative disturbed state concept (DSC) for constitutive modeling of geomaterials and interfaces/joints has found significant engineering applications. In conjunction with nonlinear finite element methods, it provides a new and alternative procedure for analysis, design, and reliability for challenging and complex problems of modern technology. He has authored/edited about 20 books and 19 chapters and has been author/co-author of over 320 technical papers in refereed journals and conferences.

His research contributions have received outstanding recognitions at national and international levels, some of which are identified as: (a) development and applications of finite element method for problems involving interaction between structures and foundations, (b) the thin-layer interface element for
simulation of contacts (interfaces and joints), (c) the residual flow procedure for free surface seepage, (d) a novel fundamental approach for microstructural instability including liquefaction, and (e) the disturbed state concept for modeling of engineering materials and interfaces, including thermomechanical and rate-dependent behavior of materials in electronic chip-substrate systems.

His book on the finite element method (Desai and Abel) published in 1972 was the first formal text on the subject in the USA, second in the world. In 1979, he authored the pioneering and the first text for teaching the finite element method to undergraduate students. His book on Constitutive Laws for Engineering Materials (Desai and Siriwardane) in 1984 is considered to be the first on the subject that presented a combination of various material models based on continuum mechanics. In 2001, he authored the book on the Disturbed State Concept (DSC) that presents an innovative concept for modeling materials and contacts in a unified manner, combining the continuum mechanics models and a novel idea for introducing the discontinuities in the deforming material. In 1977, he co-edited (Desai and Christian) including his own contributed chapters, the first book on Numerical Methods in Geotechnical Engineering that deals with problems from geotechnical and structural engineering. In 20013–14, he has co-authored (Desai and Zaman) the book, Advanced Geotechnical Engineering: Soil-structure Interaction using Computer and Material Models, which is unique because of its scope, contents, and connection between research and applications.

He was the founding General Editor of the International Journal for Numerical and Analytical Methods in Geomechanics from 1977 to 2000. He is the founding Editor-in-Chief of the International Journal of Geomechanics, published by Geo-Institute, ASC, 2001–2008, and now he serves as its Advisory Editor. He has served as a member of editorial boards of 15 journals and has been chair/member of a number of committees of various national and international societies. He is Founding President of the International
Association for Computer Methods and Advances in Geomechanics (IACMAG). He is credited with introducing the interdisciplinary definition of Geomechanics that involves various areas such as geotechnical engineering and rock mechanics, statics and dynamics of interacting structures and foundations, fluid flow through porous media, geoenvironmental engineering, natural hazards and earthquakes, landslides and subsidence, petroleum engineering, offshore and marine technology, geological engineering and modeling, geothermal energy, ice mechanics, and lunar and planetary geomechanics.

He has received a number of awards and recognition, e.g., Fellow, National Academy of Engineering, India; Lifetime Achievement Award, Alumni Association of VJTI, University of Bombay; The Distinguished Member Award by the American Society of Civil Engineers (ASCE); The Nathan M. Newmark Medal, by Structural Engineering and Engineering Mechanics Institute, ASCE; The Karl Terzaghi Award, by Geo Institute, (ASCE); Honorary Professor, University of Nottingham, UK; Diamond Jubilee Honor, Indian Geotechnical Society; Suklje Award/Lecture, Slovenian Geotechnical Society; HIND Rattan (Jewel of India) Award, by Non-resident Society, New Delhi, India; Meritorious Civilian Service Award by the US Corps of Engineers; Alexander von Humboldt Stiftung Prize by the German Government; Outstanding Contributions Medal by the International Association for Computer Methods and Advances in Geomechanics; Outstanding Contributions Medal in Mechanics by the Czech Academy of Sciences; Clock Award for outstanding Contributions for Thermomechanical Analysis in Electronic Packaging by the Electrical and Electronic Packaging Division, ASME; Five Star Faculty Teaching Finalist Award and the El Paso Natural Gas Foundation Faculty Achievement Award, at the University of Arizona, Tucson, Arizona.
Hany Farouk Shehata He is the founder and CEO of the Soil-Structure Interaction Group in Egypt “SSIGE.” He is a partner and vice-president of EHE-Consulting Group in the Middle East, and managing editor of the “Innovative Infrastructure Solutions” journal, published by Springer. He worked in the field of civil engineering early, while studying, with Bechtel Egypt Contracting & PM Company, LLC. His professional experience includes working in culverts, small tunnels, pipe installation, earth reinforcement, soil stabilization, and small bridges. He also has been involved in teaching, research, and consulting. His areas of specialization include static and dynamic soil–structure interactions involving buildings, roads, water structures, retaining walls, earth reinforcement, and bridges, as well as, different disciplines of project management and contract administration. He is the author of an Arabic practical book titled “Practical Solutions for Different Geotechnical Works: The Practical Engineers’ Guidelines.” He is currently working on a new book titled “Soil-Foundation-Superstructure Interaction: Structural Integration.” He is the contributor of more than 50 publications in national and international conferences and journals. He served as a co-chair of the GeoChina 2016 International Conference in Shandong, China. He serves also as a co-chair and secretary general of the GeoMEast 2017 International Conference in Sharm El-Sheikh, Egypt, 2016 Outstanding reviewer of the ASCE as selected by the Editorial Board of International Journal of Geomechanics.