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# Calibration Laboratory Operations

## Course No. 134

**FOR WHOM INTENDED** This course is for individuals who are involved in standards and calibration laboratories and for others who want a clear understanding of the special requirements that must be met by managers and other personnel in standards and calibration work. This two-day course is among those required for TTI's [Metrology Specialist Certificate Program](#).

This course is applicable to individuals from a wide range of industries such as Defense, Manufacturing, Utilities, Electronics, Automotive, Medical, Telecommunications, Computers, Aerospace and Universities.

**BRIEF DESCRIPTION OF COURSE** The course begins with a broad overview of the Metrology discipline, and defines some common terms. It next introduces the statistical concepts that form the cornerstones of modern metrology and calibration. The students are then exposed to statistical management concepts such as Statistical Process Control (SPC) and the Measurement Assurance Process (MAP).

The course then reviews in considerable depth the requirements imposed by ISO standard 17025. Its impact on all aspects of calibration laboratory management is analyzed clause by clause. The role of ISO 9000 quality programs vis-à-vis ISO standard 17025 is discussed.

After a discussion of the staffing requirements of standards and calibration labs, and applicable documentation requirements, the course next reviews measurement uncertainty, and attempts to dispel some of the confusion surrounding this complex subject. Valuable insights into Inter-laboratory testing, calibration and comparison (ILC) will be provided.

The final sections of the course deal with laboratory facilities, equipment and calibration logistics, as well as reporting requirements, ESD control, equipment handling and safety considerations.

**CERTIFICATE PROGRAMS** This course is required for TTI's [Metrology Specialist Certificate \(MSC\) Program](#), and may be used as an elective for any other [TTi specialist certificate program](#).

**PREREQUISITES** There are no definite prerequisites for this course. However, this course is aimed toward individuals involved in a related technical field.

**TEXT** Each participant will receive a bound set of [course notes](#), which contains most of the viewgraphs used during the presentation.

**COURSE HOURS, CERTIFICATE AND CEUs** Open courses meet seven hours per day. Upcoming presentation dates can be found on our current [open course schedule](#). Class hours/days for on-site courses can vary from 14–35 hours over 2–5 days as requested by our clients. Upon successful course completion, each participant receives a certificate of completion and one Continuing Education Unit (CEU) for every ten class hours.

For [schedules](#), [general information](#) and [registration forms](#), see TTI's web site.

### Course Outline

#### Relationship of Metrology and Calibration to Quality System

Methodologies for a Calibration Program • Metrology Glossaries  
International Definitions • ISO 9000 Quality System • Error, Accuracy, Precision • Measurement Uncertainty • Measurement Process  
Calibration Control System • Measurement Assurance Process (MAP)  
Statistical Process Control (SPC) • Check Standards in SPC  
Standard Reference Materials • Quality / Reliability Goals  
Risk Management • Calibration System—Purpose and Justification

#### Calibration System

Government Agencies • History of Calibration Requirements  
Conforming to International Definitions • International Standards  
ISO Standard 17025 Requirements: Management System • Laboratory Procedures • Corrective and Preventive Action • Management Review  
• Technical • Laboratory Personnel Job Description • Test and Calibration Methods • Estimation of Measurement Uncertainty • Measurement Traceability • Sampling • Reporting of Results  
ISO 9000—Accreditation, Certification, Registration • Proficiency Testing

#### Calibration Program and Metrology Management

Program Manager • Technical Management • Quality Manager  
Quality Systems Considerations • Documentation Requirements  
Calibration Control System • Quality / Calibration Manual

#### New Concepts in Metrology

Measurement Uncertainty • Measurement Uncertainty Evaluation  
Standard Uncertainty • Expanded Uncertainty • Glossary • Error Sources  
Type A and Type B Error Evaluation • Confidence Levels  
Measurement Uncertainty Summary • Measurement Assurance  
Inter-Laboratory Testing, Calibration • Inter-Laboratory Comparison (ILC)

#### Administrative Considerations in Metrology

Metrology Personnel: Technicians, Engineers, Management and Support  
Metrology Document Types • Test and Calibration—Procedures

#### Tools of the Metrology Trade

Laboratory Facilities • Floor Space • Equipment • Logistics  
Environmental Control • Recommended Environment for Electrical  
Measurements; for Dimensional Measurements  
Equipment and Measurement Standards • Adequacy of Standards

#### Calibration Logistics

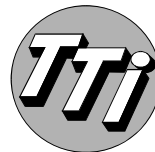
Calibration Intervals • Calibration Status  
Exclusions from Calibration System • Tamper Proof Sealing  
Recall System • Reverse Traceability

#### Reports, Records, Safety and Equipment Handling

Calibration Reports: Requirements • Calibration Records  
ESD Control in the Calibration Laboratory • Safety Considerations  
Precision Equipment Handling/Storage • Preventive Maintenance (PM)  
Ethical Considerations

#### Summary, Discussion

#### Award of Certificates for Successful Completion



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