Preface to the First Edition

This text is prepared for the purpose of introducing the concept of continuum mechanics to beginners in the field. Special attention and care have been given to the presentation of the subject matter so that it is within the grasp of those readers who have had a good background in calculus, some differential equations, and some rigid body mechanics. For pedagogical reasons the coverage of the subject matter is far from being extensive, only enough to provide for a better understanding of later courses in the various branches of continuum mechanics and related fields. The major portion of the material has been successfully class-tested at Rensselaer Polytechnic Institute for undergraduate students. However, the authors believe the text may also be suitable for a beginning graduate course in continuum mechanics.

We take the liberty to say a few words about the second chapter. This chapter introduces second-order tensors as linear transformations of vectors in a three dimensional space. From our teaching experience, the concept of linear transformation is the most effective way of introducing the subject. It is a self-contained chapter so that prior knowledge of linear transformations, though helpful, is not required of the students. The third-and higher-order tensors are introduced through the generalization of the transformation laws for the second-order tensor. Indicial notation is employed whenever it economizes the writing of equations. Matrices are also used in order to facilitate computations. An appendix on matrices is included at the end of the text for those who are not familiar with matrices.

Also, let us say a few words about the presentation of the basic principles of continuum physics. Both the differential and integral formulation of the principles are presented. the differential formulations are given in Chapters 3,4, and 6, at places where quantities needed in the formulation are defined while the integral formulations are given later in Chapter 7. This is done for a pedagogical reason: the integral formulations as presented required slightly more mathematical sophistication on the part of a beginner and may be either postponed or omitted without affecting the main part of the text.

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W. Michael Lai
David Rubin
Erhard Krempl
Division of Mechanics, Rensselaer Polytechnic Institute

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