

Book Review

Measurement & Detection of Radiation, 4th edition.

By Nicholas Tsoulfanidis and Sheldon Landsberger. CRC Press (2015). Price: \$134.95 (VitalSource eBook access code and instructions provided within the print book).

Reviewer: Joy L. Rempe

The fourth edition of *Measurement & Detection of Radiation* provides a complete education on the fundamentals of radiation measurements. As an undergraduate in nuclear engineering, I was first exposed to this topic using an unpublished version of this text, which students at the University of Missouri–Rolla affectionately named “Nick’s Notes.” I have continued to rely on various versions of this book over the years. The first edition was published in 1983; subsequent editions were published in 2005 and 2010. Although other books are available that discuss radiation detection and measurement, I find them less comprehensive and more difficult to navigate. It is a pleasure to read this latest edition, which has been considerably updated and expanded to cover a broader range of emerging applications in this area, such as advances in nuclear forensics and medicine.

The text is suitable for upper-level engineering students and first-year graduate students and a useful reference for health physicists, nuclear medicine technical personnel, and scientists, engineers, and technicians in laboratories where nuclear radiation is used. Continuing in the tradition of its predecessors, this fourth edition provides a clearly written introduction to the fundamentals of nuclear interactions and radiation detection and nuclear instrumentation with a multitude of examples and problems. A solutions manual is also available.

The text comprehensively covers a wide range of topics related to ionizing radiation. Since the third edition was published in 2010, there have been minor updates to the first sixteen chapters of the text. The first four chapters provide introductory and background information, including an introduction to radiation, a general description of a radiation measurements counting system and the associated error in system components, a review of atomic and nuclear physics, and a presentation of fundamental concepts related to radiation interactions with matter. Chapters 5, 6, and 7 introduce the reader to different types of radiation detectors and identify components of typical

counting systems using each type of detector. The subjects of relative and absolute measurements and phenomena that may affect measurement accuracy are presented in Chapter 8. The topic of spectroscopy is introduced in Chapter 9. Chapter 10 provides a general overview of electronic units used in radiation measurements, and Chapter 11 describes various methods for analysis of experimental data. The Chapter 9 introduction to spectroscopy is complemented by more-detailed information in Chapters 12, 13, and 14 on spectroscopy of photons, charged particles, and neutrons. Chapter 15 is devoted to the topic of activation analysis, introducing the reader to the theory and steps required for applying this process. Fundamental health physics concepts are presented in Chapter 16. The authors added Chapters 17 and 18 to the fourth edition to address recent advances in nuclear forensics and nuclear medicine.

In the fourth edition, the authors have corrected errors found in prior versions and eliminated discussions of outdated measurement equipment. In each chapter, new problems have been added. The reference and bibliography sections have also been updated as needed. In the newly added final two chapters, the authors pose open-ended questions to encourage more in-depth research. In future editions, the authors might want to elaborate on advances in nuclear instrumentation to support materials test reactor irradiations. However, the authors have done an excellent job of capturing technology advances in this rapidly changing field.

About the Reviewer: Joy Rempe (PhD, Nuclear Engineering, Massachusetts Institute of Technology) is the Principal of Rempe and Associates, LLC. She also serves on the U.S. Nuclear Regulatory Advisory Committee for Reactor Safeguards and is a member of the U.S. Department of Energy Nuclear Energy Advisory Committee. Prior to retiring as a Laboratory Fellow at Idaho National Laboratory, Dr. Rempe founded an instrumentation development and deployment laboratory that supported a wide range of applications, including irradiation testing at U.S. and international materials test reactors. She has authored or coauthored over 350 archival peer-reviewed journal publications, peer-reviewed conference papers, technical reports, and presentations on reactor safety, severe accident phenomena, high-temperature testing, and in-pile instrumentation.