

Book Reviews

Statistical mechanics, fluctuations and noise

A. H. W. Beck

Edward Arnold, 1976, 231pp. £12.50 (hardback) £7.50 (paperback)

The mere mention of statistical mechanics is sufficient to evoke memories of dismay and incomprehension from undergraduate days. Yet Prof. Beck has produced a very readable book which I thoroughly recommend to anyone attempting to understand the subject for the first, or indeed the second, time. The style is easy to follow without being colloquial and the text is liberally scattered with practical examples, helping to convince the reader that the subject is not too difficult after all. At the same time the derivations are sufficiently rigorous for the practical physicist or engineer, and the book should be valuable as a work of reference.

However, as the author aims to concentrate on practical aspects, it is unfortunate that Chap. 9, dealing with electrical and optical noise, is not longer. It is surprising to find that the thermionic diode provides both examples of noise in electronic devices; certainly it is easy to visualise shot noise and space-charge smoothing in vacuum diodes, but the example ignores the subtleties of bipolar current flow in transistors and semiconductor diodes. I should like to have seen an example of one of the more respectable theories of $1/f$ noise, or even of generation-recombination noise which certainly has a sound thermodynamic basis; and the ' $1/f$ catastrophe' is surely at least a 'pink' herring?

In all other respects, I believe that this is a book worth buying, although I fear that the price of the paperback edition may well deter students. I am sure that the library's hardback copy will become required reading.

R. J. HAWKINS

Digital transmission systems

IEE Telecommunication Series 4

P. Bylanski and D. G. N. Ingram

Peter Peregrinus Ltd., 1976, 368pp. £13.80

It is well known that the history of electronic communication begins with the electric telegraph: the first digital transmission system! Less well known is that the earliest carrier-modulation systems of the spark-transmitter type were also digital. After being overshadowed by analogue techniques for many years, digital methods are beginning to dominate again; large digital transmission systems are now both technically feasible and economically desirable. As a consequence, the research, development and planning of digital systems has received considerable attention of late.

The authors of this excellent book point out, however, that much of the vast amount of literature on the subject has not been critically assessed and integrated, and lacks emphasis on problems of practical importance to communication engineers. Their book is a contribution towards redressing the balance. It is a reference and review work, providing a concise and annotated summary of the theoretical,

planning and practical aspects of digital transmission systems. It is not a digital-communication-theory textbook, nor is it concerned with circuit details. Particularly felicitous are the introductory historical background; the discussion of hypothetical reference connections in the chapter on system planning; the chapters on timing and jitter, on transmission codes (particularly the section of spectral shaping), and on modulated-carrier systems; and the description of present systems and future developments in the final chapter. But the main feature of the book is that it presents a remarkably coherent and well-balanced treatment of the subject; the authors are to be congratulated for not having succumbed to the temptation to expand unduly on their own particular interests.

The book has some shortcomings, of course. A few technical terms are introduced without being defined (e.g. hybrid, codec), and there are several printing errors. The page layout is confusing in many places; in particular, it would have helped if blank spaces had been left at the ends of theorems, and if more space had been left between figures and text. These are minor criticisms, however; the book can be seriously recommended without reservation to anyone interested in digital transmission systems.

P. G. FARRELL

Antennas à large bande: théorie et applications

G. Dubost and S. Zisler

Masson, 1976, 337pp. F120

The authors have achieved a mature outlook with concise and well-referenced mathematical details followed up with copious experimental results, much of which originates from research at the University of Rennes. The first two chapters are at graduate level, and collate the relevant fundamentals. There are no student examples, but the treatment is generally very thorough, well presented and includes interesting facets, such as tabulations of the basic characteristics of commonly used antennas. Well-known contributions on numerical techniques by Hallen, King, Harrington, and many others, are explained; but the deeper issues associated with full- and partial-domain solutions are omitted. Reflector antennas are touched upon but the recent developments in feeds and the use of the geometrical theory of diffraction are not mentioned. The bulk of the experimental results are presented in chapter 3, which concentrates on conical, triangular, flat plate-like, slot, helical, spiral and folded antennas together with a description of some active antenna configurations. Chapter 4 concentrates on frequency independent antennas with emphasis on the conical spiral and log-periodic versions; circular polarisation characteristics are also given. Chapter 5 is essentially devoted to the action of a reflector on a conical equiangular spiral antenna. Finally, chapter 6 gives a somewhat out-of-context brief review of the fundamental aspects of wideband radome design.

This book, which is one of a series under the editorship of Prof. P. Grivet, may be too specialised for undergraduates and too general for specialists at large. It will, however, be particularly useful to designers of spiral-type antennas.

J. R. JAMES

Handbook of operational amplifier circuit design

David F. Stout and Milton Kaufman (Ed.)

McGraw-Hill, 1976, xiv + 434pp. £20.35

Any new text on such a well-documented theme as this must be judged in the light of what is already available, and the specific purpose for which the book is intended. It is claimed to be 'a one-stop manual for the complete design, analysis and troubleshooting of operational-amplifier circuits', a claim that a review of the material substantiates, it being based heavily on many of the standard texts in the field. The practising designer will almost certainly be familiar with most of the applications presented, and the main feature of the book is the use of a step-by-step design procedure for each circuit. There are 27 chapters, rather unevenly organised since the first few are quite lengthy, while most consist of just two short sections; there are also six appendices, the third of which is rather misleadingly entitled 'Circuit fabrication techniques', dealing not, as might be expected, with semiconductor technology (a topic avoided in the book) but with constructional hints and tips.

In places the treatment of basic operational-amplifier concepts is somewhat lacking. For example, the 'typical op-amp' shown in Fig. 1.27 has a second voltage-gain stage, whereas few modern operational amplifiers have this form. The classic transconductance-integrator-follower configuration of amplifiers, such as the 741, 101, and many more, is not discussed, nor is the concept of feedforward, a powerful technique to extend the useful bandwidth of inverting amplifiers. Some of the advice may be misleading: 'The op-amp is a natural choice for a comparator due to its high gain' reads Section 1.2, whereas most operational amplifiers make rather poor comparators for several reasons. This passion to use standard operational amplifiers in preference to more suitable special-purpose circuits is carried to an extreme in Section 6.2 which describes a 'High-precision R-2R d.a. converter' using no less than ten operational amplifiers! The 8 bit circuit relies on the use of selected c.m.o.s. gates, and is very unlikely to compete with the inexpensive monolithic d.a.c.s now available, and is contrary to the stated aim of the book 'to proceed quickly from an idea to a working circuit in the least amount of time'.

On the whole, however, the material collated is useful and extensive references are provided to its sources. A surprising omission in a book appearing in late 1976 is noted in Chapter 19 (Multipliers and dividers), where the technique most widely used for these functions in modern monolithic and discrete designs alike (i.e. the translinear multiplier) is not mentioned. Some minor inconsistencies occur in the text (for example, in Section 19 both t and T are used to denote temperature), but these are rare, and no serious errors were noted.

The book will appeal to the busy engineer and technician needing practical help in applying operational amplifiers, and directs the more interested reader to over 100 sources of the original material.

BARRIE GILBERT