Geotechnical Finite Element Analysis

Geotechnical Finite Element Analysis

A practical guide

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Published by ICE Publishing, One Great George Street,
Westminster, London SW1P 3AA

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A catalogue record for this book is available from the British Library.

ISBN 978-0-7277-6087-6

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Commissioning Editor: Laura Balchin

Development Editor: Maria Inês Pinheiro

Production Editor: Rebecca Norris

Market Development Executive: Elizabeth Hobson

Typeset by Academic + Technical, Bristol

Index created by Simon Yapp

Printed and bound in Great Britain by TJ International Ltd, Padstow

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Preface

It soon became clear to me while coordinating the European Commission Lifelong Learning COGAN Project on improving competency in geotechnical numerical analysis that finite element (FE) analysis is now widely used in geotechnical engineering but, in contrast to other fields of engineering, there are few full-time users of such software. Geotechnical FE analysis places heavy demands on the competency of engineers but it is difficult to gain sufficient competency when applying such software part-time between other engineering tasks. There was an obvious need for a ready reference for users of geotechnical FE analysis software to learn about and refresh their knowledge on applying the technique in practice. This book is intended primarily to address that need.

Before using this book, it may also be useful to know the following:

- The book is strictly software neutral. I did not want to appear to be favouring any particular software.
- I have not endeavoured to cover the essential background soil mechanics, rock mechanics and geotechnical engineering knowledge needed to perform FE analysis since this can be found readily from other sources.
- Worked examples in FE analysis are complicated to present and explain. So that readers can access information quickly, I have avoided putting examples within the topics in Chapters 1 to 7. Rather, three examples illustrating application of many of the topics are presented and described separately in Chapter 8.
- Some parts of the NAFEMS guidebook *Obtaining Parameters for Geotechnical Analysis* which I authored have been reproduced in this book, particularly in Chapter 3, with the kind permission of NAFEMS.
- This book provides the background information covering about 160 competence statements from the COGAN Competency Tracker maintained by NAFEMS. This Competency Tracker is available online to individuals free of charge for monitoring and recording competency in geotechnical numerical analysis.

Andrew Lees
Nicosia
May 2016

About the author

Andrew Lees graduated with a BEng in Civil Engineering at the University of Southampton in 1996, where he also obtained a PhD in the fields of centrifuge modelling and FE analysis of soil–structure interaction in 2000. He was then a geotechnical engineer at a major UK consultancy until 2004 when he took up a lectureship at Frederick University, Cyprus where he taught geotechnical engineering until 2015. In 2007, he also set up and continues to run the successful consultancy Geofem, specialising in geotechnical FE analysis. In 2016, he was also appointed Senior Application Technology Manager at Tensar International, where one of his tasks is to improve techniques of modelling geogrid-stabilised soils by FE analysis. He is a member of the NAFEMS Geotechnical Working Group and authored their first guidebook on obtaining parameters for numerical analysis and is a founding member of the Professional Simulation Engineer scheme administered by NAFEMS. He coordinated the European Commission Lifelong Learning project COGAN on improving competency in geotechnical numerical analysis. He was convener of the evolution group advising the Eurocode 7 committee on the use of numerical methods in accordance with the design code and has since been involved in the redrafting of Eurocode 7. He is a member of the British Geotechnical Association and the Institution of Civil Engineers.