Journal of Thermal Analysis and Calorimetry, Vol. 63 (2001) 325–327

Book review

Introduction to Engineering Thermodynamics
Richard E. Sonntag and Claus Borgnakke
John Wiley & Sons, Inc., New York, 2001, 489pp, indexed

This book is based on the recent successful textbook, Fundamentals of Thermodynamics, Fifth edition, Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen, John Wiley & Sons, Inc., 2001, but is written for a broader audience, including the end-of-chapter problems, and is specifically intended for a dual purpose use. The text is written for two different courses: a one semester introductory course in engineering thermodynamics for both majors and non-majors; and also, the first course in an introductory sequence in engineering thermal-fluid sciences. The book therefore does not include those topics commonly covered in a second thermodynamic course taken by majors: combustion; chemical and phase equilibrium; thermodynamic relations/equations of state; or compressible flow. These book has also been written to cover a broad range of background, interests and applications as well as to provide a great deal of flexibility in terms of topics covered, and units.

In the first introductory chapter a brief description of a number of examples and problems are presented such as a steam power plant, a fuel cell, a vapor-compression refrigerator, a thermoelectric cooler, a turbine, and an air separation plant. New concepts and definitions are presented in the context where they are first relevant. The first thermodynamic properties to be defined (Chapter 2) are those that can be readily measured: pressure, specific volume, and temperature. In Chapter 3, tables of the thermodynamic properties are introduced, but only in regard to these measurable properties. In Chapter 4 the work and heat are considered. Internal energy and enthalpy are introduced in connection with the first law, and entropy with the second law (Chapters 5–9). Development of the second law has been streamlined, with better integration of the concepts of thermodynamic temperature and ideal gas temperature.

Coverage of irreversibility, availability, and second law efficiency is also included on a condensed basis in Chapter 9, with the development limited to the steady-state process. Coverage of ideal gas and ideal gas mixtures focuses on unit mass expression, instead of molar expression, for simplicity in an introductory course (Chapter 10). Chapter 11, the applications chapter on thermodynamic systems and cycles, is also somewhat briefer than it is usual in other standard textbooks.

For use as the first course in the thermal-fluid sciences sequence, this book includes a chapter covering heat transfer (Chapter 12), with particular emphasis on conduction.

1418–2874/2001/ $ 5.00
Akadémiai Kiadó, Budapest

Examples, problems and heat transfer data are all packaged together for the convenience of those who cover this material.

Overall, there is more than enough material to be covered in a single semester, especially in terms of all the material in the final four chapters of the book. This book provides a comprehensive introduction to the engineering thermodynamics to students in mechanical, chemical, and energy systems engineering, who face significant challenges and opportunities during their professional careers.

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