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THE FIRST RESOURCE FOR MATHEMATICS

Liu, I-Shih

Continuum mechanics. (English) Zbl 1058.74004

Advanced Texts in Physics. Berlin: Springer (ISBN 3-540-43019-9/hbk). xii, 297 p. (2002).

The book addresses primarily graduate and advanced undergraduate students in theoretical physics, applied mathematics and engineering sciences. It contains a clear and concise introduction to modern nonlinear continuum mechanics, including kinematics, stress analysis, and balance equations of mechanics and thermodynamics. In the appendix, a brief introduction into tensor algebra and calculus is given, which can be consulted for the tensor notation, which is clear and rather common.

The second part of the book, dedicated to material theory, is more individual. It starts with general principles of rational mechanics, including a systematic and convincing outline of Euclidean invariance in its different versions. For the rest of this second part, representations of tensor functions with specific material symmetries are given in some detail, which is not usual for such books. Also, the thermodynamics are considered in a rather fundamental way, which leaves the usual paths of rational thermodynamics based on the Clausius-Duhem inequality. Instead, Liu favors the entropy principle as suggested by I. Müller, and exploits it by the method of Langrangian multipliers. Such "extended thermodynamics" is presented in a systematic and careful way. Examples of different applications are given. Of course, it is up to the reader, to adopt this approach, or to stay with the usual one suggested by Coleman, Noll e.a.

The part on material theory seems to be more appropriate for a book on thermodynamics than on mechanics, as important material classes such as plasticity or viscoplasticity are not considered in detail. All examples range from fluids to elastic solids, which is, of course, much less than what an engineer might expect. Also, the references are rather limited with less than 80 titles.

So, the book can be recommended as an introduction to nonlinear continuum mechanics, and as an interesting new approach to thermodynamics, but further literature is required for more advanced material theories.

Reviewer: Albrecht Bertram (Magdeburg)

MSC:

74-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to mechanics of deformable solids	Cited in **70** Documents
74Axx	Generalities, axiomatics, foundations of continuum mechanics of solids	

Keywords:

Euclidean invariance; material symmetries; entropy principle; extended thermodynamics

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