rating accorded a staff member at ANL. Dr. Sha has made significant contributions in computational methods for reactor design and safety. His recent pioneering work on the development of the COMMIX code, using the new porous media formulation, and the BODYFIT code, using boundary-fitted coordinate transformation for any arbitrary three-dimensional geometries, represents state-of-the-art thermal-hydraulic analysis. Dr. Sha has published approximately 200 journal papers.

Methods of Steady-State Reactor Physics in Nuclear Design

Authors	R. Stamm'ler and M. J. Abbate
Publisher	Academic Press, Inc. (1983)
Pages	506
Price	$48.00
Reviewer	Gerald A. Schlapper

This publication presents an alternative approach to a discussion of reactor physics. It does not treat the academic side of reactor physics but instead is aimed at bridging the gap between the theory-oriented, classical textbook approach and the computer-oriented reactor analysis found in practice. Some of the areas found in traditional presentations of reactor physics are not addressed in this text. There is no detailed discussion of reactor kinetics and only limited mention of problems like the Milne problem that are primarily of academic interest. The computer-oriented techniques discussed are current and in general use. For example, the philosophy and calculational methods for code packages, such as WIMS, CPM (Electric Power Research Institute), and CASMO are presented.

As the authors clearly state, this is not an introductory text in reactor physics. The first chapter discusses the Boltzmann equation, use of nuclear data files, and the computational flow of reactor physics calculations. Obviously, previous knowledge of basic reactor physics is recommended. The computer orientation of the text also assumes that the reader has had some exposure to a high-level scientific programming language, preferably FORTRAN. Because the codes discussed employ programming techniques above those normally encountered at the introductory level, the second chapter of the book provides useful advice on advanced computer programming techniques. The third chapter completes the introductory material through description of the contents and structure of a nuclear data library.

The following three chapters address calculational methods and include the method of collisional probabilities, P_1 and diffusion theory, and the S_n method. These presentations begin with the transport equation and develop the computerized form of this equation for each of the calculational techniques. The seventh chapter of this text applies these techniques to individual pin cells for the single-energy case, while the following chapter describes in very general terms how one-group solutions are combined in a multigroup iteration scheme.

Particular difficulties that are encountered in practice, such as obtaining accurate cross sections in the resonance region, are addressed in succeeding chapters. Numerical aspects of burnup calculations are presented. Derivations of the nodal equations for core calculations used in the FLARE, TRILUX, and PRESTO programs are outlined. An interesting approach is used by the authors to limit the number of long derivations within the text. Questions applicable to these derivations are located at the end of each chapter, while an Appendix contains the answers to these questions. Review of these questions and answers provides the reader with an understanding of how the methods work and what assumptions are inherent in the use of these techniques. Another Appendix contains a list of subroutines used to calculate necessary functions, such as exponential integrals.

The presentation in the text includes a limited number of figures printed in color. Numerous references are provided at the end of each chapter for the reader who wishes to obtain a more thorough background in specific areas. A detailed subject index coupled with the use of heavier type for keywords allows one to rapidly find the applicable sections of the text. A frequent problem one encounters when reading a book of this type is that abbreviations are explained only the first time that they appear and are forgotton during subsequent reading. The authors of this book graciously include a rather complete list of abbreviations early in the text to which the reader can refer.

This publication is concerned mainly with the methods of steady-state reactor physics that are found in computer programs used in nuclear power reactor design. It contains important discussions not found in more traditional textbooks and illustrates computational aspects of several key modeling techniques. It does an admirable job of tying together normal textbook presentations and practical reactor analysis. It should be of interest to practicing nuclear engineers and reactor physicists and could serve as an instructional text at the graduate or senior undergraduate level.

After receiving his MS in nuclear engineering from the University of Missouri at Columbia in 1970, Gerald Schlapper joined the reactor operations staff of the University of Missouri Research Reactor Facility. During this time he served for 5 years as reactor physicist and was responsible for core design and burnup calculations. Dr. Schlapper received his PhD in 1977 and remained on the staff of the Research Reactor Facility until January 1981, when he assumed his current position as a faculty member of the nuclear engineering department at Texas A&M University. During his career he has served as a consultant to various government and private organizations.