Preface

This text is based on a one-semester course I have been teaching at the Illinois Institute of Technology for about 30 years. Graduate students from mechanical and aerospace engineering, civil engineering, chemical engineering, and applied mathematics have been the main customers. Most of the students in my course have had some exposure to Newtonian fluids and linear elasticity. These two topics are covered here, neglecting the large number of boundary-value problems solved in undergraduate texts. On a number of topics, it becomes necessary to sacrifice depth in favor of breadth, as students specializing in a particular area will be able to delve deeper into that area with the foundation laid out in this course. Space and time constraints prevented the inclusion of classical topics such as hypoelasticity and electromagnetic effects in elastic and fluid materials and a more detailed treatment of nonlinear viscoelastic fluids.

I have included a small selection of exercises at the end of each chapter, and students who attempt some of these exercises will benefit the most from this text. Instructors may add reading assignments from other sources.

Instead of placing all the references at the end of the book, I have given the pertinent books and articles relevant to each chapter at the end of that chapter. There are some duplications in this mode of presentation, but I hope it is more convenient. The Introduction is followed by a list of books on continuum mechanics intended for students looking for deeper insight. Students are cautioned that there are a variety of notations in the literature, and it is recommended that they read the definitions carefully before comparing the equations. In particular, my definition of the deformation gradient happens to be the transverse of that found in many books. The "comma" notation for partial derivatives, which is commonly used in mechanics, usually confuses students when it comes to the order of the indices in a tensor component. I have tried to avoid the "commas" in the beginning while the students are learning to manipulate tensor components.

I am grateful to my colleagues: Michael Gosz, who used this text for a course on continuum mechanics he taught, and Hassan Nagib and Candace Wark for trying out the chapter on Cartesian tensors on their fluid dynamics students. I am also indebted to Professors Sia Nemat-Nasser and Gil Hegemier for instilling in me an

appreciation for continuum mechanics. A number of students in my classes took it upon themselves to prepare detailed errata for the notes I had distributed. I appreciate their input and have tried to incorporate all of their corrections (while, probably, adding some new errors).

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