

# Preface to the Fourth Edition

In this edition some new examples dealing with the inertia tensor and the propagation of compression and shear waves in an isotropic linear-elastic medium are incorporated. Section 3.3 is completely revised and enriched by an example of thin membranes under hydrostatic pressure. The so derived Laplace law is illustrated there by a thin wall vessel of torus form under internal pressure. In Chap. 8 I introduced a section concerned with the deformation of a line, area and volume element and some accompanying kinematic identities. Similar to the previous edition some new exercises and solutions are added.

Aachen, December 2014

Mikhail Itskov

## Preface to the Third Edition

This edition is enriched by some new examples, problems and solutions, in particular, concerned with simple shear. I also added an example with the derivation of constitutive relations and tangent moduli for hyperelastic materials with the isochoric-volumetric split of the strain energy function. Besides, Chap. 2 is completed with some new figures, for instance, illustrating spherical coordinates. These figures have again been prepared by Uwe Navrath. I also gratefully acknowledge Khiêm Ngoc Vu for careful proofreading of the manuscript. At this opportunity, I would also like to thank Springer-Verlag and in particular Jan-Philip Schmidt for the fast and friendly support in getting this edition published.

Aachen, February 2012

Mikhail Itskov

# **Preface to the Second Edition**

This second edition is completed by a number of additional examples and exercises. In response to comments and questions of students using this book, solutions of many exercises have been improved for better understanding. Some changes and enhancements are concerned with the treatment of skew-symmetric and rotation tensors in the first chapter. Besides, the text and formulae have been thoroughly reexamined and improved where necessary.

Aachen, January 2009

Mikhail Itskov

# Preface to the First Edition

Like many other textbooks the present one is based on a lecture course given by the author for master students of the RWTH Aachen University. In spite of a somewhat difficult matter those students were able to endure and, as far as I know, are still fine. I wish the same for the reader of the book.

Although the present book can be referred to as a textbook one finds only little plain text inside. I tried to explain the matter in a brief way, nevertheless going into detail where necessary. I also avoided tedious introductions and lengthy remarks about the significance of one topic or another. A reader interested in tensor algebra and tensor analysis but preferring, however, words instead of equations can close this book immediately after having read the preface.

The reader is assumed to be familiar with the basics of matrix algebra and continuum mechanics and is encouraged to solve at least some of the numerous exercises accompanying every chapter. Having read many other texts on mathematics and mechanics, I was always upset vainly looking for solutions to the exercises which seemed to be the most interesting for me. For this reason, all the exercises here are supplied with solutions amounting a substantial part of the book. Without doubt, this part facilitates a deeper understanding of the subject.

As a research work this book is open for discussion which will certainly contribute to improving the text for further editions. In this sense, I am very grateful for comments, suggestions and constructive criticism from the reader. I already expect such criticism, for example, with respect to the list of references which might be far from complete. Indeed, throughout the book I only quote the sources indispensable to follow the exposition and notation. For this reason, I apologize to colleagues whose valuable contributions to the matter are not cited.

Finally, a word of acknowledgment is appropriate. I would like to thank Uwe Navrath for having prepared most of the figures for the book. Further, I am grateful to Alexander Ehret who taught me the first steps as well as some “dirty” tricks in LaTeX, which were absolutely necessary to bring the manuscript to a printable

form. He and Tran Dinh Tuyen are also acknowledged for careful proofreading and critical comments to an earlier version of the book. My special thanks go to Springer-Verlag and in particular to Eva Hestermann-Beyerle and Monika Lempe for their friendly support in getting this book published.

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