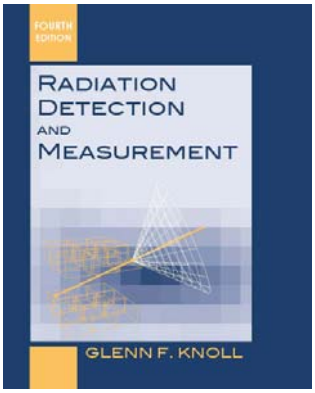
Radiation Detection and Measurement



This 5-day course was developed to provide an overview of the instruments and techniques important in the detection and spectroscopy of ionizing radiation, and to strengthen an understanding of the physical processes underlying their application. It stresses the development of a basic understanding of the principles of operation of these devices, and helps develop an ability to inter-compare and select instrumentation best suited for different applications. It will provide an opportunity for those new to the field to gain a broad perspective of measurement options, and for practitioners to refresh their knowledge in areas outside their own specialties. This course is based on the new updated 4th edition textbook "Radiation Detection and Measurement" by Dr. Glenn Knoll and now covers many new subjects as well as new scintillator materials that can achieve better energy resolution by a factor of two compared with traditional materials. The 4th edition textbook also presents new material on ROC curves, micropattern gas detectors, new sensors for scintillation light, and digital techniques in detector pulse processing, as well as revised discussions on TLDs and cryogenic spectrometers, radiation backgrounds, and the VME instrumentation standard. This book has attained widespread recognition as the standard published work in the field, and a copy is provided to all course registrants. Customized lecture notes will also be distributed to serve as a supplement to the text.

6 Reasons Why You Should Attend...

- Strengthen your understanding of the instruments and techniques important in the detection and spectroscopy of ionizing radiation.
- Receive personalized instruction from the author of the textbook recognized as the standard of the industry from your own take-home copy of the 4th edition.
- Evaluate and compare the latest developments in radiation instrumentation presented by leading manufacturers.
- Improve your perspective and ability to evaluate measurement systems for different applications.
- Understand the applicability and limitations of all major types of detectors.
- Gain a thorough understanding of gamma and neutron spectroscopy and the systems used in multichannel analysis.

Lead Instructor: Dr. Glenn Knoll

Dr. Glenn Knoll is Professor Emeritus of Nuclear Engineering and Radiological Sciences at the University of Michigan. He joined the Michigan faculty in 1962, and served as Chairman of the Department. of Nuclear Engineering from 1979 to 1990 and as Interim Dean of the College of Engineering from 1995-96. He has also held appointments as Visiting Scientist at the Nuclear Research Center in Karlsruhe, Germany, and as Senior Fellow in the Department of Physics at the University of Surrey, U.K. His research interests have centered on radiation measurements, nuclear instrumentation, and radiation imaging. He is author or co-author of over 175 technical publications, 8 patents, and 2 textbooks.

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of Health Physics
AAHP

The American Academy of Health Physics (AAHP) has awarded this course 32 continuing education credits.
Assigned ID Number: 2010-00-044

For further information or assistance, please contact:

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Course Topics

RADIATION INTERACTIONS
- Charged Particles
- Fast Electrons
- Gamma Rays and X-Rays
- Neutron Interactions
- Effects in Detector Spectra

BASIC DETECTOR PROPERTIES
- Pulse Height Spectra & Counting Curves
- Energy Resolution
- Detection Efficiency
- Dead-time

IONIZATION CHAMBERS
- Ionization in Gases
- Current Mode Ion Chambers
- Application to Radiation Dosimetry
- Pulse Mode Operation
- Gridded Ion Chambers

PROPORTIONAL COUNTERS
- Gas Multiplication
- Design Features of Proportional Tubes
- Detection Efficiency and Counter Curves
- Position Sensing Techniques

GEIGER-MUELLER COUNTERS
- The Geiger Discharge
- Counting Plateau
- Fill Gases and Quenching
- Time Behavior

SCINTILLATION DETECTORS
- Organic, Liquid and Plastic Scintillators
- Inorganic Scintillators
- Intercomparison of Scintillator Performance

PHOTOMULTIPLIER TUBES AND PHOTODIODES
- Light Collection and Coupling
- Photocathodes and Electron Multipliers
- Characteristics of PM Tubes
- Use of Photodiodes with Scintillators

SEMICONDUCTOR DIODE DETECTORS
- Basic Principles and Configurations
- Energy and Time Resolution
- Applications in Charged Particle and Electron Spectroscopy

GERMANIUM GAMMA RAY DETECTORS
- HPGe detector configurations
- Operational characteristics

OTHER SEMICONDUCTOR DETECTORS
- Si(Li) Spectrometers
- Applications in X-Ray Spectroscopy
- Candmium telluride and mercuric iodide

NEUTRON DETECTION AND SPECTROSCOPY
- Slow Neutron Conversion Reactions
- Proportional and Scintillation Detectors
- Moderation Detectors
- Proton Recoil Spectrometers

PULSE PROCESSING AND SHAPING
- Conventional and Active Reset Preamplifiers
- Pulse Shaping Methods
- Baseline Restoration
- Pile-up Rejection
- Timing and Coincidence

MULTICHANNEL ANALYSIS
- MCA Components and Operation
- ADC Characteristics and Specifications
- PC-Based Systems
- Spectrum Stabilization and Analysis

MISCELLANEOUS DETECTORS
- Cerenkov Detectors
- Liquid Ionization and Proportional Detectors
- Photographic Emulsions
- Track Etch Detectors
- Thermoluminescent Dosimeters
- Superheated Drop Detectors

DETECTOR BACKGROUND AND SHIELDING
- Sources of Background
- Effectiveness of Shielding Materials
- Active Background Suppression

INTERCOMPARISON OF DETECTOR PROPERTIES
- Detection Efficiency
- Speed of Response
- Energy Resolution
- Suitability for Various Applications