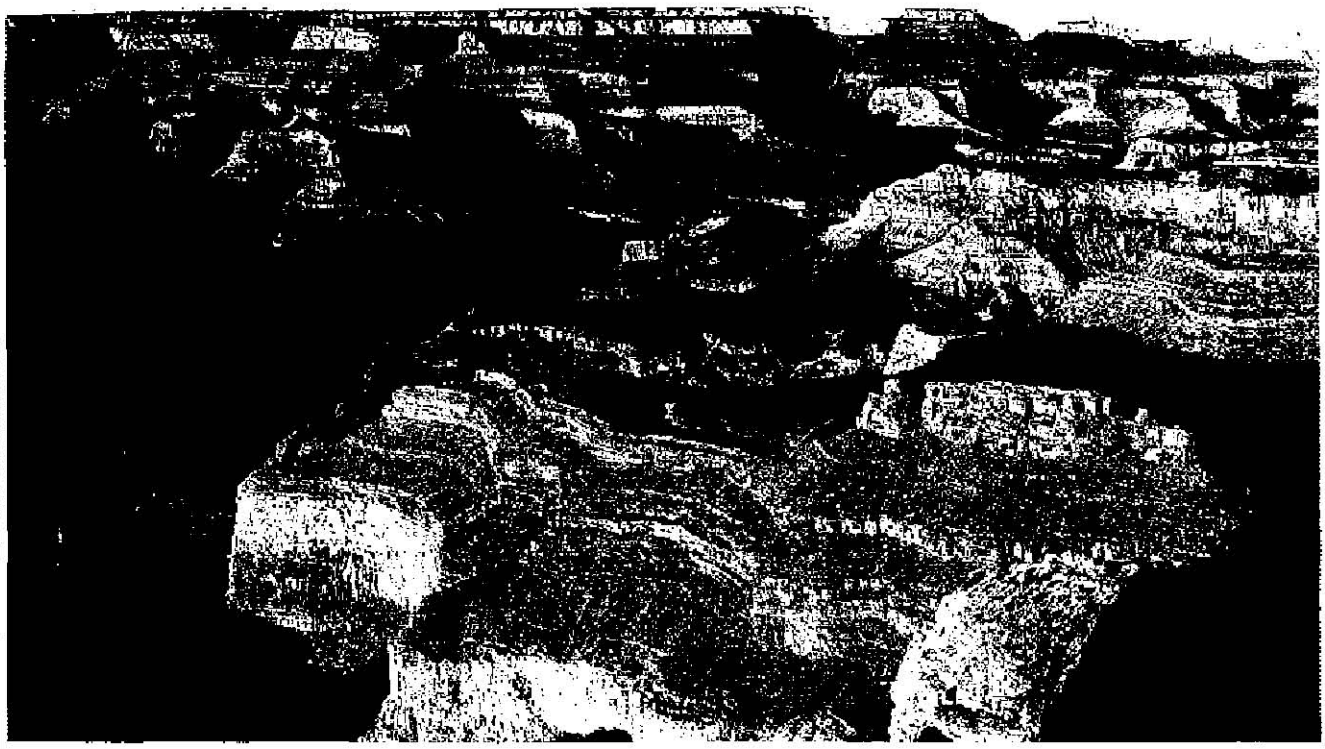
GEOTECHNICAL ENGINEERING

A Practical Problem Solving Approach



N. Sivakugan | Braja M. Das

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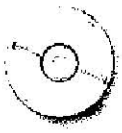

GeoStudio
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A Title in J. Ross Publishing's Eureka Series

GEOTECHNICAL ENGINEERING

A Practical Problem Solving Approach

Nagaratnam Sivakugan & Braja M. Das

Geotechnical Engineering: A Practical Problem Solving Approach covers all of the major geotechnical topics in the simplest possible way adopting a hands-on approach with a very strong practical bias. Engineers are problem solvers. Developing problem-solving skills is one of the key learning outcomes expected of engineering students and this book provides just that. 60-70% of the book is devoted to practical problem solving and 30-40% covers fundamental concepts.

KEY FEATURES

- Offers carefully selected solved problems with a wide range of difficulty level — from simple to challenging
- Includes a DVD of the Student Edition of GeoStudio that can be used for solving a wide range of geotechnical problems
- Presents the material in the most concise manner possible while still including enough detail to solve the problems
- Demonstrates theory through practical problem solving with less reliance on mathematics
- Offers both soil mechanics and foundation engineering in one book
- **WV** offers downloadable PowerPoint slides to assist in classroom instruction — **available from the Web Added Value™ Download Resource Center at www.jrosspub.com**

ABOUT THE Eureka Series

The books in the J. Ross Publishing *Eureka Series* are engineering textbooks for a new generation. Similar to problem-based learning, the subject material is integrated with extensive worked examples, quizzes and review exercises. The writing style is lean and simple while not compromising on the breadth or depth of the subject matter. Books in the *Eureka Series* are written by renowned scholars with outstanding university careers who have also made significant contributions to teaching and learning.

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Contents

Preface

We both have been quite successful as geotechnical engineering teachers. In *Geotechnical Engineering: A Practical Problem Solving Approach*, we have tried to cover every major geotechnical topic in the simplest way possible. We have adopted a hands-on approach with a strong, practical bias. You will learn the material through several worked examples that take geotechnical engineering principles and apply them to realistic problems that you are likely to encounter in real-life field situations. This is our attempt to write a straightforward, no-nonsense, geotechnical engineering textbook that will appeal to a new generation of students. This is said with no disrespect to the variety of geotechnical engineering textbooks already available—each serves a purpose.

We have used a few symbols to facilitate quick referencing and to call your attention to key concepts. This symbol appears at the end of a chapter wherever it is necessary to emphasize a particular point and your need to understand it.

There are a few thoughtfully selected review exercises at the end of each chapter, and answers are given whenever possible. Remember, when you practice as a professional engineer you will not get to see the solutions! You will simply design with confidence and have it checked by a colleague. The degree of difficulty increases with each review exercise. The symbol shown here appears beside the most challenging problems.

We also try to nurture the habit of self-learning through exercises that relate to topics not covered in this book. Here, you are expected to surf the Web; or even better, refer to library books. The knowledge obtained from both the research activity and the material itself will complement the material from this book and is an integral part of learning. Such research-type questions are identified by the symbol shown here. Today, the *www* is at your fingertips, so this should not be a problem. There are many dedicated Web sites for geotechnical resources and reference materials (e.g., Center for Integrating Information on Geoengineering at http://www.geoengineer.org). Give proper references for research-type questions in your short essays. Sites like Wikipedia (http://en.wikipedia.org) and YouTube (http://www.youtube.com) can provide useful information including images and video clips. To obtain the best references, you must go to the library and conduct a proper literature search using appropriate key words.

We have included eight quizzes to test your comprehension. These are closed-book quizzes that should be completed within the specified times. They are designed to make you think and show you what you have missed.

The site investigation chapter has a slightly different layout. The nature of this topic is quite descriptive and less reliant on problem solving. It is good to have a clear idea of what the different in situ testing devices look like. For this reason, we have included several quality photographs. The purpose of the site investigation exercise is to derive the soil parameters from the in situ test data. A wide range of empirical correlations that are used in practice are summarized in this chapter. Tests are included that are rarely covered in traditional textbooks—such as the borehole shear test and the K_0 stepped blade test—and are followed by review questions that encourage the reader to review other sources of literature and hence nurture the habit of research.

Foundation Engineering is one of the main areas of geotechnical engineering; therefore, considerable effort was directed toward Chapters 12 and 13, which cover the topics of bearing capacity and settlements of shallow and deep foundations.

This is not a place for us to document everything we know in geotechnical engineering. We realize that this is your first geotechnical engineering book and have endeavored to give sufficient breadth and depth covering all major topics in soil mechanics and foundation engineering.

A free DVD containing the *Student Edition* of *GeoStudio* is included with this book. It is a powerful software suite that can be used for solving a wide range of geotechnical problems and is a useful complement to traditional learning. We are grateful to Mr. Paul Bryden and the GeoStudio team for their advice and support.

We are grateful to the following people who have contributed either by reviewing chapters from the book and providing suggestions for improvement: Dr. Jay Ameratunga, Coffey Geotechnics; Ms. Julie Lovisa, James Cook University; Kirralee Rankine, Golder Associates; and Shailesh Singh, Coffey Geotechnics; or by providing photographs or data: Dr. Jay Ameratunga, Coffey Geotechnics; Mr. Mark Arnold, Douglas Partners; Mr. Martyn Ellis, PMC, UK; Professor Robin Fell, University of New South Wales; Dr. Chris Haberfield, Golder Associates; Professor Silvano Marchetti, University of L'Aquila, Italy; Dr. Kandiah Pirapakaran, Coffey Geotechnics; Dr. Kirralee Rankine, Golder Associates; Dr. Kelda Rankine, Golder Associates; Dr. Ajanta Sachan, IIT Kanpur, India; Mr. Leonard Sands, Venezuela; Dr. Shailesh Singh, Coffey Geotechnics; Mr. Bruce Stewart, Douglas Partners; Professor David White, Iowa State University.

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N. Sivakugan and B. M. Das