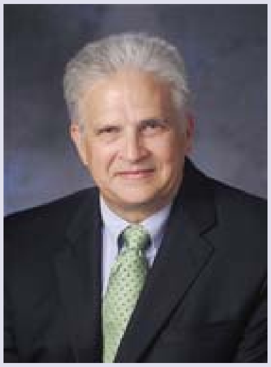
A 5-DAY SHORT COURSE

Neutron Detection and Measurement

July 21-25, 2025 ◆ "Live" Online Instruction

Since neutrons are, primarily, detected based on photons and charged particles produced by neutron interactions, our neutron detection course covers the fundamental concepts of neutron interactions as well as those of gammas and charged particles. In addition to interactions, the course will cover all methods of neutron detection; methods for determination of neutron energy; basic concepts of radiation counting statistics; principles and operation of common neutron detectors; specialized neutron detectors, and neutron dosimetry and dosimeters. The course stresses the development of a basic understanding of the principles of operation of neutron detectors and dosimeters, 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.

Course Instructor



Nolan Hertel, Ph.D., P.E., is an internationally recognized expert in radiation shielding, transport and spectrometry/dosimetry. He is a Professor Emeritus of Nuclear and Radiological Engineering at Georgia Institute of Technology and has been actively engaged in nuclear engineering education and research for over 25 years. Professor Hertel has extensive experience in neutron transport, measurement and dosimetry. During his career, he has been involved in several neutron benchmark experiments, including a recent high-energy neutron depth-dose experiment. He has experience with a variety of measurement techniques including time-of-flight measurements, unfolding of proton-recoil detector and activation foil data, tissue-equivalent ionization measurements and moderating neutron detection methods.

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Course Outline

1. **Review of Nuclear Physics**
   - a. Reactions
   - b. Basic Radiation Units and Quantities
   - c. Gamma-ray Interactions
   - d. Neutron Interactions
     - i. Scattering
     - ii Reactions of importance in detection
     - iii. Reactions of importance in applications
     - iv. Reactions of importance in dosimetry and radiation protection
   - e. Charged Particle Interactions
     - i. Review of stopping power and range
     - ii. Energy loss in materials
   - f. Neutron Sources
     - i. Radioisotope Based
     - ii. Reactors
     - iii. Accelerators
2. **Review of Counting Statistics and Uncertainty Propagation**
3. **Electronic Instrumentation Associated with Radiation Detection – General Overview**
4. **Neutron Dose Concepts and Dose Conversion Coefficients**
5. **Detection Principles**
   - a. Scintillation Detector Operation
   - b. Semiconductor Detector Operation
   - c. Gas-Filled Counters
   - d. Thermoluminescence Detectors (TLD)
6. **Overview of Neutron Detection**
7. **Detecting Neutrons with (n,charged particle) reactions**
8. **Measurement of the neutron energy spectrum**
   - a. General Problem
   - b. Folding and Unfolding
   - c. Response Functions
   - d. Methods Used For Unfolding
9. **Gas-filled Detectors for Neutron Detection**
   - a. Total Count Systems
   - b. Ionization Chambers
     - i. Dosimetry Applications
     - ii. Other Uses
   - c. Proportional Counters and Spectral Measurements
   - d. Tissue Equivalence in Radiation Dosimetry
10. **Moderating Detection Systems**
    - a. Bonner spheres
    - b. Remmeters
    - c. Moderated Detector Applications
11. **Activation and Threshold Foils**
12. **Scintillation Detectors**
    - a. Pulse Shape Discrimination
    - b. Spectral Determination
13. **More Advanced Techniques**
    - a. Time-of-Flight
      - i. Research Applications
      - ii. Instrument Applications
    - b. Proton Recoil
14. **Other Measurement Techniques**
15. **Instruments Used in Health Physics for Neutron Measurements**
16. **Monte Carlo Simulation for Instrument Response**
    - a. Calibration Techniques for Health Physics Instruments
17. **Neutron Techniques and Detection for Homeland Security**
18. **New Directions in Neutron Detection and Neutron Dosimetry**

HOW TO REGISTER ...

Visit our website at www.tmscourses.com and register online, or call 860-738-2440.

Registration questions can be emailed to info@tmscourses.com.

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