

# Book Reviews

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## ***The Mechanics and Thermodynamics of Continua***

M. E. Gurtin, E. Fried, and L. Anand, Cambridge University Press, New York, 2010, 694 pp., \$125.

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This book is intended to present a “unified treatment of continuum mechanics and thermodynamics that emphasizes the universal status of the basic balances and the entropy imbalance” and, indeed, it succeeds admirably. After a brief review of the fundamental results of vector and tensor analyses, the principles of modern continuum mechanics are presented and then used to derive theories for compressible and incompressible fluids and small and large deformation theories for elastic solids, plastic solids, and single crystals. This book is clearly written, comprehensive, and accessible for graduate students and advanced undergraduates in engineering, physics, and mathematics. Researchers in the field will find it to be a valuable resource, nicely complementing other books on continuum mechanics [1–5].

The authors are correct in their assertion that most books on continuum mechanics fail to be consistent in their application of the second law of thermodynamics to the development of constitutive models for the behavior of materials. The organized, rational, and systematic application of the second law employed by the authors is perhaps the most important aspect of this book and it is certainly a primary reason it is such a joy to read. The organization of the book into 114 chapters, several of which consist of as few as two pages, is a bit unorthodox. However, I did not find this detracted from the overall experience.

I feel that the first half of this book would make an excellent textbook for a graduate course in continuum mechanics. The exposition, while comprehensive and modern in its approach, is more accessible for graduate students in engineering than that of, for example, Truesdell and Noll [1] and Truesdell [2], and many of the sections include exercises. Necessarily, perhaps, for a book of this scope, the emphasis is on the development of theory without examples of how the theories can be applied to solve specific initial-boundary value problems in fluid dynamics, elasticity, etc. For this reason, this book is not as well suited for follow-up graduate courses in these specialized areas.

I found this book to be thoroughly enjoyable to read and a fount of useful information. I highly recommend it.

### **References**

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- [3] Malvern, L. E., *Introduction to the Mechanics of a Continuous Medium*, Prentice-Hall, Englewood Cliffs, NJ, 1969.
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- [5] Chadwick, P., *Continuum Mechanics: Concise Theory and Problems*, Wiley, New York, 1976.

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