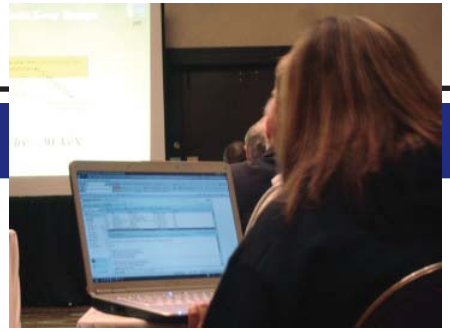

Technical Management Services

A 5-Day Short Course

Radioactive Sample Analysis - Instrumentation & Other Methods

January 13-17, 2014 ◆ Miami, FL

Course Description

This course is designed to provide a practical introduction to laboratory analysis methods for those new to the field, while also providing practical applications to those who are currently working in analytical laboratories. The course is intended for radiochemists, technicians and others who are doing routine and specialized analysis, as well as quality assurance officers and data validators who may have a need an understanding of radioanalytical measurements. Even data users will benefit from the insights and discussions of Data Quality Objectives and work specifications to ensure that the results they get back from the laboratory provide the information that is required for the project. Topics are applicable to a wide range of sample matrices including operational samples, environmental samples and in vitro bioassay.

Remember, not all results are created equally. Many details, if overlooked, can quickly invalidate a result. This course is designed to remove the 'black-box' approach to laboratory analysis and results. (i.e., Put the sample on the detector, push the button, read the printed report, accept the results). The topics provide a solid basis in the fundamentals of alpha beta proportional counting, liquid scintillation counting, alpha spectrometry and gamma spectroscopy while focusing on the areas that permit the operator to prepare a representative sample, optimize system parameters and understand the effects of interferences and geometry.

A special emphasis is placed on gamma spectroscopy including cascade summing, interference peaks, geometry, and libraries parameters. Class exercises guide the student through the interpretation of results with consideration of peak fit, source term and process knowledge of the sample. A review of the basics of radioactive decay theory and interaction of radiation with matter is used to explain calibration protocol and spectral features and their interpretation, including peak identification and energy determination, backscatter peaks, single and double escape peaks for gamma spectroscopy. Time-permitting, students will be introduced to the concepts and benefits of modeled geometries and in situ measurements.

Counting statistics, laboratory QA, good practices and development of Data Quality Objectives and Quality Assurance parameters are included. Current guidance documents for QA programs are reviewed.

This course will help you ....

- ❑ Understand the methods available to analyze samples.
- ❑ Understand what pitfalls can occur, even in the most well-established laboratories.
- ❑ Understand how the source term can impact the results.
- ❑ Understand the impact of sample preparation on the results.
- ❑ Understand how to develop Data Quality Objectives with the laboratory to ensure that the results you need are the results you get.
- ❑ Determine the results you need.
- ❑ Understand how much QA/QC is required.

Course Instructor

Rowena Argall has been a practicing Health Physicist for over 30 years in a variety of capacities including DOE, nuclear power plants, research, industrial and consulting assignments. She holds a Master's Degree from Colorado State University and has been a diplomat of the American Board of Health Physics since 1983. Ms. Argall joined the nuclear industry in 1974 supporting chemistry and radiochemistry at the Ft. St. Vrain HTGR. She joined Canberra Industries in 1978 providing technical support and training to both their health physics and radiochemistry customer base. Ms. Argall returned to the laboratory in 1991 as Manager of Radiochemistry and Training Services with Scientific Ecology Group supporting decommissioning services. Rowena is currently President of RETN and provides radiochemistry, health physics and training services to DOE, nuclear utilities, FEMA and private industry.

Review of Fundamentals

- Review of Interactions with Matter (Charged particles and photons)
- Gamma Spectral Characteristics
- Transient and Secular Equilibrium
- Decay Corrections
  - ◊ Short Lived Nuclides - Decay During Counting and Sample Collection
  - ◊ Buildup, in-growth
  - ◊ Neutron Activation
- Peak Shape and Fitting - What it is and What it Means
- Decay Schemes
- References

Laboratory Detection Systems

- Gas Flow Proportional Counting
  - ◊ Detector and Electronics
  - ◊ Calibration
  - ◊ Sample Preparation
  - ◊ Sample Self-Absorption Corrections
- Liquid Scintillation Counting
  - ◊ Detector and Electronics
  - ◊ Sample Preparation
  - ◊ Calibration & Quench Corrections
  - ◊ Chemiluminescence & Other Interferences
  - ◊ Alpha/Beta Counting
- Alpha Spectrometry
  - ◊ Detectors and Electronics
  - ◊ Sample Matrix & Effects on Spectral Characteristics

Gamma Spectroscopy - Remaining time with The exception of the hours spent on QA

- Detectors (HPGe, NaI(Tl), and others)

Gamma Spectroscopy Electronics & Effects on Spectral Results

- Pole Zero
- ADC
- Dead Time
- High & Low Count Rate Considerations

Gamma Spectroscopy Calibration

- Energy and Shape Calibrations
- Fixed Geometry Efficiency Calibration Considerations
- Modeled Laboratory Geometry Considerations
- In Situ Field Geometry Considerations

How Does the Gamma Software identify Nuclides

- Peak Search and Fit
- Interactive Peak and Fit
- Interference Corrections
- MDA/LLD/Critical Level
- Analysis Parameters which affect results

Gamma Spectroscopy Summation Error Corrections

- Random Summing
- Coincidence (Cascade) Summing Correction

Gamma Spectroscopy Library Parameters

- Selecting Key Lines
- Selecting Confirming Peaks
- Use of Lines from Progeny for Quantification of a Nuclide
- Optimizing the Library to the Software

Reviewing Gamma Spectra

- Exercises

Unindentified Gamma Spectroscopy Peaks

- Why Resolve These Peaks?
- How to Resolve These Peaks?

Counting Statistics

- Statistical Basis of Radiation Detection
  - ◊ Statistical Nature of Radioactive Decay
  - ◊ Commonly Used Statistical Methods
  - ◊ Confidence Interval Estimation
- Statistical Analysis of Radiation Measurements
  - ◊ Types of Error
  - ◊ Error Estimation in Count Data
  - ◊ Propagation of Error
  - ◊ Expectation and Goodness of Fit Methods
  - ◊ Detection Limit Derivation (decision level, lower limit of detection, minimum detectable activity, counting time estimation)
  - ◊ Chi-Square testing of counting results
- Total Propagated Uncertainty/Combined Standard Uncertainties

Quality Assurance - Laboratory Instruments

- Data Quality Objectives - Why bother?
- Establishing Parameters
- Trending Charts
- Control Charts
- Verification of Efficiency Calibrations, including density correction and quench curves
- ANSI N42.23 and others
- Selection of calibration standards
- Preparation of standards derived from certified materials
- Guidance
  - ◊ Quality assurance specifications
  - ◊ Standards
  - ◊ References
- Documentation
  - ◊ Procedures
  - ◊ Sample Tracking
  - ◊ Calibration and Analytical Results
  - ◊ Calculations & Computer Software
- Quality Assurance Programs
  - ◊ Performance Evaluation Samples
  - ◊ Control of M&TE

Applications and Practical Problems

- Sampling Techniques
  - ◊ Sample size & Type - Air, water, smear, soil, urinalysis, vegetation, effluents, etc.
  - ◊ Taking representative samples
- Sample preparation - General
  - ◊ Geometry, density
  - ◊ Separation methods
  - ◊ Quality control

Continuing Education Credits

The AAHP has awarded 32 credits for this course

Reference ID #: 2011-00-011

Accommodations

This course will be held at the Sheraton Miami Airport Hotel. A block of rooms has been reserved at reduced rates for course participants. Please make your reservation directly with the hotel by calling 305-871-3800 – 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 tothe course (at which time rooms will be offered on an availability basis only).

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

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Company_____
Address_____
City _____ State _____ Zip_____
Telephone _____ Fax_____
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Course Fee: $1295.00

❑ Bill my company
P.O. Number: _____
Charge Credit Card:
❑ Visa ❑ Mastercard ❑ American Express

Discounts:

$50 discount if 2 or more people from the same company register
... take an additional $50 discount if payment is received by April 1st.