

# Nuclear Reactor Physics Solution Manual

*Nuclear Energy, Fifth Edition provides nuclear engineers, plant designers and radiation physicists with a comprehensive overview of nuclear energy and its uses, discusses potential problems and provides an outlook for the future. New and important trends are discussed including probabilistic safety analysis (PSA), deregulation of the electric power industry to permit competition in the supply of electricity; improvements in performance characteristics of nuclear power plants, such as capacity factor, production costs, and safety factors; storage and disposal of all types of radioactive wastes; advances in decontamination, decommissioning and reutilization; continued progress in evolutionary reactors; increased interest in the role of nuclear power in reducing pollution and global warming. Attention will also be given to the developments in such countries as Russia, Ukraine, France, Sweden, South Korea, China and Third World Countries. The author also looks at the problems of nuclear weapons proliferation and the potential threat from terrorist organizations or reckless countries. In addition, the author has identified Web sites and other electronic information sources to supplement all of the topics covered in this book. \**

*Latest edition with updated content in*

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*important subject areas \* Free downloadable software accompanies book contents \* Revised instructor's manual to accompany book*

*An introductory text for broad areas of nuclear reactor physics Nuclear Reactor Physics and Engineering offers information on analysis, design, control, and operation of nuclear reactors. The author—a noted expert on the topic—explores the fundamentals and presents the mathematical formulations that are grounded in differential equations and linear algebra. The book puts the focus on the use of neutron diffusion theory for the development of techniques for lattice physics and global reactor system analysis. The author also includes recent developments in numerical algorithms, including the Krylov subspace method, and the MATLAB software, including the Simulink toolbox, for efficient studies of steady-state and transient reactor configurations. In addition, nuclear fuel cycle and associated economics analysis are presented, together with the application of modern control theory to reactor operation. This important book: Provides a comprehensive introduction to the fundamental concepts of nuclear reactor physics and engineering Contains information on nuclear reactor kinetics and reactor design analysis Presents illustrative examples to enhance understanding Offers self-contained derivation of ?uid conservation equations Written for undergraduate and graduate students in nuclear engineering and*

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*practicing engineers, Nuclear Reactor Physics and Engineering covers the fundamental concepts and tools of nuclear reactor physics and analysis.*

*This book is intended to provide an introduction to the basic principles of nuclear fission reactors for advanced undergraduate or graduate students of physics and engineering. The presentation is also suitable for physicists or engineers who are entering the nuclear power field without previous experience with nuclear reactors. No background knowledge is required beyond that typically acquired in the first two years of an undergraduate program in physics or engineering. Throughout, the emphasis is on explaining why particular reactor systems have evolved in the way they have, without going into great detail about reactor physics or methods of design analysis, which are already covered in a number of excellent specialist texts. The first two chapters serve as an introduction to the basic physics of the atom and the nucleus and to nuclear fission and the nuclear chain reaction. Chapter 3 deals with the fundamentals of nuclear reactor theory, covering neutron slowing down and the spatial dependence of the neutron flux in the reactor, based on the solution of the diffusion equations. The chapter includes a major section on reactor kinetics and control, including temperature and void coefficients and xenon poisoning effects in power reactors. Chapter 4*

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*describes various aspects of fuel management and fuel cycles, while Chapter 5 considers materials problems for fuel and other constituents of the reactor. The processes of heat generation and removal are covered in Chapter 6.*

*Fundamentals of Nuclear Science and Engineering Second Edition*

*Introduction to Elementary Particles*

*Fundamentals of Nuclear Science and Engineering*

*Thermodynamics In Nuclear Power Plant Systems*

*The nuclear power industry in the world today -- The pressurized water reactor -- The boiling water reactor -- Fast reactors, gas reactors, and military reactors -- Thermal energy production in nuclear power plants -- The laws of thermodynamics -- Thermodynamic properties and equations of state -- The nuclear steam supply system -- Reactor thermal cycles -- The laws of heat transfer -- Heat removal from nuclear fuel rods -- Time dependent nuclear heat transfer -- Nuclear reactor fluid mechanics -- Fluid statics and fluid dynamics -- The conservation equations of fluid mechanics -- Single phase flow in nuclear power plants -- Laminar and turbulent flow with friction -- Core and fuel assembly fluid flow -- Reactor coolants, coolant pumps, and power turbines -- Single phase nuclear heat transfer -- Correlations for single phase nuclear heat transfer -- Natural convection in nuclear*

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*power plants -- Fundamentals of two phase flow in nuclear power plants -- Two phase nuclear heat transfer -- Heat transfer correlations for advanced two phase nuclear heat transfer -- Core temperature fields -- Nuclear hot channel factors, the critical heat flux, and the dnbr -- Thermal design limits, operating limits, and safety limits -- Equilibrium and non-equilibrium flows, critical flow, and choke flow -- Reactor accidents, dbas, and locas -- Flow oscillations, density waves, and hydrodynamic instabilities -- Containment buildings and their function -- particle transport and entrainment during reactor accidents -- Response of a containment building to a reactor LOCA.*

*Fundamentals of Nuclear Reactor Physics offers a one-semester treatment of the essentials of how the fission nuclear reactor works, the various approaches to the design of reactors, and their safe and efficient operation . It provides a clear, general overview of atomic physics from the standpoint of reactor functionality and design, including the sequence of fission reactions and their energy release. It provides in-depth discussion of neutron reactions, including neutron kinetics and the neutron energy spectrum, as well as neutron spatial distribution. It includes ample worked-out examples and over 100 end-of-chapter problems. Engineering students will find this applications-oriented approach,*

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*with many worked-out examples, more accessible and more meaningful as they aspire to become future nuclear engineers. A clear, general overview of atomic physics from the standpoint of reactor functionality and design, including the sequence of fission reactions and their energy release In-depth discussion of neutron reactions, including neutron kinetics and the neutron energy spectrum, as well as neutron spatial distribution Ample worked-out examples and over 100 end-of-chapter problems Full Solutions Manual*

*There has been an increase in interest worldwide in fusion research over the last decade and a half due to the recognition that a large number of new, environmentally attractive, sustainable energy sources will be needed to meet ever increasing demand for electrical energy. Based on a series of course notes from graduate courses in plasma physics and fusion energy at MIT, the text begins with an overview of world energy needs, current methods of energy generation, and the potential role that fusion may play in the future. It covers energy issues such as the production of fusion power, power balance, the design of a simple fusion reactor and the basic plasma physics issues faced by the developers of fusion power. This book is suitable for graduate students and researchers working in applied physics and nuclear engineering. A large number of problems accumulated over two decades of*

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*teaching are included to aid understanding. Fundamental aspects of nuclear reactor fuel elements*

*Energy Research Abstracts*

*Reactor Physics Laboratory Manual*

*Thermal Hydraulic Fundamentals, Second Edition*

*A Practical Perspective*

Achieve success in your physics course by making the most of what PHYSICS FOR SCIENTISTS AND ENGINEERS WITH MODERN PHYSICS has to offer. From a host of in-text features to a range of outstanding technology resources, you'll have everything you need to understand the natural forces and principles of physics. Throughout every chapter, the authors have built in a wide range of examples, exercises, and illustrations that will help you understand the laws of physics AND succeed in your course! Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This manual gives the solutions to all problems given in the book by A Das and T Ferbel. The problems are discussed in full detail, to help both the student and teacher get a better grasp of the issues brought up in the text and in the associated problems.

Classic textbook for an introductory course in nuclear reactor analysis that introduces the nuclear engineering student to the basic scientific principles of nuclear fission chain reactions and lays a foundation for the subsequent application of these principles to the nuclear design and analysis of reactor cores. This text

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introduces the student to the fundamental principles governing nuclear fission chain reactions in a manner that renders the transition to practical nuclear reactor design methods most natural. The authors stress throughout the very close interplay between the nuclear analysis of a reactor core and those nonnuclear aspects of core analysis, such as thermal-hydraulics or materials studies, which play a major role in determining a reactor design.

**An Introduction to the Concepts, Systems, and Applications of Nuclear Processes**

**Physics of Nuclear Reactors**

**U.S. Environmental Protection Agency Library System Book Catalog Holdings as of July 1973**

**solution to problems**

**Fundamentals of Nuclear Science and Engineering, Second Edition - Solutions Manual**

Physics of Nuclear Reactors presents a comprehensive analysis of nuclear reactor physics. Editors P. Mohanakrishnan, Om Pal Singh, and Kannan Umasankari and a team of expert contributors combine their knowledge to guide the reader through a toolkit of methods for solving transport equations, understanding the physics of reactor design principles, and developing reactor safety strategies. The inclusion of experimental and operational reactor physics makes this a unique reference for those working and researching nuclear power and the fuel cycle in existing power generation sites and experimental facilities. The book also includes radiation physics, shielding techniques and an analysis of shield design, neutron monitoring and core

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operations. Those involved in the development and operation of nuclear reactors and the fuel cycle will gain a thorough understanding of all elements of nuclear reactor physics, thus enabling them to apply the analysis and solution methods provided to their own work and research. This book looks to future reactors in development and analyzes their status and challenges before providing possible worked-through solutions. Cover image: Kaiga Atomic Power Station Units 1 – 4, Karnataka, India. In 2018, Unit 1 of the Kaiga Station surpassed the world record of continuous operation, at 962 days. Image courtesy of DAE, India. Includes methods for solving neutron transport problems, nuclear cross-section data and solutions of transport theory. Dedicates a chapter to reactor safety that covers mitigation, probabilistic safety assessment and uncertainty analysis. Covers experimental and operational physics with details on noise analysis and failed fuel detection.

Focused on the undergraduate audience, *Chemical Reaction Engineering* provides students with complete coverage of the fundamentals, including in-depth coverage of chemical kinetics. By introducing heterogeneous chemistry early in the book, the text gives students the knowledge they need to solve real chemistry and industrial problems. An emphasis on problem-solving and numerical techniques ensures students learn and practice the skills they will need later on, whether for industry or graduate work.

*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

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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.

An Introduction to Nuclear Heat Transfer and Fluid Flow

Nuclear Reactor Thermal Hydraulics

Nuclear Engineering Fundamentals

Fundamentals of Nuclear Reactor Physics

Introduction to Nuclear Engineering

The text is designed for junior and senior level Nuclear Engineering students. The third edition of this highly respected text offers the most current and complete introduction to nuclear engineering available.

Introduction to Nuclear Engineering has been thoroughly updated with new information on French, Russian, and Japanese nuclear reactors. All units have been revised to reflect current standards. In addition to the numerous end-of-chapter problems, computer exercises have been added.

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A dynamic, all-inclusive overview of the field of health physics. If it's an important topic in the field of health physics, you'll find it in this trusted text . . . in sections on physical principles, atomic and nuclear structure, radioactivity, biological effects of radiation, and instrumentation. This one-of-a-kind guide spans the entire scope of the field and offers a problem-solving approach that will serve you throughout your career. Features: A thorough overview of need-to-know topics, from a review of physical principles to a useful look at the interaction of radiation with matter. Chapter-ending practice problems to solidify your grasp of health physics topics and their real-world application. Essential background material on quantitative risk assessment for health-threatening radiation dangers. Authoritative radiation safety and environmental health coverage that supports the International Commission on Radiological Protection's standards for specific populations. High-yield appendices to expand your comprehension.

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of chapter material: Values of Some Useful Constants, Table of the Elements, The Reference Person, Specific Absorbed Fraction of Photon Energy, and Total Mass Attenuation Coefficients NEW! Essential coverage of non-ionizing radiation-laser and microwaves, computer use in dose calculation, and dose limit recommendations

Fundamentals of Nuclear Science and Engineering provides an ideal introduction to the subject. The first half of the text reviews the important results of "modern" physics and introduces the fundamentals of nuclear science. The second half introduces the theory of nuclear reactors and its application in electrical power production and propulsion. It also surveys many other applications of nuclear technology encountered in space research, industry, and medicine. Each chapter contains extensive problem sets, and appendices at the end of the text furnish large amounts of practical data that enable students to perform a wealth of calculations. Among the myriad concepts, principles, and

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applications addressed in this text, Fundamentals of Nuclear Science and Engineering Describes sources of radiation, radiation interactions, and the results of such interactions Summarizes developments in the creation of atomic and nuclear models Develops the kinematics and energetics of nuclear reactions and radioactivity Identifies and assesses biological risks associated with ionizing radiation Presents the theory of nuclear reactors and their dynamic behavior Discusses the design and characteristics of modern nuclear power reactors Summarizes the nuclear fuel cycle and radioactive waste management Describes methods for directly converting nuclear energy into electricity Presents an overview of nuclear propulsion for ships and space crafts Explores the use of nuclear techniques in medical therapy and diagnosis Covers basic concepts in theory of special relativity, wave-particle duality, and quantum mechanics Fundamentals of Nuclear Science and Engineering builds the background students embarking on the study of

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nuclear engineering and technology need to understand and quantify nuclear phenomena and to move forward into higher-level studies.

Nuclear Reactor Analysis

Nuclear Science Abstracts

Fundamentals of Nuclear Science and Engineering Third Edition

Nuclear Energy

Plasma Physics and Fusion Energy

*"The fourth edition of Elements of Chemical Reaction Engineering is a completely revised version of the book. It combines authoritative coverage of the principles of chemical reaction engineering with an unsurpassed focus on critical thinking and creative problem solving, employing open-ended questions and stressing the Socratic method. Clear and organized, it integrates text, visuals, and computer simulations to help readers solve even the most challenging problems through reasoning, rather than by memorizing equations."--BOOK JACKET.*

*Handbook of Small Modular Nuclear Reactors, Second Edition is a fully updated comprehensive reference on Small Modular Reactors (SMRs), which reflects the latest research and technological advances in the field from the last five years. Editors Daniel T. Ingersoll and Mario D. Carelli, along with their team of expert contributors, combine their wealth of collective*

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*experience to update this comprehensive handbook that provides the reader with all required knowledge on SMRs, expanding on the rapidly growing interest and development of SMRs around the globe. This book begins with an introduction to SMRs for power generation, an overview of international developments, and an analysis of Integral Pressurized Water Reactors as a popular class of SMRs. The second part of the book is dedicated to SMR technologies, including physics, components, I&C, human-system interfaces and safety aspects. Part three discusses the implementation of SMRs, covering economic factors, construction methods, hybrid energy systems and licensing considerations. The fourth part of the book provides an in-depth analysis of SMR R&D and deployment of SMRs within eight countries, including the United States, Republic of Korea, Russia, China, Argentina, and Japan. This edition includes brand new content on the United Kingdom and Canada, where interests in SMRs have increased considerably since the first edition was published. The final part of the book adds a new analysis of the global SMR market and concludes with a perspective on SMR benefits to developing economies. This authoritative and practical handbook benefits engineers, designers, operators, and regulators working in nuclear energy, as well as academics and graduate students researching nuclear reactor*

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*technologies. Presents the latest research on SMR technologies and global developments Includes new case study chapters on the United Kingdom and Canada and a chapter on global SMR markets Discusses new technologies such as floating SMRs and molten salt SMRs*

*Since the publication of the bestselling first edition, there have been numerous advances in the field of nuclear science. In medicine, accelerator based teletherapy and electron-beam therapy have become standard. New demands in national security have stimulated major advances in nuclear instrumentation. An ideal introduction to the fundamentals of nuclear science and engineering, this book presents the basic nuclear science needed to understand and quantify an extensive range of nuclear phenomena. New to the Second Edition- A chapter on radiation detection by Douglas McGregor Up-to-date coverage of radiation hazards, reactor designs, and medical applications Flexible organization of material that allows for quick reference This edition also takes an in-depth look at particle accelerators, nuclear fusion reactions and devices, and nuclear technology in medical diagnostics and treatment. In addition, the author discusses applications such as the direct conversion of nuclear energy into electricity. The breadth of coverage is unparalleled, ranging from the theory and design characteristics of nuclear reactors to the identification of biological risks*

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*associated with ionizing radiation. All topics are supplemented with extensive nuclear data compilations to perform a wealth of calculations. Providing extensive coverage of physics, nuclear science, and nuclear technology of all types, this up-to-date second edition of Fundamentals of Nuclear Science and Engineering is a key reference for any physicists or engineer.*

*Introduction to Health Physics: Fourth Edition  
Physics for Scientists and Engineers with Modern Physics*

*Reactor Physics Calculations For Applications In Nuclear Technology - Proceedings Of The Workshop*

*Elements of Chemical Reaction Engineering  
Introduction to Nuclear and Particle Physics*

Nuclear engineering plays an important role in various industrial, health care, and energy processes. Modern physics has generated its fundamental principles. A growing number of students and practicing engineers need updated material to access the technical language and content of nuclear principles. "Nuclear Principles in Engineering, Second Edition" is written for students, engineers, physicians and scientists who need up-to-date information in basic nuclear concepts and calculation methods using numerous examples and illustrative computer application areas. This new edition features a modern graphical interpretation of the phenomena described in the book fused with the results from research and new applications of nuclear engineering, including but not limited to nuclear engineering, power engineering, homeland security, health physics, radiation treatment and imaging, radiation shielding systems, aerospace and propulsion engineering, and power production propulsion.

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This expanded, revised, and updated fourth edition of Nuclear Energy maintains the tradition of providing clear and comprehensive coverage of all aspects of the subject, with emphasis on the explanation of trends and developments. As in earlier editions, the book is divided into three parts that achieve a natural flow of ideas: Basic Concepts, including the fundamentals of energy, particle interactions, fission, and fusion; Nuclear Systems, including accelerators, isotope separators, detectors, and nuclear reactors; and Nuclear Energy and Man, covering the many applications of radionuclides, radiation, and reactors, along with a discussion of wastes and weapons. A minimum of mathematical background is required, but there is ample opportunity to learn characteristic numbers through the illustrative calculations and the exercises. An updated Solution Manual is available to the instructor. A new feature to aid the student is a set of some 50 Computer Exercises, using a diskette of personal computer programs in BASIC and spreadsheet, supplied by the author at a nominal cost. The book is of principal value as an introduction to nuclear science and technology for early college students, but can be of benefit to science teachers and lecturers, nuclear utility trainees and engineers in other fields.

Nuclear Thermal-Hydraulic Systems provides a comprehensive approach to nuclear reactor thermal-hydraulics, reflecting the latest technologies, reactor designs, and safety considerations. The text makes extensive use of color images, internet links, computer graphics, and other innovative techniques to explore nuclear power plant design and operation. Key fluid mechanics, heat transfer, and nuclear engineering concepts are carefully explained, and supported with worked examples, tables, and graphics. Intended for use in one or two semester courses, the text is suitable for both undergraduate and graduate students. A complete Solutions Manual is available for professors adopting the text.

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Metals and Alloys

Nuclear Reactor Physics

Nuclear Principles in Engineering

Scientific and Technical Aerospace Reports

Nuclear Systems

**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

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achieved the highest overall satisfaction of any mainstream nuclear engineering textbook available on the market today.

Nuclear power is in the midst of a generational change—with new reactor designs, plant subsystems, fuel concepts, and other information that must be explained and explored—and after the 2011 Japan disaster, nuclear reactor technologies are, of course, front and center in the public eye. Written by leading experts from MIT, Nuclear Systems Volume I: Thermal Hydraulic Fundamentals, Second Edition provides an in-depth introduction to nuclear power, with a focus on thermal hydraulic design and analysis of the nuclear core. A close examination of new developments in nuclear systems, this book will help readers—particularly students—to develop the knowledge and design skills required to improve the next generation of nuclear reactors.

Includes a CD-ROM with Extensive Tables for Computation Intended for experts and senior undergraduate/early-stage graduate students, the material addresses: Different types of reactors Core and plant performance measures Fission energy generation and deposition Conservation equations Thermodynamics Fluid flow Heat transfer Imparting a wealth of knowledge, including their longtime experience with the safety aspects of nuclear installations, authors Todreas and Kazimi stress the integration of fluid flow and heat transfer, various reactor types, and energy source distribution. They cover recent nuclear reactor concepts and systems, including Generation III+ and IV reactors, as well as new power cycles. The book features new chapter problems and examples using concept parameters, and a solutions manual is available with qualifying course adoption.

Fundamentals of Nuclear Reactor Physics Elsevier

Technical Books & Monographs

Applied Reactor Physics

Solutions Manual for Second Edition of Text by Das and Ferbel

Nuclear-reactor Analysis

Handbook of Small Modular Nuclear Reactors

This workshop was designed to meet the needs of those

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currently involved in or are planning a nuclear programme involving research and/or power fission reactors. The workshop had a broad scope including not only fission reactor core calculations, but also safety, fuel management, waste disposal reactor licensing. The lectures and computer exercises covered almost all aspects of the operation of fission reactors. This workshop introduced participants to the methods currently used in fission reactor calculations and to some computer codes in which these methods are used. The third, revised edition of this popular textbook and reference, which has been translated into Russian and Chinese, expands the comprehensive and balanced coverage of nuclear reactor physics to include recent advances in understanding of this topic. The first part of the book covers basic reactor physics, including, but not limited to nuclear reaction data, neutron diffusion theory, reactor criticality and dynamics, neutron energy distribution, fuel burnup, reactor types and reactor safety. The second part then deals with such physically and mathematically more advanced topics as neutron transport theory, neutron slowing down, resonance absorption, neutron thermalization, perturbation and variational methods, homogenization, nodal and synthesis methods, and space-time neutron dynamics. For ease of reference, the detailed appendices contain nuclear data, useful mathematical formulas, an overview of special functions as well as introductions to matrix algebra and Laplace transforms. With its focus on conveying the in-depth knowledge needed by advanced student and professional nuclear engineers, this text is

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ideal for use in numerous courses and for self-study by professionals in basic nuclear reactor physics, advanced nuclear reactor physics, neutron transport theory, nuclear reactor dynamics and stability, nuclear reactor fuel cycle physics and other important topics in the field of nuclear reactor physics.

Since the publication of the bestselling first edition, there have been numerous advances in the field of nuclear science. In medicine, accelerator based teletherapy and electron-beam therapy have become standard. New demands in national security have stimulated major advances in nuclear instrumentation. An ideal introduction to the fundamentals of nuclear science and engineering, this book presents the basic nuclear science needed to understand and quantify an extensive range of nuclear phenomena. New to the Second Edition— A chapter on radiation detection by Douglas McGregor Up-to-date coverage of radiation hazards, reactor designs, and medical applications Flexible organization of material that allows for quick reference This edition also takes an in-depth look at particle accelerators, nuclear fusion reactions and devices, and nuclear technology in medical diagnostics and treatment. In addition, the author discusses applications such as the direct conversion of nuclear energy into electricity. The breadth of coverage is unparalleled, ranging from the theory and design characteristics of nuclear reactors to the identification of biological risks associated with ionizing radiation. All topics are supplemented with extensive nuclear data compilations to perform a wealth of calculations. Providing extensive coverage of physics,

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nuclear science, and nuclear technology of all types, this up-to-date second edition of Fundamentals of Nuclear Science and Engineering is a key reference for any physicists or engineer.

Nuclear Fission Reactors

Fundamentals of Radiation Materials Science

Chemical Reactions and Chemical Reactors

Second Edition

Reactor Physics: Methods and Applications

This book covers the fundamentals of thermodynamics required to understand electrical power generation systems, honing in on the application of these principles to nuclear reactor power systems. It includes all the necessary information regarding the fundamental laws to gain a complete understanding and apply them specifically to the challenges of operating nuclear plants. Beginning with definitions of thermodynamic variables such as temperature, pressure and specific volume, the book then explains the laws in detail, focusing on pivotal concepts such as enthalpy and entropy, irreversibility, availability, and Maxwell relations. Specific applications of the fundamentals to Brayton and Rankine cycles for power generation are considered in-depth, in support of the book's core goal- providing an examination of how the thermodynamic principles are applied to the design, operation and safety analysis of current and projected reactor systems. Detailed appendices cover metric and English system units and conversions, detailed steam and gas tables, heat transfer properties, and nuclear reactor system descriptions.

The revised second edition of this established text offers readers a significantly expanded introduction to the effects of radiation on metals and alloys. It describes the various processes that occur when energetic particles strike a solid,

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inducing changes to the physical and mechanical properties of the material. Specifically it covers particle interaction with the metals and alloys used in nuclear reactor cores and hence subject to intense radiation fields. It describes the basics of particle-atom interaction for a range of particle types, the amount and spatial extent of the resulting radiation damage, the physical effects of irradiation and the changes in mechanical behavior of irradiated metals and alloys. Updated throughout, some major enhancements for the new edition include improved treatment of low- and intermediate-energy elastic collisions and stopping power, expanded sections on molecular dynamics and kinetic Monte Carlo methodologies describing collision cascade evolution, new treatment of the multi-frequency model of diffusion, numerous examples of RIS in austenitic and ferritic-martensitic alloys, expanded treatment of in-cascade defect clustering, cluster evolution, and cluster mobility, new discussion of void behavior near grain boundaries, a new section on ion beam assisted deposition, and reorganization of hardening, creep and fracture of irradiated materials (Chaps 12-14) to provide a smoother and more integrated transition between the topics. The book also contains two new chapters. Chapter 15 focuses on the fundamentals of corrosion and stress corrosion cracking, covering forms of corrosion, corrosion thermodynamics, corrosion kinetics, polarization theory, passivity, crevice corrosion, and stress corrosion cracking. Chapter 16 extends this treatment and considers the effects of irradiation on corrosion and environmentally assisted corrosion, including the effects of irradiation on water chemistry and the mechanisms of irradiation-induced stress corrosion cracking. The book maintains the previous style, concepts are developed systematically and quantitatively, supported by worked examples, references for further reading and end-of-chapter problem sets. Aimed primarily at students

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of materials sciences and nuclear engineering, the book will also provide a valuable resource for academic and industrial research professionals. Reviews of the first edition:

"...nomenclature, problems and separate bibliography at the end of each chapter allow to the reader to reach a straightforward understanding of the subject, part by part. ... this book is very pleasant to read, well documented and can be seen as a very good introduction to the effects of irradiation on matter, or as a good references compilation for experimented readers." - Pauly Nicolas, Physicalia Magazine, Vol. 30 (1), 2008 "The text provides enough fundamental material to explain the science and theory behind radiation effects in solids, but is also written at a high enough level to be useful for professional scientists. Its organization suits a graduate level materials or nuclear science course... the text was written by a noted expert and active researcher in the field of radiation effects in metals, the selection and organization of the material is excellent... may well become a necessary reference for graduate students and researchers in radiation materials science." - L.M. Dougherty, 07/11/2008, JOM, the Member Journal of The Minerals, Metals and Materials Society.

Nuclear Reactor Physics and Engineering