

A 5-Day Short Course



Principles of Radiation Shielding

April 29-March 3, 2013
Orlando, FL



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Course Instructor

Nolan Hertel, Ph.D., P.E., is an internationally recognized expert in radiation shielding, transport and spectrometry/dosimetry. He is currently a Professor of Nuclear and Radiological Engineering at Georgia Institute of Technology and has been actively engaged in nuclear engineering education and research for over 30 years. Professor Hertel has extensive experience in radiation transport, measurement and dosimetry. Dr. Hertel has taught courses in Monte Carlo Methods, Radiation Shield Design, and Deterministic Methods of Radiation Transport as well as courses in Radiation Protection and Radiological Assessment. He has performed radiation transport calculations to model benchmark shielding experiments, shield performance, activation product inventories, and instrument response. Dr. Hertel has extensive experience in the use of various discrete ordinates transport codes, point-kernel shielding codes, isotope buildup and depletion (activation) codes, and Monte Carlo codes. He has served as a consultant to a variety of companies, performing shielding, activation and skyshine analyses. Dr. Hertel has graduated 41 MS students and 24 Ph.D. students in nuclear engineering. He was formerly a member of both the ANSI N13 Consensus Committee on Radiation Protection Standards and the N17 Consensus Committee on Research Reactors, Reactor Physics, Radiation Shielding, and Computational Methods. In 2008 he served as the General Chair of the 11th International Conference on Radiation Shielding.

Course Description

This course focuses on the fundamentals of the production and interaction of ionizing radiation with matter and on how to use these fundamental properties to estimate and reduce radiation doses in practical situations. Simplified analytical and computer-based methods are presented for estimating doses from gamma rays, neutrons, beta-particles and alpha particles. Both the similarities and differences in shielding methods for different types of radiation are presented. The application of fundamental shielding principles to a wide variety of important radiation protection problems is emphasized. In addition, special approximate techniques applicable for a particular radiation or special geometry are also reviewed. The course is based on the widely used textbook "*Radiation Shielding*" by Profs. Shultis and Faw. This text and additional supplementary material will be provided to all course registrants.

REASONS WHY YOU SHOULD ATTEND....

- Gain a thorough understanding of the underlying principles used in simplified techniques for practical shield design and dose evaluation, as well as the capabilities and limitations of these methods.
- Strengthen your understanding of practical radiation shielding techniques and how to locate and use much recent shielding data.
- Improve your understanding of recent developments in radiation dosimetric units and their application to real-world situations.
- Develop new computer skills to enable rapid evaluation of simple shielding problems.

Course Outline

Radiation Types and Interactions

- directly and indirect ionizing radiation
- photon interactions
- neutron interactions
- electron interactions
- stopping heavy charged particles
- interaction coefficients, cross sections, stopping power

Radiation Fields and Dosimetry

- concept of flux density and fluence
- biological effects of radiation
- various radiological units
- fluence-to-dose conversion factors
- dose standards, occupational and public limits

Radiation Sources and Properties

- neutron sources
- gamma and X-ray sources
- sources for charged particles
- radioisotopes of importance

General Principles of Radiation Shielding

- importance of time, distance and attenuation on dose
- collided and uncollided radiation
- exponential attenuation
- geometric versus material attenuation
- half- and tenth-value layer concept
- charged particle ranges

Special Techniques for Photon Attenuation

- buildup factors
- using the source superposition principles
- dose for simple source/detector geometries
- albedo concepts and duct problems

Special Techniques for Neutron Attenuation

- limitations of buildup factors to neutrons
- attenuation in hydrogenous material
- other calculational methods for neutrons
- attenuation in concrete
- neutron skyshine and duct penetration

Special Techniques for Charged Particles

- charged particle ranges
- spatial distribution of absorbed doses
- beta-particle dose kernels
- application to important problems

Special Topics

Each class will be given special presentations addressing particular needs and interests of the attendees (e.g., reactor shielding, internal dose assessment, limitations and control of particular radionuclides, dose management, special computer codes, etc.)

Computational Techniques

- subroutines for important shielding data and functions
- use of point-kernel codes (e.g. MicroSky shine, ISOSHLD)
- Codes of special interest to attendees

Registration

Name _____ Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____ Fax _____

Email _____

Course Fee: \$1295

bill my company

P.O. Number: _____

Charge Credit Card:

Visa Mastercard American Express

Card No. _____

Exp. Date _____

Signature _____

4 Easy Ways To Register....

1. Register online: www.tmscourses.com
2. Call TMS at (860) 738-2440
3. Fax your registration (860) 738-9322
4. Mail the attached form:
TMS, P.O. Box 226, New Hartford, CT 06057

Accommodations



This course will be held at the Orlando Airport Marriott.

A block of rooms has been reserved at reduced rates for course participants. Please make your reservation directly with the hotel by calling 407-851-9000 – please specify that you are attending Technical Management Services' short course to receive the group rate.

The reserved block of rooms will be released 3 weeks prior to the course (at which time rooms will be offered on an availability basis only).