

BOOK REVIEWS

Electron Beam Analysis of Materials

Reviewed by Dr. K. H. G. Ashbee, University of Bristol, England.

REFERENCE: Loretto, M. H., *Electron Beam Analysis of Materials*, Chapman and Hall/Methuen, London/New York, 1984, \$49.95 (cloth), \$19.95 (paper), 210 pp.

This is a very readable text, written at graduate student level. It is well illustrated with simplified diagrams and experimental examples, and contains a minimal number of mathematical equations.

The first third of the book deals with the concepts and experimental details that a beginner should know before he is shown how to use electron optical equipment. The remainder of the book describes the interpretation of images and data generated by various electron optical instruments and, to this end, five appendices are included at the end of the book. One of these contains examples of "schematic" Kikuchi maps. Kikuchi patterns are gnomonic projections of Brillouin zone boundaries, the exact computation and graphical display of which can be, but in this book are not, accomplished using readily available software.

State-of-the-art electron beam analysis of materials encompasses a far broader spectrum of disciplines and materials that can be covered in a single 200-page book. There are therefore several gaps, the most obvious of which is exclusion of the special requirements of low beam intensities for investigating the polymers. In respect of this, a section on image intensification would have been welcomed by this reviewer. I would also have liked to see more on *in situ* scanning electron microscope techniques, of which Kossel X-ray diffraction to determine crystal orientation and elastic strain, and cathodoluminescence, spring to mind. There is no mention of environmental specimen stages, nor of microprocessor interfaced experiments.

The subject index is a bit sparse, and there is no author index. Nevertheless, a valuable addition to my bookshelf.

SI Units in Radiation Protection and Measurements

Reviewed by L. E. Barrow, Consultant, Office of Weights and Measures, National Bureau of Standards, Gaithersburg, MD 20899. Member of ASTM.

REFERENCE: "SI Units in Radiation Protection and Measurements," NCRP Report No. 82, National Council on Radiation Protection and Measurements, Washington, DC, 1985, 64 pp.

This 64-page booklet is a guide for increasing use of the modernized metric system (the International System of Units, SI) in the field of radiology and radiation protection. Increased use of the metric system in any sector involves two aspects: (1) proper use of SI units and (2) systematic and economically feasible application of SI units throughout the sector. Both of these aspects of metrication

in the field of radiology and radiation protection are dealt with thoroughly and clearly in this report.

The SI units of particular interest in this field are the gray, sievert, becquerel, and coulomb per kilogram for the quantities absorbed dose, dose equivalent, activity, and exposure, respectively; these units replace the conventional units rad, rem, curie, and roentgen, respectively. The report discusses in detail how these SI units fit into the SI structure and how they relate to the conventional units that they are replacing. The material is in complete accord with ASTM Standard for Metric Practice (E 380-85) with one notable exception: In symbols for compound units a space rather than a raised dot is used to indicate multiplication of component units. This is an unfortunate deviation from United States practice even though the space is permitted as an alternative usage in ISO standards.

The report deals in depth and in a balanced way with considerations both for and against superseding conventional units with SI units and discusses practical means for making the transition, both in unit usage and in instrumentation. The chief argument against the transition relates to safety considerations, while the chief argument for the transition is that SI is the consensus candidate for a single system of units to be used for all branches of science and engineering throughout the world.

The National Council on Radiation Protection and Measurements, which published the report, recommends the gradual adoption of SI units over a two-stage transition period to be completed by the end of 1989. In the first stage, ending 31 December 1986, measurements would be reported with the value in conventional units given first followed by the value in SI units given in parentheses, while in the second stage, 1 January 1987 to 31 December 1989, the order would be reversed. Starting in 1990 only SI units would be used.

This report is highly recommended reading for anyone interested in understanding how this very specialized and complex field fits logically into SI. It is especially recommended for those engaged in radiation science, protection, and therapy, diagnostic radiation, nuclear medicine, and environmental radiation measurements.

Appliance Switch Standards: Approvals and Safe Electrical Control

Review supplied by S. David Hoffman, Vice President and General Counsel, Underwriters Laboratories Inc., Northbrook, IL 60062.

REFERENCE: Honey, G., *Appliance Switch Standards: Approvals and Safe Electrical Control*, Sheridan House, Dobbs Ferry, NY, hardcover, \$30.00, 95 pp.

This book was reviewed by a senior engineer at Underwriters Laboratories. Although it deals mainly with switches, our reviewer reported that the book provides an excellent basic insight into standards development, electrical testing, and product certification as

BOOK REVIEWS

they exist in the major industrial countries. It is our reviewer's opinion that the information is presented in a well-written, easy-to-read, yet factual manner. He recommends it as extracurricular reading for anyone involved with international standards and foreign manufacturers of electrical products, regardless of type of product.

Finite Element Analysis of Shells of Revolution

Reviewed by Spencer T. Wu, Structures Division, Center for Building Technology, National Bureau of Standards, Gaithersburg, MD 20899. Currently with Directorate of Aerospace Sciences, AFOSR, Bolling AFB, Washington, DC 20332.

REFERENCE: Gould, Phillip, L., *Finite Element Analysis of Shells of Revolution*, Pitman, New York, 1985, hardcover, 210 pp.

It is well known that analytical solutions of shell problems can be quite difficult to find. The ease or difficulty in obtaining analytical solutions depends on the loading, geometry, or boundary conditions of the structural system. Since approaches for finding numerical solutions are usually more straightforward and unified, methodologies such as the finite element method are widely used in engineering practice. This book is written for analyzing shells of revolution using the finite element method with emphasis on static and dynamic problems involved in the design of shell structures.

The book contains seven chapters. The first chapter, an introduction to the book, covers mainly the scope of the text and historical development of the subject area. Chapter 2 reviews the funda-

mentals including basic laws and conditions for defining a shell problem. Some variational principles of mechanics related to finite element formulation are also described. Chapter 3 deals with static analysis of shells. Approaches using special elements such as stiffened shells, compound shells, and branched shells are discussed. Chapter 4 describes methods for solving dynamic problems. Dynamic analyses including soil-structure interactions and blast load effects are illustrated in the case studies. Chapter 5 describes briefly the approaches for solving some geometric non-linearity and stability problems. Chapter 6 deals with subjects of locally non-axisymmetric shells. Usages of general and transitional elements are discussed. Chapter 7 describes the features of two public domain programs developed for shell analysis. Steps involved in the design of shells, including establishment of meridional geometry, selection of discretization pattern, determination of loading, and stress analyses for dead, live, and earthquake loads, are shown based on the program, SHORE, developed by the author of this book.

The text is intended to be at the "intermediate" level. Readers may need some background in the areas of finite element analysis and shell structures to understand fully the problems involved in the shell analysis even though some of the fundamentals are reviewed. A book cannot be all things to all readers. This book does not elaborate on such interesting research subjects as problems related to large displacements and inelastic material behavior. However, the book introduces various analytical problems pertinent to the design of shell structures. Through case studies, modeling techniques are set out and results of analyses are given, based on the author's engineering experience. Those interested in shell design will find the book helpful.