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### **HODGES WERNER**

#### **Nuclear Reactor Design** Publishing

Nuclear Engineering: A Conceptual Introduction to Nuclear Power provides coverage of the introductory, salient principles of nuclear engineering in a comprehensive manner for those entering the profession at the end of their degree. The nuclear power industry is undergoing a renaissance because of the desire for low-carbon baseload electricity, the growing population, and environmental concerns about shale gas, so this book is a welcomed addition to the science. In addition, users will find a great deal of information on the change in the industry, along with other topical areas of interest that are uniquely covered. Intended for undergraduate students or early postgraduate students studying nuclear engineering, this new text will also be appealing to scientifically-literate non-experts wishing to be better informed about the 'nuclear option'. Presents a succinct and clear explanation of the key facts and concepts on how nuclear engineering power systems function and how their related fuel supply cycles operate Provides full coverage of the nuclear fuel cycle, including its scientific and historical basis Describes a comprehensive range of relevant reactor designs, from those that are defunct, current, and in plan/construction for the future, including SMRs and GenIV Summarizes all major accidents and their impact on the industry and society

#### **Fundamentals of Nuclear Science and Engineering Third Edition** Springer

This book focuses on core design and methods for design and analysis. It is based on advances made in nuclear power utilization and computational methods over the past 40 years, covering core design of boiling water reactors and pressurized water reactors, as well as fast reactors and high-temperature gas-cooled reactors. The objectives of this book are to help graduate and advanced undergraduate students to understand core design and analysis, and to serve as a background reference for engineers actively working in light water reactors. Methodologies for core design and analysis, together with physical descriptions, are emphasized. The book also covers coupled thermal hydraulic core calculations, plant dynamics, and safety analysis, allowing readers to understand core design in relation to plant control and safety.

#### **Fast Reactor System Design** Academic Press

Dr. Samuel Glasstone, the senior author of the previous editions of this book, was anxious to live until his ninetieth birthday, but passed away in 1986, a few months short of this milestone. I am grateful for the many years of stimulation received during our association, and in preparing this edition have attempted to maintain his approach. Previous editions of this book were intended to serve as a text for students and a reference for practicing engineers. Emphasis was given to the broad perspective, particularly for topics important to reactor design and operation, with basic coverage provided in such supporting areas as neutronics, thermal-hydraulics, and materials. This, the Fourth Edition, was prepared with these same general objectives in mind. However, during the past three decades, the nuclear industry and university educational programs have matured considerably,

presenting some challenges in meeting the objectives of this book. Nuclear power reactors have become much more complex, with an accompanying growth in supporting technology. University programs now offer separate courses covering such basic topics as reactor physics, thermal hydraulics, and materials. Finally, the general availability of inexpensive xv xvi Preface powerful micro-and minicomputers has transformed design and analysis procedures so that sophisticated methods are now commonly used instead of earlier, more approximate approaches.

*Nuclear Engineering* CRC Press

Dr. Samuel Glasstone, the senior author of the previous editions of this book, was anxious to live until his ninetieth birthday, but passed away in 1986, a few months short of this milestone. I am grateful for the many years of stimulation received during our association, and in preparing this edition have attempted to maintain his approach. Previous editions of this book were intended to serve as a text for students and a reference for practicing engineers. Emphasis was given to the broad perspective, particularly for topics important to reactor design and operation, with basic coverage provided in such supporting areas as neutronics, thermal-hydraulics, and materials. This, the Fourth Edition, was prepared with these same general objectives in mind. However, during the past three decades, the nuclear industry and university educational programs have matured considerably, presenting some challenges in meeting the objectives of this book. Nuclear power reactors have become much more complex, with an accompanying growth in supporting technology. University programs now offer separate courses covering such basic topics as reactor physics, thermal hydraulics, and materials. Finally, the general availability of inexpensive xiii xiv Preface powerful micro- and minicomputers has transformed design and analysis procedures so that sophisticated methods are now commonly used instead of earlier, more approximate approaches.

**Nuclear Engineering** Springer Science & Business Media

Offering the most current and complete introduction to nuclear engineering available, this book contains new information on French, Russian, and Japanese nuclear reactors. All units have been revised to reflect current standards. Includes discussions of new reactor types including the AP600, ABWR, and SBWR as well as an extensive section on non-US design reactors; the nuclear Navy and its impact on the development of nuclear energy; binding energy and such topics as the semi-empirical mass formula and elementary quantum mechanics; and solutions to the diffusion equation and a more general derivation of the point kinetics equation. Topics in reactor safety include a complete discussion of the Chernobyl accident and an updated section on TMI and the use of computer codes in safety analysis. For nuclear engineers.

**NUREG/CR.** Springer

Chemical Engineering Design, Second Edition, deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

**Nuclear Power Reactor Designs** CRC Press

Fundamentals of Nuclear Science and Engineering, Third Edition, presents the nuclear science concepts needed to understand and quantify the whole range of nuclear phenomena. Noted for its accessible level and approach, the Third Edition of this long-time bestselling textbook provides overviews of nuclear physics, nuclear power, medicine, propulsion, and radiation detection. Its flexible organization allows for use with Nuclear Engineering majors and those in other disciplines. The Third Edition features updated coverage of the newest nuclear reactor designs, fusion reactors, radiation health risks, and expanded discussion of basic reactor physics with added examples. A complete Solutions Manual and figure slides for classroom projection are available for instructors adopting the text.

**Nuclear Power Plant Design and Analysis Codes** Springer Science & Business Media

Fundamental of Nuclear Engineering is derived from over 25 years of teaching undergraduate and graduate courses on nuclear engineering. The material has been extensively class tested and provides the most comprehensive textbook and reference on the fundamentals of nuclear engineering. It includes a broad range of important areas in the nuclear engineering field; nuclear and atomic theory; nuclear reactor physics, design, control/dynamics, safety and thermal-hydraulics; nuclear fuel engineering; and health physics/radiation protection. It also includes the latest information that is missing in traditional texts, such as space radiation. The aim of the book is to provide a source for upper level undergraduate and graduate students studying nuclear engineering.

**Nuclear Engineering** Elsevier

35 9.2 Typical PWR Station Layout 36 9.3 Regions of Highest Radiological Hazard 38 9.4 Decommissioning Scenarios 40 9.5 Existing Structural Features of a PWR which may aid Decommissioning 42 9.6 Structural Features that might be introduced into Future PWR Stations to aid Decommissioning 43 10. REFERENCES 44 11. ACKNOWLEDGEMENTS 45 12. TABLES AND FIGURES 45 APPENDIX A - SUPPLEMENTARY INFORMATION 98 1 1. INTRODUCTION 1.1 This report describes the work carried out by Taylor Woodrow Construction Limited (TWC) in a study aimed at identifying features which may be incorporated at the design stage of future nuclear power plants to facilitate their eventual decommissioning and, in so doing, promote economic and radiological benefits at the decommissioning stage. 1.2 For the purposes of this study, decommissioning of a nuclear facility means those measures taken at the end of the facility's operating life to remove it from the site and restore the site to green field conditions, and, while so doing, ensure the continued protection of the public from any residual radioactivity or other potential hazards present in or emanating from the facility. The overall decommissioning process involves eventual dismantling and demolition and may also include, where possible and appropriate, the intermediate steps of renewal and refurbishing.

*Fundamentals of Nuclear Science and Engineering Second Edition* Springer

This reference combines broad yet in-depth coverage of nuclear engineering principles with practical descriptions of their application in the design and operation of nuclear power plants. It should be of interest to upper-level undergraduates, graduates, and professionals.

*Design and Construction of Nuclear Power Plants* CRC Press

NUCLEAR ENGINEERING FUNDAMENTALS is the most modern, up-to-date, and reader friendly nuclear engineering textbook on the market today. It provides a thoroughly modern alternative to classical nuclear engineering textbooks that have not been updated over the last 20 years. Printed in full color, it conveys a sense of awe and wonder to anyone interested in the field of nuclear energy. It discusses nuclear reactor design, nuclear fuel cycles, reactor thermal-hydraulics, reactor operation, reactor safety, radiation detection and protection, and the interaction of radiation with matter. It presents an in-depth introduction to the science of nuclear power, nuclear energy production, the nuclear chain reaction, nuclear cross sections, radioactivity, and radiation transport. All major types of reactors are introduced and discussed, and the role of internet tools in their analysis and design is explored. Reactor safety and reactor containment systems are explored as well. To convey the evolution of nuclear science and engineering, historical figures and their contributions to evolution of the nuclear power industry are explored. Numerous examples are provided throughout the text, and are brought to life through life-like portraits, photographs, and colorful illustrations. The text follows a well-structured pedagogical approach, and provides a wide range of student learning features not available in other textbooks including useful equations, numerous worked examples, and lists of key web resources. As a bonus, a complete Solutions Manual and .PDF slides of all figures are available to qualified instructors who adopt the text. More than any other fundamentals book in a generation, it is student-friendly, and truly impressive in its design and its scope. It can be used for a one semester, a two semester, or a three semester course in the fundamentals of nuclear power. It can also serve as a great reference book for practicing nuclear scientists and engineers. To date, it has achieved the highest overall satisfaction of any mainstream nuclear engineering textbook available on the market today.

**Nuclear Systems** CRC Press

The book has been developed in conjunction with NERS 462, a course offered every year to seniors and graduate students in the University of Michigan NERS program. The first half of the book covers the principles of risk analysis, the techniques used to develop and update a reliability data base, the reliability of multi-component systems, Markov methods used to analyze the unavailability of systems with repairs, fault trees and event trees used in probabilistic risk assessments (PRAs), and failure modes of systems. All of this material is general enough that it could be used in non-nuclear applications, although there is an emphasis placed on the analysis of nuclear systems. The second half of the book covers the safety analysis of nuclear energy systems, an analysis of major accidents and incidents that occurred in commercial nuclear plants, applications of PRA techniques to the safety analysis of nuclear power plants (focusing on a major PRA study for five nuclear power plants), practical PRA examples, and emerging techniques in the structure of dynamic event trees and fault trees that can provide a more realistic representation of complex sequences of events. The book concludes with a discussion on passive safety features of advanced nuclear energy systems under development and approaches taken for risk-informed regulations for nuclear plants.

**Nuclear Engineering Fundamentals** John Wiley & Sons

Building upon the success of the first edition, the Nuclear Engineering Handbook, Second Edition, provides a comprehensive, up-to-date overview of nuclear power engineering. Consisting of chapters written by leading experts, this volume spans a wide range of topics in the areas of nuclear power reactor design and operation, nuclear fuel cycles, and radiation detection. Plant safety issues are addressed, and the economics of nuclear power generation in the 21st century are presented. The Second Edition also includes full coverage of Generation IV reactor designs, and new information on MRS technologies, small modular reactors, and fast reactors.

**Foundations of Nuclear Engineering** John Wiley & Sons

This book describes the fast reactor (FR), a type of new reactor for nuclear plants, currently under research and development. The book targets young researchers and engineers who will be charged with commercializing this new type of reactor to lead to the development of new components and systems for improved plant reliability and economy. This volume also helps readers to understand the methods of integrating the power plant in its entirety, from the reactor core to all of the various systems and components, and teaches the way of thinking that forms the background of these methods. This background includes the various organizational and management issues that are encountered as projects move forward and will be explored in great detail based on actual design and construction experience with Japan's prototype FR, Monju.

**Nuclear Reactor Engineering (Principle and Concepts)** Springer

This is an authoritative compilation of information regarding methods and data used in all phases of nuclear engineering. Addressing nuclear engineers and scientists at all levels, this book provides a condensed reference on nuclear engineering since 1958.

*Chemical Engineering Design* S. Chand Publishing

Despite all the efforts being put into expanding renewable energy sources, large-scale power stations will be essential as part of a reliable energy

supply strategy for a longer period. Given that they are low on CO2 emissions, many countries are moving into or expanding nuclear energy to cover their baseload supply. Building structures required for nuclear plants whose protective function means they are classified as safety-related, have to meet particular construction requirements more stringent than those involved in conventional construction. This book gives a comprehensive overview from approval aspects given by nuclear and construction law, with special attention to the interface between plant and construction engineering, to a building structure classification. All life cycle phases are considered, with the primary focus on execution. Accidental actions on structures, the safety concept and design and fastening systems are exposed to a particular treatment. Selected chapters from the German concrete yearbook are now being published in the new English "Beton-Kalender Series" for the benefit of an international audience. Since it was founded in 1906, the Ernst & Sohn "Beton-Kalender" has been supporting developments in reinforced and prestressed concrete. The aim was to publish a yearbook to reflect progress in "ferro-concrete" structures until - as the book's first editor, Fritz von Emperger (1862-1942), expressed it - the "tempestuous development" in this form of construction came to an end. However, the "Beton-Kalender" quickly became the chosen work of reference for civil and structural engineers, and apart from the years 1945-1950 has been published annually ever since.

Introduction to Nuclear Engineering McGraw-Hill Companies

*Nuclear Power Reactor Designs: From History to Advances* analyzes nuclear designs throughout history and explains how each of those has helped to shape and inform the nuclear reactor designs of today and the future. Focused on the structure, systems and relevant components of each reactor design, this book provides the readers with answers to key questions to help them understand the benefits of each design. Each reactor design is introduced, their origin defined, and the relevant research presented before an analysis of its successes, what was learned, and how research and technology advanced as a result are presented. Students, researchers and early career engineers will gain a solid understanding of how nuclear designs have evolved, and how they will continue to develop in the future. Presents reactor designs through history to present day, focusing on key structures, systems and components Provides readers with quick answers about various design principles and rationales Includes new approaches such as the micro-reactor and small-modular reactors

*Nuclear Thermal Hydraulics* John Wiley & Sons

*Fundamentals of Nuclear Science and Engineering*, Third Edition, presents coverage of the nuclear science and engineering concepts needed to

understand and quantify the whole range of nuclear phenomena. Noted for its accessible level and approach, this long-time bestselling textbook provides overviews of nuclear physics, nuclear power generation, medicine, propulsion, and radiation detection. The Third Edition features updated coverage of the newest nuclear reactor designs, fusion reactors, radiation health risks, and expanded discussion of basic reactor physics with added examples.

*Nuclear Reactor Engineering* CRC Press

*Risk-informed Methods and Applications in Nuclear and Energy Engineering: Modelling, Experimentation, and Validation* presents a comprehensive view of the latest technical approaches and experimental capabilities in nuclear energy engineering. Based on Idaho National Laboratory's popular summer school series, this book compiles a collection of entries on the cutting-edge research and knowledge presented by proponents and developers of current and future nuclear systems, focusing on the connection between modelling and experimental approaches. Included in this book are key topics such as probabilistic concepts for risk analysis, the survey of legacy reliability and risk analysis tools, and newly developed tools supporting dynamic probabilistic risk-assessment. This book is an insightful and inspiring compilation of work from top nuclear experts from INL. Industry professionals, researchers and academics working in nuclear engineering, safety, operations and training will gain a board picture of the current state-of-practice and be able to apply that to their own risk-assessment studies. Based on Idaho National Laboratory's summer school series, this book is a collection of entries from proponents and developers of current and future nuclear systems Provides an up-to-date view of current technical approaches and experimental capabilities in nuclear energy engineering, covering modeling and validation, and focusing on risk-informed methods and applications Equips the reader with an understanding of various case studies and experimental validations to enable them to carry out a risk-assessment study

*Nuclear Engineering and Design* John Wiley & Sons

The third edition of this popular book is updated to include a completely revised discussion of reactor technology, an improved discussion of the reactor physics, and a more detailed discussion of basic nuclear physics and models. Introduces the basics of the shell model of the nucleus and a beginning discussion of quantum mechanics. Discusses both U.S. and non-U.S. reactor designs, as well as advanced reactors. Provides for a more detailed understanding of both reactor statics and kinetics. Includes updated information on reactor accidents and safety.

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