TECHNICAL EXCHANGE

MEASUREMENT TRAINING PROVIDED BY NCSL INTERNATIONAL

ISO 17025 Accredited ACR Technical Services, Inc.

AMRL AASHTO Materials Reference Laboratory

AMETEK TEST & CALIBRATION INSTRUMENTS

essco CALIBRATION LABORATORY

February 11 - 12, 2015

Raleigh Marriott Crabtree Valley Hotel | Raleigh, North Carolina | $134 USD | 1-888-236-2427

What is the Technical Exchange?

The NCSLI Technical Exchange workshops, conducted by experts in the field of metrology, will provide valuable hands-on measurement training techniques you should not pass up. This program also provides a forum for discussion and exchanging of ideas, measurement techniques, best practices and innovations with others interested in metrology industry trends. Our program will build and enhance specific hands-on skills in the calibration of measurement and test equipment, along with introducing new calibration and testing hardware, software and calibration services. This two-day Measurement Training is designed for Engineers, Metrologists, Lab Managers, Lab Technicians (beginner and intermediate), Testing Technicians and Engineers, Specifiers and Measurement Professionals working in all areas of Metrology. We are offering classes in Electrical, Temperature, Dimensional, Pressure, Vibration, Proficiency Testing, Process Calibration, Calibration Intervals, Calibration Automation, and Statistical Analysis of Metrology Data in a Testing Lab, Record Keeping in a Testing Lab, Asset Management and a lot more.

Enhance your skills, increase your knowledge of best practices, build a network of peers to help resolve mutual metrology challenges and contribute to your professional development. CEU Credits will be earned.

What's New in 2015? Testing Track!

NCSL International has a goal to foster greater communication and perspective between Calibration Laboratories and the Testing Community. In 2015 NCSLI will partner with AMRL to sponsor a Testing Track of classes. AMRL is an organization that accredits construction material testing laboratories and they are bringing their perspective of metrology to the NCSLI Technical Exchange. We are very pleased to have AMRL involved in our goal of promoting measurement science to a broad audience and further involving the testing community.

WEDNESDAY | FEBRUARY 11
TECHNICAL TRAINING CLASSES

TE-1 | FEBRUARY 11 AND 12, 2015 | 2 DAY

An Introduction to Instrument Control and Calibration Automation in LabVIEW™
Logan Kunitz, National Instruments Corporation

This two day hands-on tutorial will introduce session participants to the fundamental tools and concepts required to automate instrument control for calibration. Each participant will have a dedicated workstation equipped with the full LabVIEW environment and an instrument simulator. With a combination of instruction and hands-on exercises, they will learn the basics of using LabVIEW as powerful and easy to use programming environment for automation, and the fundamentals of instrument control. At the end of the course, participants will be guided through the creation of an automated calibration solution, complete with user input, automated instrument control, and data-logging.

TE-2 | FEBRUARY 11 AND 12, 2015 | 2 DAY

***ISO/IEC 17025* Laboratory Accreditation**
Rob Knake, American Association for Laboratory Accreditation (A2LA)

This course is a comprehensive look at ISO/IEC 17025 and its documentation and internal auditing requirements. Previously taught in three separate one-day courses, the merged subject matter enables the instructor to present an understandable explanation of the standard and how it should be applied. In this course, you will gain critical insight into the interpretation of the requirements of this laboratory standard and you will also receive a detailed review of the accreditation process. This course also gives attendees the knowledge needed to establish an internal audit program as required by ISO 17025, and to initiate the sequence of activities involved in scheduling, planning, conducting, reporting on and closing out internal audits. Participants will be able to employ effective techniques of auditing and the ability to develop the auditing procedures, scheduling and recording systems needed to sustain the program. Attendees will receive practical instructions on the development, implementation and long-term maintenance of an effective laboratory management system. This course is for anyone new to the quality arena or anyone that wants to gain a greater understanding and appreciation of quality standard implementation and demonstration of technical competence in their laboratory.

TE-3 | FEBRUARY 11, 2015 | 1 DAY

Precision DMM Measurements
Jack Somppi, Fluke Calibration

Making Sure Your Electrical DMM Measurements Are At Their Best
Get the maximum performance from your 8.5 digit dmm. The digital multimeter is a solid and reliable workhorse of an electrical calibration lab. The high performance 8.5 digit varieties of these DMMs have both simple and sophisticated measurement abilities. Getting the best performance from such instruments requires an understanding of many aspects of the dmm, its electrical measurement techniques and general measurement considerations. This session covers a variety of such topics and includes hands on work for exploring such capabilities.

The topics included in this session include:
Aspects to Better Understand Your Instrument
•Understanding its Specs with the examples
•Internal Architecture
•Different AC RMS techniques
•Noise Rejection with Filtering
•The effects of varying measurement resolution
Measurement Quality Techniques
•Zeroing the meter
•Loading and offset errors
•Test lead considerations
•Thermal EMFs and removing their effects
•Resistance measurement with low source current, high source high current and high source voltage
•Transfer and relative comparison measurements
•What is a guard and how to use it?
Advanced Measurement Techniques
•Ratio techniques
•Null detector applications
•Measurement reversal techniques

TE-4 | FEBRUARY 11, 2015 | 1 DAY

Calculating Uncertainties in Testing Laboratories
Dilip Shah, E=MC3 Solutions

This is a full-day, beginner to intermediate level workshop targeted towards metrologists, technicians and engineers. This workshop will also be useful for specifiers of calibration services. This workshop covers the Measurement Uncertainty fundamentals for metrology professionals new to the subject. Statistical concepts relevant to Metrology and Measurement Uncertainty are introduced, explained and demonstrated. The process of measurement uncertainty estimation is demonstrated per the guidelines from the ISO Guide to the Expression of Uncertainty in Measurement (GUM).

The workshop covers practical examples encountered in calibration and testing laboratories using a hands-on approach for estimating Measurement Uncertainty. The workshop breaks down the Measurement Uncertainty estimation process into a 7-step process. Each step is demonstrated using the Excel spreadsheet template to calculate and document the measurement uncertainty budget that is shared with the attendees. Examples and techniques related to metrology and measurement; including Test Uncertainty Ratios (TUR), risk analysis, control charting applications in metrology and data validation are discussed during the workshop to ensure that participants leave the session with practical and timesaving

techniques that can be utilized immediately in meeting measurement uncertainty requirements for process improvement.

Learning Objectives

Understanding the Measurement Uncertainty Process
Developing and understanding statistical tools for analyzing and improving the measurement uncertainty process
Developing tools and methods for reporting customer's measurement uncertainty per ILAC P14 guidelines

Target Attendees

This workshop is intended for laboratory managers and technicians who are involved in the daily laboratory operations
It is intended for both beginner and intermediate level of comprehension

TE-5 | FEBRUARY 11, 2015 | 1 DAY

Thermocouple Theory and Practical Application

Ken Sloneker, ASL U.S. Sponsored by A2LA

Thermocouples are widely used in nearly every manufacturing industry. Their use and calibration require a fundamental understanding of the principles behind their operation. This course covers those principles in sufficient depth to allow the user to make more confident measurements. Thermoelectric theory to practical application issues are covered in over six hours of course material. Working with thermocouples in the field and in the laboratory is different, and it is important for the respective user to understand what the others data is really telling them. Although some practical application issues are covered in this course, there will be an emphasis on thermocouple calibration and use in a laboratory environment. A practical section using thermocouple sensors and instruments is included. Participants are encouraged to submit questions about thermocouples ahead of time. Please forward your questions or course needs to the registrar prior to attending.

Examples of previously asked questions are:

• How is MGO cable made? What difference does it make? Why are type K thermocouples used more often than type T thermocouples?
• Which type thermocouple is better suited in an oxidizing environment?
• How does a particular failure mode appear in terms of the data - or (better yet) in terms of the physical structure?
• What is "inhomogeneity" and how can it be measured?
• How can an uncertainty estimate be obtained that represents inhomogeneity?
• If you measure it, how can it be practically applied?

TE-6 | FEBRUARY 11, 2015 | 1 DAY

Asset Management in a Test Lab Environment

James Smith and Rob Parchinski, The Boeing Company

What is Asset Management and specifically “Active Life Cycle Management” of test assets?
Referencing the ISO 55000 series of

- Defining the assets to be managed in specific test disciplines
- The Life Cycle infinity loop
- Elements moving your test schedule “to the left” using Test Asset Management

“Delay Dating” of M&TE and sensors
Lease/Buy criteria and opportunities to rapidly acquire test instrumentation for short to mid-term testing or where Capital investment is not feasible
Test Asset Utilization Studies, Concept, theories and application

TE1-Testing | FEBRUARY 11, 2015 | 1/2 DAY AM

Record-Keepers and Record Seekers: Common Record-Keeping Mistakes
Casey Soneira, AASHTO Materials Reference Laboratory

This workshop will be split into two sessions:

Session I
Record keeping can seem like a tedious and frustrating task in a busy laboratory environment. However, well-kept documentation can be a great tool for evaluating trends in test results, implementation of an effective preventative maintenance program, and so much more. This workshop will investigate tips and tricks for staying on top of it all, and will cover some of the most common record-keeping blunders and how to avoid them.

Session 2
Internal auditors often find themselves overwhelmed by the sheer volume of records created by their organization. Filtering through this information to ensure that your company's quality management system has been implemented effectively can be a challenge. Therefore, the second half of the workshop will focus on internal auditing how to effectively review the record-keeping practices of your organization.

TE-7 | FEBRUARY 11, 2015 | 1/2 DAY AM

Dimensional Measurements in an Industrial Testing Environment
Dr. Hy Tran, Sandia National Laboratories

This tutorial provides an overview of calibration techniques and key issues in dimensional metrology. This tutorial will include a variety of hands-on practical calibration exercises. All the major types of dimensional calibrations will be discussed. We will start by studying the calibration, use, and traceability issues of the standards used in the field, such as gage blocks, ring gages, optical flats, thread wires, and length standards. We will then discuss the calibration of common small measuring tools such as micrometers, calipers, dial indicators, and height gages. Hands-on exercises in the calibration of small tools will include procedures, worksheets, and certificates. We will also discuss the field calibration of major instruments such as optical comparators and coordinate measuring machines. In addition to presenting specific calibration methods, a goal of the tutorial is on developing understanding of the principles behind the dimensional calibration methods thereby giving the attendee the necessary tools to extend the tutorial concepts to other types of calibrations. With that goal in mind, not only will recommended procedures be presented, but also optional methods, sources of errors and methods to reduce them, and techniques for estimating the uncertainty of measurement.

TE-8 | FEBRUARY 11, 2015 | 1/2 DAY PM

Industrial Pressure Calibration and Measurements
Jon Sanders, Additel Corporation

This course will provide an introduction to basic pressure calibration and measurement. We will cover considerations when making pressure measurements and calibrations. Some of these considerations include a discussion on different pressure types such as gauge, absolute, compound, differential, negative gauge, and vacuum. We will also cover requirements for field calibration, uncertainties associated with field calibration, errors relating to temperature effects and different methods of calibration. In addition to pressure calibration and measurement theory, this course will also include a hands-on work shop where various methods of pressure calibration are tried and experienced.

THURSDAY | FEBRUARY 12
TECHNICAL TRAINING CLASSES

TE-9 | FEBRUARY 12, 2015 | 1 DAY
Statistical Analysis of Metrology Data
Dilip Shah, E=MC3 Solutions

This workshop will cover many aspects of estimating the measurement uncertainty for a testing laboratory. Compared to a calibration laboratory, testing laboratory criteria for estimating measurement uncertainty can be different and require more treatment of data using statistical analysis. The workshop will cover the finer aspects of data analysis for developing measurement uncertainty budgets for a test laboratory using the GUM approach.

TE-10 | FEBRUARY 12, 2015 | 1 DAY
Temperature Measurement/ Temperature Metrology and Thermometer Calibration
Tom Wiandt, TrueCal Metrology, LLC Sponsored by A2LA

Temperature metrology and thermometer calibration differ from other metrological disciplines in many respects. These differences often lead to misunderstandings, measurement blunders, and overall errors in calibration philosophy, practice, and method. This training session is an intermediate presentation intended to resolve these issues and provide a solid foundation upon which to base thermometry calibrations and thermometry laboratory quality control. The focus will be on fundamentals of temperature metrology, thermometer calibration, measurement quality, and uncertainty evaluation. Topics include thermodynamic principles, temperature traceability, temperature calibration equipment, thermometer calibration techniques, data analysis, curve fitting issues, thermometry mathematics, and temperature uncertainty budgets, including a short review of relevant GUM topics. The vehicle for this discussion will be resistance thermometry, including both PRTs & SPRTs. However, the issues discussed translate well to thermistors, combined probe/readout systems, and even thermocouples. This training is intended for those who have some experience in temperature measurement/calibration, those who need to validate what they already know and/or improve their methods, or those who just have some nagging questions that need to be answered.

TE2-Testing | FEBRUARY 12, 2015 | 1/2 DAY AM
Application of Calibration Data in a Testing Lab
Maria Knake, AASHTO Materials Reference Laboratory

This workshop will ask and answer the question: “What should you do with equipment calibration data after you get it?” We will examine the criteria for good calibration data and then show how to apply it in the lab. This is an important but usually overlooked step in the calibration process – failure to complete this step can lead to overstated confidence, and even to inaccurate test results. We will use step-by-step examples to show a good methodology to apply and to demonstrate the possible impact on test results.

TE-11 | FEBRUARY 12, 2015 | 1/2 DAY AM

Basic Electrical Metrology Techniques

Jack Somppi, Fluke Calibration

Electrical Measurement Workshop for Metrology Technicians This 4 hour workshop is an introduction to precision DC and Low Frequency AC electrical/electronic measurements, calibration, and associated practical tips. It discusses the techniques for calibration and the reasons for these techniques. Participants will become more productive in the calibration of test instrumentation when they understand the techniques for calibration and the reasons for their use.
Topics discussed include:

- Understanding specifications.
- Recognition of error sources, including loading errors.
- Selection of cables
- Thermal EMFs.
- Grounding and guarding.

This workshop is intended for technicians whose work involves measurement and calibration. Participants should have a basic electronics background and an understanding of calibration and measurement theory.
The workshop will use real instrument demonstrations of these measurement situations. There will be in class examples where students will work through real scenarios that illustrate measurement problems and the techniques used to minimize the associated errors.

TE-12 | FEBRUARY 12, 2015 | 1/2 DAY AM

Dynamic Sensors & Calibration

Steven Bill, The Modal Shop

This four-hour tutorial on vibration calibration will dive into calibration theory, standards, and methodology for dynamic sensors as well as explanations of different sensor types and the operational theories behind them. Target audience is beginner to intermediate level.

Specific accelerometers to be covered:

- Piezoelectric
- Piezoresistive
- Capacitive
- Shock
- Vibration
- Pressure

Specific calibration methods to be covered:

- High frequency
- Low frequency
- Shock
- Pressure
- Acoustics
- Portable Vibration Calibration

TE-13 | FEBRUARY 12, 2015 | 1/2 DAY AM

Proficiency Testing

Chuck Ellis, National Association for Proficiency Testing

In this session, participants will receive guidance on the value of participation in a properly conducted interlaboratory comparison. Participants will receive guidance on the proper method to conduct proficiency tests in accordance with ISO Standard 17043. Participants will receive guidance on performing proper statistical analysis when conducting interlaboratory comparisons. Participants will receive guidance on what to do and what not to do when conducting intra-interlaboratory comparisons.

By participating in this session, participants will receive in depth guidance on how to conduct their own interlaboratory comparison, develop a proficiency testing plan, how to evaluate reports from a proficiency testing provider, receive guidance on implementing corrective action for any unsatisfactory performance from participation in an interlaboratory comparison.

TE3-Testing | FEBRUARY 12, 2015 | 1/2 DAY PM

Selecting Appropriate Calibration Intervals

Bob Lutz, AASHTO Materials Reference Laboratory

Most people do not realize that equipment calibration intervals are meant to be flexible. Calibrating too often can be a waste of time and money; calibrating not often enough can call data and test results into question. Different approaches for selecting calibration intervals will be examined, and the pros and cons of each will be discussed. We will even show how calibrating too often can lead to poor results. Learn how to get the most of your calibration system.

TE-14 | FEBRUARY 12, 2015 | 1/2 DAY PM

Process Calibration

Jim Shields, Fluke Calibration

This process calibration course offers a combination of practical information and hands-on experience covering key concepts and methods used by instrument technicians supporting the process industry.
You will cover:

- Loop Characteristics
- Temperature and pressure calibration test equipment selection
- Temperature and Pressure calibration procedures on the bench and in the field
- You will be able to explain the function of the components of a control loop
- Calibrate temperature sensors
- Calibrate temperature and pressure instruments
- Understand instrument specifications
- Document a calibration
- Read a calibration report

TE-15 | FEBRUARY 12, 2015 | 1/2 DAY PM

Minimizing Sources of Error in Pipetting

Objective: Know your pipette, your environment, and how your technique affects accuracy and precision
Course Introduction: Trained pipette users save their laboratories time and money by minimizing themselves as significant sources of error when using pipettes. This approximately 3 hour, 2 part workshop, teaches users how to identify and minimize contributors of pipetting error. Through hands-on instruction, presentation, and discussion, this interactive training program teaches participants the knowledge and skills needed to begin producing more consistently reliable results.

Part 1:
Pipette basics, including history, design, and mechanics
Identify the various sources of uncertainty and error in pipetting
Understand accuracy and precision, calibration, and tolerances
Learn how to select the appropriate instrument based upon laboratory needs

Part 2:
Become familiar with different models of pipettes and their working parts
Practice hands-on pipetting skills with different models
Receive one-on-one instruction to improve technique
Test personal accuracy and precision using gravimetric balances

Conclusion: At the conclusion of this course, each participant will receive a Certificate of Completion along with a detailed graph analysis illustrating improvement in pipetting competency after demonstration, discussion, and practice given throughout the curriculum.

TE-16 | FEBRUARY 12, 2015 | 1/2 DAY PM

Microwave Measurement Techniques
Ronald Ginley, Radio Frequency Electronics Group, NIST

Have you ever wanted to learn more about microwave measurement techniques? This session is the place to be! An introduction to the basic measurement concepts for microwave measurements will be covered. This class is for those who have a basic knowledge about microwave measurements and want to learn more and for those who are just getting into making higher frequency measurement and want to get the basics. The class will be focused on power and scattering-parameters measurements to keep the content manageable. Specific topics covered will include transmission line theory, practical handling or the do's and don'ts for transmission lines and microwave connectors, Vector Network Analyzer calibration/measurements and real world sources of uncertainties, microwave power detectors types, power measurements and uncertainties, and the session will conclude with a discussion of verification techniques for microwave measurements.

Register Today!