

completeness, especially in the field of metallic materials.

In forty-three well-organized sections, metals, organic and inorganic materials, and the cause and prevention of failures in materials are treated. To make specific data readily available, technical tables, design information, structural characteristics, and tabular data have been carefully prepared, and the references at the end of each section enable the reader to find any information not embraced in the handbook. The reliability of the information presented is achieved by coordinating the work of more than 150 specialists under the direction of Professor Mantell who is chairman of the Department of Chemical Engineering at the Newark College of Engineering.

To make the book of practical value to an engineer concerned with materials, emphasis is placed on the fabricated forms of materials, their physical and mechanical properties, their advantages, limitations, competition with one another, protection against deterioration, and their ability to withstand use and abuse.

Approximately half of the book concerns metals, and the reviewer feels that the properties of the individual metals are thoroughly covered. The section on steel and its heat treatment is especially well done. However, it is the reviewer's opinion that too little space is given to the difficulties that arise in the fabrication of materials into commercial shapes.

It is in the second half of the book that the reviewer has the idea that the editor has spread himself too thin in a desire to take in the whole field of materials. In devoting reasonably complete attention to such materials as brick, clay, textiles, stone, and concrete, the editor has not allowed enough space for complete coverage to such newer subjects as materials for nuclear reactors, rockets, and guided missiles. While textiles, stone, etc., are of interest to some engineers, it is the reviewer's opinion that chemical and metallurgical engineers would have profited more had the treatment of the newer materials, such as high temperature ceramics, been more inclusive.

Nevertheless, the reviewer feels that the handbook is a good one and would be of practical value to any engineer faced with a problem of the choice of materials, particularly if the choice is to be made in the metallic field.

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**Modern Mathematics for the Engineer, E. F. Beckenbach, et al, University of California Engineering Extension Series, McGraw-Hill Book Company, Inc., New York (1958). 514 pages. \$7.50.**

This book is described as a broad survey of the applications of advanced mathematics to the expanding modern technology. The basic idea behind the volume is quite sound; indeed, an intimate association with a large number of the theories of advanced mathematics has become a practical necessity for those attempting to keep abreast of the literature in practically any scientific field.

*Modern Mathematics for the Engineer is*

divided into three major sections: Mathematical Models, Probabilistic Problems, and Computational Considerations. These sections are further divided into individual chapters dealing with the more specific problems which might be expected to be encountered, such as linear and nonlinear oscillations, the calculus of variations, hyperbolic partial-differential equations, and boundary-value problems in elliptic partial-differential equations in the first section; the theory of prediction, the theory of games, dynamic programming, and Monte Carlo methods in the section on Probabilistic Problems; and matrices and engineering, functional transformations, nonlinear methods, relaxation methods, and high-speed computing devices in the last section.

From an inspection of this partial list of contents, it can be seen that the authors have not lacked for broadness in their approach to the applications of modern mathematical techniques for the engineer. Many volumes have been written on individual chapters in this book, and in many cases it has been necessary for the authors to assume a fairly complete knowledge of the contents of these volumes in presenting the material. Such is to be expected in any advanced textbook or reference work, although to the engineer whose education and experience has not left him well acquainted with the workings of advanced mathematical methods, the quantity of knowledge necessary for the rewarding pursuit of this book may seem overwhelming. Owing to the nature of the lectures from which the material included in the book is taken, one cannot consider it a textbook in the normal sense of the word.

From the point of view of the practicing engineer, the last section, on Computational Considerations, is probably the most interesting and useful, particularly the chapters dealing with the uses of matrices, relaxation methods, high-speed computers, and methods of steep descent. Unfortunately, the entire subject of functional transformations and associated methods is discussed in some fourteen pages, which is entirely inadequate for methods of such importance. Although many excellent discussions of the subject appear elsewhere, it would seem that the book under consideration here would benefit from the additional scope and balance between the various topics provided by further treatment of this subject.

The discussions of the various probabilistic problems and methods are quite interesting and bear close inspection because of the increasing importance of these methods in the solution of a multitude of problems.

In general, it can be said that a book representing such a wide diversification of topics and a variety of authors as this one is quite likely to suffer from sheer magnitude of effort. *Modern Mathematics for the Engineer* represents a successful attempt to minimize these difficulties, however; even the casual reader will be able to gain some understanding of the variety of problems which can be solved with these techniques and, consequently, to develop the interest necessary for the learning of the material. For those more fully acquainted with the various topics encountered in consideration of advanced mathematics, the book would best be described as a valuable reference

work for the most important of the applications of mathematics for the contemporary engineer.

JOHN B. BUTT

**Elements of Gasdynamics**, H. W. Liepmann and A. Roshko, John Wiley & Sons, 439 pages, \$11.00.

*Elements of Gasdynamics*, by Liepmann and Roshko, is an excellent book. The material covered may be ascertained from the chapter headings which read: (1) Concepts from Thermodynamics; (2) One Dimensional Gasdynamics; (3) One Dimensional Wave Motion; (4) Waves in Supersonic Flow; (5) Flow in Ducts and Wind Tunnels; (6) Methods of Measurement; (7) The Equations of Frictionless Flow; (8) Small-Perturbation Theory; (9) Bodies of Revolution. Slender Body Theory; (10) The Similarity Rules of High Speed Flow; (11) Transonic Flow; (12) The Method of Characteristics; (13) Effects of Viscosity and Conductivity; (14) Concepts from Gas Kinetics.

There are very few criticisms which need to be made. It is unfortunate that the authors chose to use the symbols  $F$  and  $G$  for the Helmholtz and Gibbs free energy rather than  $A$  and  $G$ . The use of  $F$  for the Helmholtz free energy will cause much confusion, since most Americans use  $F$  for the Giffs free energy and the majority of the tables of thermodynamic data adhere to this convention. This reviewer would have liked to have seen a somewhat more extended discussion of the second law of thermodynamics and of the principles

of irreversible thermodynamics, especially since the latter is used in one form or another extensively throughout the text. The treatment of the Clausius-Clapeyron equation is very poor and unconvincing. The usual thermodynamic derivations are superior to the quasi-molecular one given by the authors. Also the treatment of imperfect gases is superficial, and the relationship between thermodynamic properties and gas imperfection is very incomplete. These criticisms are not meant to imply that the thermodynamics chapter is poor but rather to indicate some places where improvement is possible. The remainder of the book, especially the sections dealing with the hydrodynamics of compressible fluid flow, is admirably clear.

The final chapter on the kinetic theory of gases is short but complements well the rest of the text. This reviewer was very pleased to see a brief discussion of the properties of Couette flow in the Knudsen region. The development of missiles which fly in regions of the upper atmosphere where the mean free path is of the order of the dimensions of the flying object makes this pressure range of great importance.

*Elements of Gasdynamics* is to be recommended to all students interested in gasdynamics and its applications. The book will also be of interest to physical chemists who will find a wide realm of irreversible phenomena which await exploration.

STUART A. RICE  
Junior Fellow  
Society of Fellows  
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