Control Systems

Regelungstechnik, Kurze Einführung am Beispiel der Drehzahlregelung von Wasserturbinen. Second Edition. By Dr.-Ing. Georg Hutarew. Springer Verlag, Berlin, 1961, Cloth, 6 × 9 in., xii and 180 pp. DM 21.

REVIEWED BY K. PILARCZYK[2]

In this short book the author attempts to show the application of the basic theory to the analysis of some actual speed control systems. Although the subtitle refers specifically to water turbine controls, the materials and the analysis shown can be readily applied to control mechanisms of other machines.

After summarizing in the first chapter the solutions of the basic differential equations used in control-systems calculations, the author devotes the rest of the book to a variety of working systems proved in practice, showing their appropriate mathematical treatments. First, the various types of controls are defined and then the components of control mechanisms are analyzed separately. Finally, the methods of investigating the control ranges, control loops, and the stability of the entire system are presented.

In this second edition the derivations of the differential equations and some curves, which have been proved to be inapplicable to practical cases, have been omitted. The most important change is in the chapter dealing with the control ranges where new dimensionless governor curves have been introduced.

It is the reviewer's opinion that this short work is a valuable addition to the literature on controls. The clear, concise, and simple analysis of the various cases together with the high standard of printing makes the content easily understandable to any engineer without previous background in the subject matter.

Continuum Mechanics

Introduction of Mechanics of Continua. By W. Prager. Ginn and Company, Boston, Mass., 1961. Cloth, 6½ × 9½ in., x and 230 pp. $8.00.

REVIEWED BY K. H. GERSTLE[3]

At a time when the science of continuum mechanics progresses at a rapid pace, shooting out new branches in many directions—viscoelasticity and plasticity, non-Newtonian flow, magnetohydrodynamics—there is a pressing need to unify the approach to the analysis of continuous media. Only in this way can the splintering of effort which is so common among engineers and scientists be prevented at a time when each group of specialists sits in its own corner, unable to communicate with others.

A powerful unifying tool is the emphasis on the common laws and mathematical tools underlying a seemingly diverse array of physical phenomena. The book is a successful attempt to focus attention on the aspects common to all branches of continuum mechanics—the laws of conservation of mass, momentum, and energy, the equations of motion, and conditions of compatibility, all expressed in the concise language of tensor analysis. Only after these fundamentals are thoroughly covered in Professor Prager's typically fluent, concise style are they applied to specific fields of application.

The book begins with an introduction to Cartesian tensors; subsequent chapters deal with stress at a point, the kinetics of small deformations, the conservation theorems, and Newton's laws. Constitutive equations are discussed at the end of Chap. 4, and the next six chapters treat the application to diverse fields—perfect and viscous fluids, elastic, plastic, and viscoplastic solids, and problems of finite elastic and plastic deformation.

All discussion is on a concise mathematical level and requires a certain degree of sophistication on the part of the reader—the author's introductory statement regarding mathematical prerequisites may be somewhat optimistic. The engineer with classical training may wish for more emphasis on the relation of tensor equations to conventional representation, and on applications. But there is no doubt the student who understands the contents of this book has a solid base on which to build an up-to-date and creative analytical career, and for this reason this book deserves widespread use.

Nonlinear Control Systems

Analysis of Nonlinear Control Systems. By D. Graham and Duane McRuer. John Wiley & Sons, Inc., New York, N. Y., 1961. Cloth 6 × 9½ in., xiii and 482 pp. $9.75.

REVIEWED BY D. C. KARNOPP[4]

The historical dichotomization of all systems into the classes *linear* and *nonlinear* might lead one to expect from the title of this book that the analysis of all systems except linear systems would be discussed. The notion is, of course, doubly wrong, for, first of all, it is hard to conceive of a method of analysis which can be applied to nonlinear systems and not linear ones, and, secondly, the universe of possible nonlinear systems is so vast and variegated that a practical and universal system of analysis seems to be out of the question.

The authors have addressed themselves to the useful task of presenting most of the theory, techniques, and results that have been developed by engineers in the study of nonlinear systems and, particularly, control systems. The result is a unified treatment which is about as complete as could be expected within the confines of a single reasonably sized book.

The book should appeal to many engineers interested in nonlinear systems because of its emphasis on utility rather than on mathematical intricacy. For those well acquainted with the literature of recent years, relatively little will be found that is actually new. However, the topics discussed are thoroughly referenced and thus the book can serve as an excellent guide to the literature. The book is nearly ideal for those who wish to increase their knowledge of nonlinear control systems by self study since the theory is clearly presented and profusely illustrated with examples.

Shock Waves

Shock Tubes. By J. K. Wright. John Wiley & Sons, Inc., New York, N. Y., 1961. Cloth, 5 × 7½ in., vii and 164 pp. $2.95.

REVIEWED BY E. F. GREENE[5]

This little book is a worthy member of the Methuen series which has been so successful in providing sound and readable introductions to many fields of scientific work. The book summarizes the theory of shock waves and gives brief descriptions of many of the techniques which have been used in studying the physics of shock waves. Engineering applications are not stressed. In nine short chapters the author discusses: one-dimensional compressible gas flow; the theory of shock tubes; measurement techniques; the reflection, refraction, and diffraction of shock waves; the structure of the shock front; and the production and use of strong shock waves. There are many helpful figures.

No book can satisfy everyone in all respects. The reviewer would have appreciated the inclusion of more experimental results. These might have been particularly helpful in figures such as those showing the expected variation of shock strength with the initial pressure ratio across the shock-tube diaphragm.

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