

2020 NIST Sponsored SIM Training Courses

National Institute of Standards and Technology (NIST)

The International and Academic Affairs Office is pleased to be partnering with the Office of Weights and Measures to offer two training courses to metrologists from our SIM-affiliated National Metrology Institute/Designated Institute counterparts.

Fundamentals of Metrology

20 – 24 July 2020

Fundamentals of Metrology focuses on the practical application of key metrology concepts such as traceability and measurement uncertainty through a hands-on training scenario providing students with useful tools to improve their work.



Balance and Scale Calibration and Uncertainties

13 – 16 July 2020

Students will gain valuable experience in the use of mass balances and bench-top scales. The course incorporates hands-on training to examine reference standards, uncertainty budgets, and ISO/IEC 17025, among other important topics.

Students must be proficient in English to participate (interpretation services will not be available). Those wishing to apply must be employees of NMIs/DIs who are Active Members of SIM. Applications must be submitted to IAAO (andrew.conn@nist.gov) from the NMI/DI Director, with priority ranking if more than one application is being submitted. Selected participants will receive travel support to defray the cost of travel (airfare, lodging, and per diem; support for visa fees are not included). **The application deadline for both courses is 31 March 2020.**

2020 NIST SPONSORED SIM TRAINING COURSES

APPLICATION

NMI/DI Directors must submit applications to Andrew Conn (andrew.conn@nist.gov) on behalf of their staff. Applicants will be considered for only one of the two courses.

Name of Applicant:	
Country and Affiliation:	
Email Address:	
Metrology Expertise:	
Select course of interest: <i>Fundamentals</i> <i>Balance and Scale</i> *select one course	
Benefits Statement: please explain how the course will help improve the work you do for your NMI/DI.	
Signature of NMI/DI Director:	

Fundamentals of Metrology (NIST, Office of Weights and Measures)

*Students must be proficient in English to participate.

The 5 day Fundamentals of Metrology seminar is an intensive course that introduces participants to the concepts of measurement systems, units, good laboratory practices, data integrity, measurement uncertainty, measurement assurance, traceability, basic statistics and how they fit into a laboratory Quality Management System. Additional topics covered will include overall Laboratory Management and specific discussions of the requirements for proficiency testing, calibration certificate generation and software verification and validation. Topics will be covered using a variety of measurement disciplines and laboratory measurements and case studies so that the participants will be able to apply the concepts to any measurement discipline upon completion. Topics are covered in a mixture of training styles including lecture, hands-on exercises, case studies and discussion.

This class covers the following procedures from [NISTIR 6969](#):

- GLP 1, Quality Assurance of the Measurement Process;
- GLP 9, Rounding Expanded Uncertainties and Calibration Values;
- GMP 11, Assignment and Adjustment of Calibration Intervals for Laboratory Standards;
- GMP 13, Ensuring Traceability;
- SOP 1, Preparation of Calibration Certificates;
- SOP 29, Assignment of Uncertainty; and
- SOP 30, Process Measurement Assurance Program.

Learning Objectives:

At the end of this seminar, participants will be able to:

- IDENTIFY and USE reference materials to ensure good quality, accurate, traceable measurement results;
- EXPLAIN highlights and key concepts of each topic (noted on the [Table of Contents](#) and the detailed [learning objectives](#)) to each other and to your managers and show how these topics fit in to a management system using ISO/IEC 17025 as the basis.
- Have and know how to IMPLEMENT several simple tools, job aids, and references to use and improve your laboratory operations.

Materials & Supplies:

A number of notebooks and course materials will be provided.

Prerequisite(s):

Required prerequisites include having a demonstrated knowledge of basic mathematics (pre-test) and completion of a number of reading assignments. Additional helpful pre-work will be provided by the instructor prior to the seminar to minimize course homework time. Participants must be proficiency in spreadsheet functions and operations and formatting in word processing software.

Pre-Work:

In addition to completing and submitting the Math Exercises, please read:

- “[NPL Beginner’s Guide to Measurement](#)”.
- “[Beginner's Guide to Measurement in Mechanical Engineering](#)”.
- ISO/IEC 17025:2017 "General Requirements for the Competence of Testing and Calibration Laboratories" (you will need to obtain your own official copy of this standard).
- For reference, download NIST Special Publication 811 "[Guide for the Use of the International System of Units \(SI\)](#)"

Pre-Work Deadline:

Submit the math exercises (pre-work) according to instructions by COB on [TBD].

Balance and Scale Calibration and Uncertainties (NIST, Office of Weights and Measures)

*Students must be proficient in English to participate.

This 4-day seminar will cover the calibration and use of analytical weighing instruments (balances and laboratory/bench-top scales), including sources of weighing errors in analytical environments, methodologies for quantifying the errors, and computation of balance calibration uncertainty and global (user) uncertainty. Attention will be given to error sources, selection of reference standards, and various calibration procedures used in the weighing industry. Approximately 50 percent of the time will be spent doing hands-on exercises, calibrating a variety of balances, accumulating data, and developing uncertainty budgets. The focus will then move to the use of balances in an analytical environment and regulatory environment where compliance with pharmaceutical (FDA/ USP) and international requirements will be discussed and practiced. Methodologies for process measurement assurance techniques in analytical weighing will also be covered. Participants will leave with a working skill-set of balance calibration methods, uncertainty estimation, measurement assurance concepts & minimum sample quantity computations that can be applied directly to their calibration and/or use of weighing instruments. This NIST Seminar is designed for beginner to advanced users of balances, metrologists, ISO/IEC 17025 assessors and accreditation bodies, or calibration managers wanting a better understanding of balances and associated uncertainties in organizations where analytical weighing is an integral part of operations. This seminar is limited to 12 participants. All participants will receive a USB stick with a comprehensive collection of national and international references and documents.

Learning Objectives:

At the end of this seminar, using your references and notes, you will be able to:

- SUMMARIZE the principles and concepts of Measurement Traceability, Measurement Assurance, and Measurement Uncertainty.
- EXPLAIN the interrelationships between traceability, measurement assurance, and measurement uncertainty.
- SELECT the appropriate reference standards for the calibration of weighing instruments.
- SELECT the appropriate international or national method/procedure for the calibration and/or use of weighing instruments in the ISO/IEC 17025 or regulatory environment.
- DESCRIBE the NIST Eight-Step Process of Measurement Uncertainty Estimation applied to weighing instrument calibration and/or use
- CONSTRUCT a procedure or outline for a balance calibration.
- BRAINSTORM, CATEGORIZE, and QUANTIFY potential error sources and uncertainty contributors to weighing devices.
- DEVELOP a basic uncertainty budget for weighing devices that is validated with the principles of measurement assurance.
- ESTIMATE the minimum sample quantity for weighing instruments.

Materials & Supplies:

All materials and supplies provided by seminar hosts.

Prerequisite(s):

- Read** Euramet cg-18 before the seminar. The currently published version of cg-18 is found at: [cg-18 PDF](#). After reading Euramet cg-18, it will become obvious that knowledge of basic and some advanced mathematics skills are needed to be successful in the Balance Calibration and Uncertainty Seminar. It is also recommended that you complete the Recommended Math Exercises to enhance your participation in the seminar. These topics will be covered during the seminar; however, early review will increase your understanding of the concepts.
- BALANCE MATH EXERCISES LINK** - **Submit** completed mathematics exercises for which you want feedback to val.miller@nist.gov. The provided feedback will let you know which topic areas need some review.

Pre-Work:

Complete and submit the 'Required To Know' [math exercises](#) that contain evidence of mathematical skills you must have to be successful in the seminar: There is no planned review of these basic mathematics topics during the seminar.