Preface

This treatise provides a broad overview of the definitions of fundamental quantities and the methods of analysis employed when solid materials that behave in an elastic manner are used in structural components. The presentation is limited to the linear elastic range of material behavior where there is a one-to-one relationship between load and displacement. Fundamental methods of analysis and typical results for structures made of elastic solid materials subjected to axial, bending, torsion, thermal, and internal pressure loading are presented. Stability of rods, analysis of plates, concepts of the finite element method, and mechanics of fibrous composite materials also are reviewed.

The presentation is at an introductory level suitable for advanced students in STEM (Science, Technology, Engineering, and Mathematics); it also can serve as an introduction or review for students and professionals in science and engineering. The treatise can be an introduction for specialists in fields such as aerospace engineering, mechanical engineering, materials science, and civil engineering. It is also intended to serve as an overview and possibly the only formal study of the subject for specialists in other fields of engineering and science. For a course of study at the college or university level, it is expected that it would, at most, be equivalent to a one-hour semester course. Finally, it is intended as an introductory overview for those in secondary science education and those teaching at the secondary level, as well as an introductory course for those studying in the arts and sciences at universities. As the emphasis on STEM education in the USA has increased in recent years, this treatise is a contribution to that effort. The treatise is written from the perspective of an engineer, one with more than fifty years of experience as an engineering professor. Introductory level exercises and their solutions are included.

This book is an expanded and improved version of a book entitled, Elastic Solids, previously self-published and no longer available.

Charlottesville, VA, USA — Carl T. Herakovich
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Herakovich, C.T.

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