computations. But many parts of the book that deal with
these peripheral subjects could be substantially improved.

E. M. Gelbard
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August 10, 1967

About the Reviewer: Dr. Gelbard is an Advisory
Scientist at the Bettis Atomic Power Laboratory, and a
Fellow of the ANS. He received a PhD in Physics at the
University of Chicago in 1954. Since that time he has
worked at Bettis, where he has specialized in the develop-
ment of numerical methods for use in reactor physics
computations.

Neutron Noise, Waves and Pulse Propagation. AEC
$3.00.

This book is the proceedings of a symposium held at the
University of Florida in February, 1966. As such, it is a
record of the status of the field at that time. Comparison
with the Proceedings of the previous Florida conference
(Noise Analysis in Nuclear Systems, AEC Symposium
Series 4, TID-7679), held just over two years prior, shows
how the field had developed during that interval.

A few specific topics will serve as examples. First,
there is the technique of pseudorandom binary cross
correlation. The original work on the technique was
reported at the previous conference. The present confer-
ence had a number of papers dealing with the use of the
technique in the measurement of transfer functions of
critical and subcritical reactors and the determination of
the characteristics of nuclear-rocket propellant systems.

Another new technique that was discussed by its origi-
nators is the method of measuring reactor noise by taking
the cross correlation between the signals from two de-
tectors. This simplifies the interpretation of the measure-
ments by giving the detection-noise component a zero
expectation value, and allows some relaxation of the
detection-efficiency requirement.

There is also mention of the “polarity correlation”
method of noise analysis, in which correlation functions
are calculated for two-valued variables, whose values at
any time depend upon whether the corresponding observed
random variables are above or below their means. The
method greatly facilitates the use of digital techniques at a
cost of very little loss of information.

A great deal of work is reported, both theoretical and
experimental, in the area of space-dependent reactor
kinetics. A large segment of this deals with neutron-pulse
and neutron-wave experiments and their interpretation in
terms of dispersion functions. It is shown that results of
the $P_1$ approximation (telegrapher’s equation) do not agree
with the experimental data as well as do those of diffusion
theory, although the difference appears only at very high
frequencies.

Consideration is given to the application of noise anal-
ysis to the acoustic and gamma radiation produced by
reactors. Finally, there is a great deal of theoretical and
experimental work directed toward the application, exten-
sion, and elucidation of older methods of noise analysis.

The papers are of uniformly high quality, and are well
ordered by subject. The physical quality of the book is
excellent. However, because of the 1½-year publication
delay, the book does not show the very latest advances in a
number of areas.

Charles Erwin Cohn
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October 30, 1967

About the Reviewer: The reviewer is a physicist at the
Argonne National Laboratory where he has had interest in
experimental nuclear and reactor physics, particularly in
reactor kinetics and noise analysis, since 1956. Dr. Cohn
had his training at the University of Chicago where he held
a National Science Foundation fellowship.

Radioisotope Measurement Applications in Engineering.
By Robin P. Gardner and Ralph L. Ely, Jr. Reinhold

This volume was prepared as a text for radioisotope
methods (under the auspices of the U. S. Atomic Energy
Commission). The two authors are connected with the
Research Triangle Institute and North Carolina State
University. The text is organized into four major subject
areas: characteristics of nuclear radiation (six chapters),
radioactivity (three chapters), radiography (four chapters),
and radiography (one chapter). At the close of the book,
fifteen laboratory experiments are presented which corre-
spond to the four areas of the text.

The authors suggest the book for a two-semester,
three-credit course with two lectures and one laboratory
or problem period per week. The book appears to be
particularly useful for teaching because of its problems
and laboratory exercises.

In this text the authors’ goal is to cover the basic
material pertinent to applications rather than to cover a
large number of applications and, as a result, the book has
only limited use as a general sourcebook on radioisotope
applications.

In the first part of the text, 156 pages are devoted to
nuclear reactions, radioisotope decay processes, sources
and interaction of radiation with matter, radiation detec-
tors and their response, and radiation safety. This brief
coverage is intended to serve as introductory material for
engineers who are not familiar with radiation or radio-
isotopes.

The following sections of the book describe a variety of
applications and reflect the experience and work of the
authors. As a result of this “selective” coverage, the text
will be particularly helpful to an engineer or scientist
interested in a better understanding of the fundamentals
and the mathematics relating to the well-described appli-
cations. The applications which are covered most thor-
oughly are: (1) studies of the frequency response of
systems; (2) the determination of particle size by sedi-
mentation; (3) the study of the batch grinding of coal
relating to the ability to predict the size-weight distribu-
tion and determine performance of the grinding system;
(4) a study of two-component flow systems including
suspensions, powder slurries, gas liquid systems (vold
fraction in water-steam system), and two-component liquid
solutions; (5) soil moisture and density gauging; and (6)
determination of salt content of aqueous solutions.

Other applications, covered in less detail, include
determining: fluid properties; flow patterns and rates; leak
detection; tracer dilution; isotope dilution; wear; mixing
and residence time; laminar flow; diffusion and mass
transfer; the statistics necessary for calculating the accuracy and sensitivity of static and continuous gauges for alpha gauging, and for beta thickness, density, and back scattering gauging.

The fifteen laboratory experiments vary widely in their difficulty. The first few on detector response and pulse measurement are relatively simple. Later experiments on particle size determination, beta particle transmission, beta particle scattering for two-component gases, salt solution density, solid density gauging, and characteristics of continuous radiogauges are relatively complex experiments which, as the authors say, could serve as subjects for term papers.

This reviewer concludes that the book should be particularly useful for teaching students in hydraulic, civil and chemical engineering about radiotracers and their application. It should also prove valuable for use by individuals interested in those applications listed above, the fundamentals of which are thoroughly covered in this book.

J. Kohl
ORTEC Incorporated
Oak Ridge, Tennessee
August 24, 1967

About the Reviewer: Jerome Kohl is currently manager of marketing at ORTEC Incorporated, Oak Ridge, Tennessee. He obtained his BS degree in applied chemistry from the California Institute of Technology and was formerly affiliated with Tracerlab Incorporated and was coordinator of special products of the General Atomic Division of General Dynamics Corporation. Mr. Kohl has been an instructor in extension courses in radioisotope applications and engineering at the University of California in Berkeley and San Diego. He is the senior author of Radioisotope Applications Engineering and author of a chapter on industrial uses of radioisotopes in Modern Nuclear Technology.


In his Preface, the author expresses an intention to assist the reader in discovering feedback control theory and practice. This is done by encouraging the inductive learning process with examples and problems interspersed among lucid explanations. Members of the pedantic deductive school must seek elsewhere for their formula derivations. Hence, the author admirably achieves his goal of instilling a creative learning process in the reader.

A double clichéd opening, "Chapter 1, Introduction to Control Systems; Section 1, Introduction," is followed by a chapter on mathematical models used in describing control systems. After explaining the fundamentals of feedback, the book treats performance specifications and stability criteria in successive chapters.

With this background, the remaining two-thirds of the book contains specific methods for system analysis: the root locus method, Bode plots, the Nyquist criterion, and time-domain analysis. A final chapter examines methods of compensating control systems to achieve desired performance.

Mason's signal flow graphs are prolific, occurring in many chapters. Perhaps this is in the hope of obtaining converts to their use. On the other hand, no space is devoted to control-related concepts of correlation and random processes.

Also perhaps conspicuous by its absence is any discussion of analog computer applications. The emphasis on digital computer usage in time-domain analysis is good. Perhaps some exposition of the time-honored usage of analog computers in control system analysis would have had educational appeal, especially to those readers who prefer electrical to algebraic thinking.

The non-matrix-oriented reader may shy away from the time-domain analysis chapter. This would be unfortunate because, as the author points out, digital computer matrix calculations facilitate this type of analysis. Hopefully, most readers will either have matrix algebra at their fingertips or will use the thoughtfully provided Appendix on the subject.

An upper-level undergraduate will have no difficulty understanding the explanations of principles, especially since a numerical example follows each. The author goes to considerable length to find fascinating control problems at the end of each chapter: Telstar, lunar landing craft, student grades, and status seeking are typical subjects. The interests of "spacemen" more than "nuclear men" receive attention, for there is scarcely more than one reactor control problem. To be sure, everyone's interest is reached at least somewhere; for example, a problem on foxes vs rabbits is even included for the child prodigy.

In summary, this book is an excellent aid to the control-theory student toward which it is aimed. It may also interest those who occasionally seek elucidations of control analysis topics.

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July 13, 1967

About the Reviewer: Joseph A. Thie is a consultant to the reactor industry, having served in this capacity since 1960. In former years at the Argonne National Laboratory he pioneered in Boiling-Water Reactor development. He has worked extensively in fields of reactor design, experiment-mentation, and operation. Books on physics experiments, reactor kinetics, and reactor safety are among his publications.