Radiation Protection And Dosimetry An Introduction To Health Physics

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Radiation Protection in Medical Physics - Yves Lemoigne 2011-04-14
This book introduces the fundamental aspects of Radiation Protection in Medical Physics and covers three main themes: General Radiation Protection Principles; Radiobiology Principles; Radiation Protection in Hospital Medical Physics. Each of these topics is developed by analysing the underlying physics principles and their implementation, quality and safety aspects, clinical performance and recent advances in the field. Some issues specific to the individual techniques are also treated, e.g. calculation of patient dose as well as that of workers in hospital, optimisation of equipment used, shielding design of radiation facilities, radiation in oncology such as use of brachytherapy in gynecology or interventional procedures. All topics are presented with didactical language and style, making this book an appropriate reference for students and professionals seeking a comprehensive introduction to the field as well as a reliable overview of the most recent developments.
Microdosimetry - Lennart Lindborg 2017-07-06
Experimental microdosimetry deals with the measurement of charged particle energy deposition in tissue equivalent volumes, ranging in size from nanometres to micrometres. Microdosimetry is employed to improve our understanding of the relationship between radiation energy deposition, the resulting biological effects, and the appropriate quantities to be used in characterizing and quantifying radiation quality. Although many reviews and contributions to the field have been published over the past fifty years, this new book is the first to provide a single, up to date, and easily accessible account of experimental microdosimetry. This book is designed to be used in medical, radiation, and health physics courses and by Master’s and PhD students. In addition to serving as an introductory text to the field for graduate students, this book will also be of interest as a teaching and reference resource for graduate supervisors and established researchers. Drs. Lennart Lindborg and Anthony Waker have spent a life-time career in experimental microdosimetry research in academic, industrial and regulatory environments and have observed the development of the field from its early days as a recognized discipline; they bring to this book particular knowledge and experience in the design, construction, operation and use of tissue equivalent gas ionization counters and chambers.
Basic Radiation Protection Technology - Daniel A. Gollnick 1983

Radiation Safety in Radiation Oncology - K. N. Govinda Rajan 2017-07-28

The proposed book aims to explain the basic principles, concepts and regulations behind radiation protection and their application in the field of radiation oncology practice. This book will be useful to all those students, teachers and practicing professionals involved in the field of radiation oncology.

Radiation Shielding for Diagnostic Radiology - David G. Sutton 2012-07-05

The first edition of this book was published in 2000 and it has become the standard for shielding design in the UK. The second edition is designed to be a compendium of information for radiation protection physicists involved in specification of shielding requirements for X-Ray facilities.

An Introduction to Radiation Protection - ALAN MARTIN and SAMUEL A. HARBISON 2013-12-01

The Essential Physics of Medical Imaging - Jerrold T. Bushberg 2011-12-28

This renowned work is derived from the authors' acclaimed national review course (“Physics of Medical Imaging") at the University of California-Davis for radiology residents. The text is a guide to the fundamental principles of medical imaging physics, radiation protection and radiation biology, with complex topics presented in the clear and concise manner and style for which these authors are known. Coverage includes the production, characteristics and interactions of ionizing radiation used in medical imaging and the imaging modalities in which they are used, including radiography, mammography, fluoroscopy, computed tomography and nuclear medicine. Special attention is paid to optimizing patient dose in each of these modalities. Sections of the book address topics common to all forms of diagnostic imaging, including image quality and medical informatics as well as the non-ionizing medical imaging modalities of MRI and ultrasound. The basic science important to nuclear imaging, including the nature and production of radioactivity, internal dosimetry and radiation detection and measurement, are presented clearly and concisely. Current concepts in the fields of radiation biology and radiation protection relevant to medical imaging, and a number of helpful appendices complete this comprehensive textbook. The text is enhanced by numerous full color charts, tables, images and superb illustrations that reinforce central concepts. The book is ideal for medical imaging professionals, and teachers and students in medical physics and biomedical engineering. Radiology residents will find this text especially useful in bolstering their understanding of imaging physics and related topics prior to board exams.

Radiation Biophysics - Edward L. Alpen 1997-10-22

This newly revised and updated edition of Radiation Biophysics provides an in-depth description of the physics and chemistry of radiation and its effects on biological systems. Coverage begins with fundamental concepts of the physics of radiation and radioactivity, then progresses through the chemistry and biology of the interaction of radiation with living systems. The Second Edition of this highly praised text includes major revisions which reflect the rapid advances in the field. New material covers recent developments in the fields of carcinogenesis, DNA repair, molecular genetics, and the molecular biology of oncogenes and tumor suppressor genes. The book also includes extensive discussion of the practical impact of radiation on everyday life. Covers the fundamentals of radiation physics in a manner that is understandable to students and professionals with a limited physics background Includes problem sets and exercises to aid both teachers and students Discusses radioactivity, internally deposited radionuclides, and dosimetry Analyzes the risks for occupational and non-occupational workers exposed to radiation sources

Radiation Quantities and Units - International Commission on Radiation Units and Measurements 1980

Radiation Protection in Nuclear Medicine - Sören Mattsson 2012-09-14

This book explains clearly and in detail all aspects of radiation protection in nuclear medicine, including measurement quantities and units, detectors and dosimeters, and radiation biology. Discussion of radiation doses to patients and to embryos, fetuses, and children forms a central part of the book. Phantom models, biokinetic models, calculations, and software solutions are all considered, and a further chapter is devoted to quality assurance and reference levels. Occupational exposure also receives detailed attention. Exposure resulting from the production, labeling, and injection of radiopharmaceuticals and from contact with patients is discussed and shielding calculations are explained. The book closes by considering exposure of the public and summarizing the "rules of thumb" for radiation protection in nuclear medicine. This is an ideal textbook for students and a ready source of useful information for nuclear medicine specialists and medical physics experts.

Radiation Shielding - J. Kenneth Shultis 2000-01-01

This newly published book is intended for dual use as a textbook for students in radiation shielding courses and a reference work for shielding practitioners. It emphasizes the principles behind techniques used in various aspects of shield analysis and presents these principles in many different contexts. This approach is intended to provide a strong base of understanding in order to facilitate use of the large shielding codes that have come to dominate shielding design and analysis. An assumption is made that the reader has an understanding of mathematics through basic calculus and vector analysis as well as a knowledge of the nuclear physics of radioactive decay. For most chapters, problem sets are provided.

Introduction to Health Physics: Fourth Edition - Herman Cember 2008-05-04

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 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

Workbook for Radiation Protection in Medical Radiography - Mary Alice Statkiewicz Sherer 2013-12-04

Enhance your understanding of radiation physics and radiation protection! Corresponding to the chapters in Radiation Protection in Medical Radiography, 7th Edition, by Mary Alice Statkiewicz Sherer, this workbook provides a clear, comprehensive review of all the material included in the text. Practical exercises help you apply your knowledge to the practice setting. It is well written and easy to comprehend". Reviewed by: Kirsten Farrell, University of Portsmouth Date: Nov 2014 A comprehensive review includes coverage of all the material included in the text, including x-radiation interaction, radiation quantities, cell biology, radiation biology, radiation effects, dose limits, patient and personnel protection, and radiation monitoring. Chapter highlights call out the most important information with an introductory paragraph and a bulleted summary. A variety of question formats includes multiple choice, matching, short answer, fill-in-the-blank, true-false, labeling, and crossword puzzles. Calculation exercises offer practice in applying the formulas and equations introduced in the text. Answers are provided in the back of the book so you can easily check your work.

Fundamentals of Radiation Dosimetry - J.R Greening 2017-12-14

This book reviews ionising radiation quantities and the relationships between them and discusses the principles underlying their measurement. The emphasis is on the determination of absorbed dose and related dosimetric quantities.

Potential Radiation Exposure in Military Operations - Institute of Medicine 1999-06-24

In 1996, NATO issued guidance for the exposure of military personnel to radiation doses different from occupational dose levels, but not high enough to cause acute health effects-and in doing so set policy in a new arena. Scientific and technological developments now permit small groups or individuals to use, or threaten to use, destructive devices (nuclear, biological, chemical, and cyber-based weaponry, among others) targeted anywhere in the world. Political developments, such as the loss of political balance once afforded by competing superpowers, have increased the focus on regional and subregional disputes. What doctrine should guide decisionmaking regarding the potential exposure of troops to radiation in this changed theater of military operations? In 1995, the Office of the U.S. Army Surgeon General asked the Medical Follow-up Agency of the Institute of Medicine to provide advice. This report is the final product of the Committee on Battlefield Radiation Exposure Criteria convened for that purpose. In its 1997 interim report, Evaluation of Radiation Exposure Guidance for Military Operations, the committee addressed the technical aspects of the NATO directive. In this final report, the committee reiterates that discussion and places it in an ethical context.

Radiation Protection - William H. Hallenbeck 1994-04-19

This text/reference provides an excellent introduction to fundamental topics in radiation protection, including energetics, kinetics, interaction, external radiation protection, dosimetry, standards, and measurement. Chapters on radioactive waste and radon, topics not normally covered in introductory texts, have been incorporated as well. An extensive glossary of terms, abbreviations, acronyms, physical constants, units, and unit conversions provides a ready source of frequently needed information. Several appendices contain specifications and vendors for commercially available portable radiation survey instruments, personal dosimeters, and radon/radon progeny monitors.

Introduction to Radiation Protection Dosimetry - Jozef Sabol 1995

One essential characteristic of life is the exchange of matter and energy between organisms and their environment. Radiation is a form of energy that has always been around in nature and will forever be the companion of human beings throughout life. In order to assess the impact of radiation exposures properly, it is essential to introduce appropriate quantities and units which can then be used for quantification of exposures from various sources. In principle, radiation protection is mainly aimed at controlling radiation exposure, while radiation dosimetry deals primarily with the measurement of relevant radiation quantities especially doses. This book is divided into two parts. The first contains up-to-date definitions of the most significant radiation quantities including their interpretation. In the second part, the exposures of both individuals and population at large to various types of natural and man-made sources are compared and discussed. The concept of quantities and units as well as analysis of exposure due to various sources in our environment is based on the latest, highly regarded authentic sources such as ICRU, ICRP, IAEA and particularly UNSCEAR reports and recommendations. The material reflects the latest review of the current terminology in radiation protection dosimetry and the contemporary assessment of radiation exposures of the population, radiation workers and patients.

Medical Radiation Dosimetry - Brian J McParland 2013-11-11

Accurate radiation dosimetry is a requirement of radiation oncology, diagnostic radiology and nuclear medicine. It is necessary so as to satisfy the needs of patient safety, therapeutic and diagnostic optimisation, and retrospective epidemiological studies of the biological effects resulting from low absorbed doses of ionising radiation. The radiation absorbed dose received by the patient is the ultimate consequence of the transfer of kinetic energy through collisions between energetic charged particles and atoms of the tissue being traversed. Thus, the ability of the medical physicist to both measure and calculate accurately patient dosimetry

demands a deep understanding of the physics of charged particle interactions with matter. Interestingly, the physics of charged particle energy loss has an almost exclusively theoretical basis, thus necessitating an advanced theoretical understanding of the subject in order to apply it appropriately to the clinical regime. Each year, about one-third of the world's population is exposed to ionising radiation as a consequence of diagnostic or therapeutic medical practice. The optimisation of the resulting radiation absorbed dose received by the patient and the clinical outcome sought, whether diagnostic or therapeutic, demands accuracy in the evaluation of the radiation absorbed doses resulting from such exposures. This requirement arrises primarily from two broadly-encompassing factors: The requirement in radiation oncology for a 5% or less uncertainty in the calculation and measurement of absorbed dose so as to optimise the therapeutic ratio of the probabilities of tumour control and normal tissue complications; and The establishment and further refinement of dose reference levels used in diagnostic radiology and nuclear medicine to minimise the amount of absorbed dose for a required degree of diagnostic benefit. The radiation absorbed dose is the outcome of energetic charged particles decelerating and transferring their kinetic energy to tissue. The calculation of this energy deposition, characterised by the stopping power, is unique in that it is derived entirely from theoretical principles. This dominant role of the associated theory makes its understanding of fundamental to the calculation of the radiation absorbed dose to the patient. The theoretical development of charged particle energy loss recognised in medical physics textbooks is in general limited to basic derivations based upon classical theory, generally a simplified form of the Bohr theory. More advanced descriptions of, for example, the Bethe-Bloch quantum result usually do not go beyond the simple presentation of the result without full explanation of the theoretical development of the theory and consideration of its limitations, its dependencies upon the Born perturbation theory and the various correction factors needed to correct for the failures of that Born theory at higher orders. This is not appropriate for a full understanding of the theory that its importance deserves. The medical radiation physicist should be aware of the details of the theoretical derivations of charged particle energy loss in order to appreciate the levels of accuracy in tabular data provided in reports and the calculation methodologies used in modern Monte Carlo calculations of radiation dosimetry.

Radiation Physics for Medical Physicists - Ervin B. Podgorsak 2018-06-28
This textbook summarizes the basic knowledge of atomic, nuclear, and radiation physics that professionals working in medical physics and biomedical engineering need for efficient and safe use of ionizing radiation in medicine. Concentrating on the underlying principles of radiation physics, the textbook covers the prerequisite knowledge for medical physics courses on the graduate and post-graduate levels in radiotherapy physics, radiation dosimetry, imaging physics, and health physics, thus providing the link between elementary undergraduate physics and the intricacies of four medical physics specialties: diagnostic radiology physics, nuclear medicine physics, radiation oncology physics, and health physics. To recognize the importance of radiation dosimetry to medical physics three new chapters have been added to the 14 chapters of the previous edition. Chapter 15 provides a general introduction to radiation dosimetry. Chapter 16 deals with absolute radiation dosimetry systems that establish absorbed dose or some other dose related quantity directly from the signal measured by the dosimeter. Three absolute dosimetry techniques are known and described in detail: (i) calorimetric; (ii) chemical (Fricke), and (iii) ionometric. Chapter 17 deals with relative radiation dosimetry systems that rely on a previous dosimeter calibration in a known radiation field. Many relative radiation dosimetry systems have been developed to date and four most important categories used routinely in medicine and radiation protection are described in this chapter: (i) Ionometric dosimetry; (ii) Luminescence dosimetry; (iii) Semiconductor dosimetry; and (iv) Film dosimetry. The book is intended as a textbook for a radiation physics course in academic medical physics graduate programs as well as a reference book for candidates preparing for certification examinations in medical physics sub-specialties. It may also be of interest

to many professionals, not only physicists, who in their daily occupations deal with various aspects of medical physics or radiation physics and have a need or desire to improve their understanding of radiation physics.

Radiation Protection and Dosimetry - Michael G. Stabin 2010-02-12

This book provides a comprehensive yet accessible overview of all relevant topics in the field of radiation protection (health physics). The text is organized to introduce the reader to basic principles of radiation emission and propagation, to review current knowledge and historical aspects of the biological effects of radiation, and to cover important operational topics such as radiation shielding and dosimetry. The author’s website contains materials for instructors including PowerPoint slides for lectures and worked-out solutions to end-of-chapter exercises. The book serves as an essential handbook for practicing health physics professionals.

Handbook of Anatomical Models for Radiation Dosimetry - Xie George Xu 2009-09-01

Over the past few decades, the radiological science community has developed and applied numerous models of the human body for radiation protection, diagnostic imaging, and nuclear medicine therapy. The Handbook of Anatomical Models for Radiation Dosimetry provides a comprehensive review of the development and application of these computational models, known as "phantoms." An ambitious and unparalleled project, this pioneering work is the result of several years of planning and preparation involving 64 authors from across the world. It brings together recommendations and information sanctioned by the International Commission on Radiological Protection (ICRP) and documents 40 years of history and the progress of those involved with cutting-edge work with Monte Carlo Codes and radiation protection dosimetry. This volume was in part spurred on by the ICRP’s key decision to adopt voxelized computational phantoms as standards for radiation protection purposes. It is an invaluable reference for those working in that area as well as those employing or developing anatomical models for a a number of clinical applications. Assembling the work of nearly all major phantom developers around the world, this volume examines: The history of the research and development in computational phantoms Detailed accounts for each of the well-known phantoms, including the MIRD-5, GSF Voxel Family Phantoms, NCAT, UF Hybrid Pediatric Phantoms, VIP-Man, and the latest ICRP Reference Phantoms Physical phantoms for experimental radiation dosimetry The smallest voxel size (0.2 mm), phantoms developed from the Chinese Visible Human Project Applications for radiation protection dosimetry involving environmental, nuclear power plant, and internal contamination exposures Medical applications, including nuclear medicine therapy, CT examinations, x-ray radiological image optimization, nuclear medicine imaging, external photon and proton treatments, and management of respiration in modern image-guided radiation treatment Patient-specific phantoms used for radiation treatment planning involving two Monte Carlo code systems: GEANT4 and EGS Future needs for research and development Related data sets are available for download on the authors’ website. The breadth and depth of this work enables readers to obtain a unique sense of the complete scientific process in computational phantom development, from the conception of an idea, to the identification of original anatomical data, to solutions of various computing problems, and finally, to the ownership and sharing of results in this groundbreaking field that holds so much promise.

Fundamentals of Ionizing Radiation Dosimetry - Pedro Andreo 2017-06-14

Fosters a thorough understand of radiation dosimetry concepts: detailed solutions to the exercises in the textbook "Fundamentals of Ionizing Radiation Dosimetry"!

Basic Radiotherapy Physics and Biology - David S. Chang 2014-09-19

This book is a concise and well-illustrated review of the physics and biology of radiation therapy intended for radiation oncology residents, radiation therapists, dosimetrists, and physicists. It presents topics that are included on the Radiation Therapy Physics and Biology examinations and is designed with the intent of presenting information in an easily digestible format with maximum retention in mind. The inclusion of

mnemonics, rules of thumb, and reader-friendly illustrations throughout the book help to make difficult concepts easier to grasp. Basic Radiotherapy Physics and Biology is a valuable reference for students and prospective students in every discipline of radiation oncology.

ICRP Publication 140 - ICRP 2019-11

Radiopharmaceuticals are increasingly used for the treatment of various cancers with novel radionuclides, compounds, tracer molecules, and administration techniques. The goal of radiation therapy, including therapy with radiopharmaceuticals, is to optimise the relationship between tumour control probability and potential complications in normal organs and tissues. This report provides an overview of therapy procedures and a framework for calculating radiation doses for various treatment approaches.

Fundamentals of Nuclear Pharmacy - Gopal B. Saha 2013-06-29

A new edition of a book is warranted when the book is successful and there are many new developments in the related discipline. Both have occurred for this book during the past 7 years since its second edition. The growth and development in nuclear pharmacy and radiopharmaceutical chemistry along with the continued success of the book have convinced us to update the book; hence this third edition. This book is a ramification of my nuclear pharmacy courses offered to pharmacy students specializing in nuclear pharmacy, nuclear medicine resi dents, and nuclear medicine technology students. The book is written in an integrated form from the basic concept of atomic structure to the practical clinical uses of radiopharmaceuticals. It serves both as a textbook on nu clear pharmacy for pharmacy students and nuclear medicine technologists, and as a useful reference book for many professionals related to nuclear medicine, such as nuclear medicine physicians and radiologists. The book contains 12 chapters. Each chapter is written as comprehen sively as possible based on my personal experience and understanding. At the end of each chapter, a section of pertinent questions and problems and so me suggested reading materials are included. I have made justifiably many additions and deletions as weIl as some reorganization in this edition. Chapter 3 is entirely dedicated to instru ments for radiation detection and measurement, including brief description of gas detectors, gamma-detecting instruments, and tomographic scanners.

An Introduction to Medical Physics - Muhammad Maqbool 2017-11-11

This book begins with the basic terms and definitions and takes a student, step by step, through all areas of medical physics. The book covers radiation therapy, diagnostic radiology, dosimetry, radiation shielding, and nuclear medicine, all at a level suitable for undergraduates. This title not only describes the basics concepts of the field, but also emphasizes numerical and mathematical problems and examples. Students will find An Introduction to Medical Physics to be an indispensible resource in preparations for further graduate studies in the field.

Radiation Oncology Physics - International Atomic Energy Agency 2005

This publication is aimed at students and teachers involved in teaching programmes in field of medical radiation physics, and it covers the basic medical physics knowledge required in the form of a syllabus for modern radiation oncology. The information will be useful to those preparing for professional certification exams in radiation oncology, medical physics, dosimetry or radiotherapy technology.

Statistical Methods in Radiation Physics - James E. Turner 2012-08-27

This statistics textbook, with particular emphasis on radiation protection and dosimetry, deals with statistical solutions to problems inherent in health physics measurements and decision making. The authors begin with a description of our current understanding of the statistical nature of physical processes at the atomic level, including radioactive decay and interactions of radiation with matter. Examples are taken from problems encountered in health physics, and the material is presented such that health physicists and most other nuclear professionals will more readily understand the application of statistical principles in the familiar context of the examples. Problems are presented at the end of each chapter, with solutions to selected problems provided online. In addition, numerous

worked examples are included throughout the text.

Introduction to Radiation - 2012

Introduction to Radiological Physics and Radiation Dosimetry - Frank Herbert Attix 2008-09-26

A straightforward presentation of the broad concepts underlying radiological physics and radiation dosimetry for the graduate-level student. Covers photon and neutron attenuation, radiation and charged particle equilibrium, interactions of photons and charged particles with matter, radiotherapy dosimetry, as well as photographic, calorimetric, chemical, and thermoluminescence dosimetry. Includes many new derivations, such as Kramers X-ray spectrum, as well as topics that have not been thoroughly analyzed in other texts, such as broad-beam attenuation and geometrics, and the reciprocity theorem. Subjects are layed out in a logical sequence, making the topics easier for students to follow. Supplemented with numerous diagrams and tables.

An Introduction to Radiation Protection in Medicine - Jamie V. Trapp 2008-03-13

Combining facets of health physics with medicine, An Introduction to Radiation Protection in Medicine covers the background of the subject and the medical situations where radiation is the tool to diagnose or treat human disease. Encouraging newcomers to the field to properly and efficiently function in a versatile and evolving work setting, it familiarizes them with the particular problems faced during the application of ionizing radiation in medicine. The text builds a fundamental knowledge base before providing practical descriptions of radiation safety in medicine. It covers basic issues related to radiation protection, including the physical science behind radiation protection and the radiobiological basis of radiation protection. The text also presents operational and managerial tools for organizing radiation safety in a medical workplace. Subsequent chapters form the core of the book, focusing on the practice of radiation protection in different medical disciplines. They explore a range of individual uses of ionizing radiation in various branches of medicine, including radiology, nuclear medicine, external beam radiotherapy, and brachytherapy. With contributions from experienced practicing physicists, this book provides essential information about dealing with radiation safety in the rapidly shifting and diverse environment of medicine.

Advanced Radiation Protection Dosimetry - Shaheen Dewji 2019-04-02

Although many radiation protection scientists and engineers use dose coefficients, few know the origin of those dose coefficients. This is the first book in over 40 years to address the topic of radiation protection dosimetry in intimate detail. Advanced Radiation Protection Dosimetry covers all methods used in radiation protection dosimetry, including advanced external and internal radiation dosimetry concepts and regulatory applications. This book is an ideal reference for both scientists and practitioners in radiation protection and students in graduate health physics and medical physics courses. Features: A much-needed book filling a gap in the market in a rapidly expanding area Contains the history, evolution, and the most up-to-date computational dosimetry models Authored and edited by internationally recognized authorities and subject area specialists Interrogates both the origins and methodologies of dose coefficient calculation Incorporates the latest international guidance for radiation dosimetry and protection

An Introduction to Radiation Dosimetry - S. Lovell 1979-09-13

First published in 1979, this volume presents an elementary and, as far as is practicable, non-mathematical introduction to radiation dosimetry. Where it proved necessary to use mathematical notation, it was kept to a simple level. The volume treats dosimetry from first principles, dealing with the interaction of the various radiations with matter, then defining dosimetric quantities and units and showing how the more important ones are measured. It concludes with a brief chapter on radiation protection. Although a number of dosimetric systems are described in some detail the treatment is by no means encyclopaedic. SI units appear throughout, including some which were not yet in universal use when the book was first published. Where it was considered necessary, the older non-SI units were also defined and conversion factors were given.

Radiation Protection - William H. Hallenbeck 2020-11-26
This text/reference provides an excellent introduction to fundamental topics in radiation protection, including energetics, kinetics, interaction, external radiation protection, dosimetry, standards, and measurement. Chapters on radioactive waste and radon, topics not normally covered in introductory texts, have been incorporated as well. An extensive glossary of terms, abbreviations, acronyms, physical constants, units, and unit conversions provides a ready source of frequently needed information. Several appendices contain specifications and vendors for commercially available portable radiation survey instruments, personal dosimeters, and radon/radon progeny monitors.
Optically Stimulated Luminescence Dosimetry - L. Boetter-Jensen 2003-10-24
Optically Stimulated Luminescence (OSL) has become the technique of choice for many areas of radiation dosimetry. The technique is finding widespread application in a variety of radiation dosimetry fields, including personal monitoring, environmental monitoring, retrospective dosimetry (including geological dating and accident dosimetry), space dosimetry, and many more. In this book we have attempted to synthesize the major advances in the field, covering both fundamental understanding and the many applications. The latter serve to demonstrate the success and popularity of OSL as a dosimetry method. The book is designed for researchers and radiation dosimetry practitioners alike. It delves into the detailed theory of the process from the point of view of stimulated relaxation phenomena, describing the energy storage and release processes phenomenologically and developing detailed mathematical descriptions to enable a quantitative understanding of the observed phenomena. The various stimulation modes (continuous wave, pulsed, or linear modulation) are introduced and compared. The properties of the most important synthetic OSL materials beginning with the dominant carbon-doped Al2O3, and moving through discussions of other, less-well studied but nevertheless important, or potentially important, materials. The OSL properties of the two most important natural OSL dosimetry material types, namely quartz and feldspars are discussed in depth. The applications chapters deal with the use of OSL in personal, environmental, medical and UV dosimetry, geological dating and retrospective dosimetry (accident dosimetry and dating). Finally the developments in instrumentation that have occurred over the past decade or more are described. The book will find use in those laboratories within academia, national institutes and the private sector where research and applications in radiation dosimetry using luminescence are being conducted. Potential readers include personnel involved in radiation protection practice and research, hospitals, nuclear power stations, radiation clean-up and remediation, food irradiation and materials processing, security monitoring, geological and archaeological dating, luminescence studies of minerals, etc.
Handbook of Nuclear Medicine and Molecular Imaging for Physicists - Michael Ljungberg 2022-01-25
Mathematical modelling is an important part of nuclear medicine. Therefore, several chapters of this book have been dedicated towards describing this topic. In these chapters, an emphasis has been put on describing the mathematical modelling of the radiation transport of photons and electrons, as well as on the transportation of radiopharmaceuticals between different organs and compartments. It also includes computer models of patient dosimetry. Two chapters of this book are devoted towards introducing the concept of biostatistics and radiobiology. These chapters are followed by chapters detailing dosimetry procedures commonly used in the context of diagnostic imaging, as well as patient-specific dosimetry for radiotherapy treatments. For safety reasons, many of the methods used in nuclear medicine and molecular imaging are tightly regulated. Therefore, this volume also highlights the basic principles for radiation protection. It discusses the process of how guidelines and regulations aimed at minimizing radiation exposure are determined and implemented by international organisations. Finally, this book describes how different dosimetry methods may be utilized depending on the intended target, including whole-body or organ-specific imaging, as well as small-scale to cellular dosimetry. This text will be an invaluable resource for libraries,

institutions, and clinical and academic medical physicists searching for a complete account of what defines nuclear medicine. The most comprehensive reference available providing a state-of-the-art overview of the field of nuclear medicine Edited by a leader in the field, with contributions from a team of experienced medical physicists, chemists, engineers, scientists, and clinical medical personnel Includes the latest practical research in the field, in addition to explaining fundamental theory and the field's history

Fundamentals of Nuclear Medicine Dosimetry - Michael G. Stabin 2008-01-15

Written by a leading international authority in the field, this book is ideal for physicians and residents in nuclear medicine who want to improve their knowledge in internal dosimetry. The text is a practical introduction that guides the reader through fundamental concepts in the calculation of radiation dose, including discussions of standardized models, methods of calculations, and available software applications. This comprehensive guide discusses too the biological effects of radiation on living systems. The book also includes an overview of regulatory aspects related to the radiation dosimetry of new radiopharmaceuticals.

Introduction to Health Physics - Herman Cember 1992

This guide offers students a background and basic understanding of the biophysical bases of radiation, radiation safety standards and the key factors in radiation protection. A revised and expanded edition, the book's contents include: radiation dosimetry, basic physical principles, biological effects of radiation, criticality control and radiation surveillance. The author also highlights new findings on non-ionizing radiation (laser and microwaves), computer use in dose calculation and dose limit recommendations from the International Commission on Radiation Protection. It aims to provide students with a framework and practical introduction to scientific principles and the problem-solving approaches needed in daily radiation protection practice.

The 2007 Recommendations of the International Commission on Radiological Protection - J. Valentin 2008-02-29

ABSTRACT -- These revised Recommendations for a System of Radiological Protection formally replace the Commission's previous, 1990, Recommendations, and update, consolidate, and develop the additional guidance on the control of exposure from radiation sources issued since 1990. Thus, the present Recommendations update the radiation and tissue weighting factors in the quantities equivalent and effective dose and update the radiation detriment, based on the latest available scientific information of the biology and physics of radiation exposure. They maintain the Commission's three fundamental principles of radiological protection, namely justification, optimisation and the application of dose limits, clarifying how they apply to radiation sources delivering exposure and to individuals receiving exposure. The Recommendations evolve from the previous process-based protection approach using practices and interventions by moving to an approach based on the exposure situation. They recognise planned, emergency, and existing exposure situations, and apply the fundamental principles of justification and optimisation of protection to all of these situations. They maintain the Commission's current individual dose limits for effective dose and equivalent dose from all regulated sources in planned exposure situations. They re-inforce the principle of optimisation of protection, which should be applicable in a similar way to all exposure situations, subject to restrictions on individual doses and risks: dose and risk constraints for planned exposure situations, and reference levels for emergency and existing exposure situations. The Recommendations also include an approach for developing a framework to demonstrate radiological protection of the environment. Note: this edition does not contain Annex A and Annex B, which are available in the main edition ISBN 978-0-7020-3048-2.

Computational Methods in Reactor Shielding - J. I. Wood 1982