Laboratory Instrumentation and Calibration Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Modern laboratories depend on high-precision analytical instruments, digital automation, calibration management systems, quality assurance protocols, data integrity practices, metrology standards, and regulatory compliance frameworks to ensure reliable and reproducible results. As laboratories embrace Industry 4.0, smart laboratories, predictive maintenance, digital calibration systems, IoT-enabled instrumentation, and automated data acquisition, the demand for professionals skilled in instrumentation performance verification and calibration management continues to grow.

Laboratory Instrumentation and Calibration Training Course provides participants with practical and theoretical knowledge of laboratory instrumentation, calibration techniques, measurement uncertainty, traceability standards and data integrity requirements. Through practical examples and industry case studies, participants will develop competencies necessary to maintain instrument accuracy, reliability, and regulatory compliance.

Programme Curriculum

Laboratory Instrumentation and Calibration Training Course

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Course Objectives

Upon completion of this course, participants will be able to:

1. Understand modern **laboratory instrumentation technologies** and applications.
2. Apply **metrology principles and measurement science** effectively.
3. Implement **calibration management systems** for laboratory instruments.
4. Establish **measurement traceability** to national and international standards.
5. Evaluate **measurement uncertainty and error analysis**.
6. Conduct **instrument qualification and performance verification**.
7. Develop **risk-based calibration programs**.
8. Ensure compliance with **ISO/IEC 17025, GLP, GMP, and FDA requirements**.
9. Utilize **digital calibration software and electronic records**.
10. Perform **preventive and predictive maintenance strategies**.
11. Improve **data integrity and laboratory quality systems**.
12. Analyze calibration results using **statistical quality control tools**.
13. Optimize laboratory performance through **smart instrumentation and automation technologies**.

Target Audience

1. Laboratory Managers
2. Quality Assurance Professionals
3. Quality Control Analysts
4. Calibration Engineers
5. Instrumentation Engineers
6. Laboratory Technicians
7. Metrology Specialists
8. Regulatory and Compliance Personnel

Course Modules

Module 1: Fundamentals of Laboratory Instrumentation

- Types of laboratory instruments
- Measurement principles
- Instrument performance parameters
- Accuracy, precision, sensitivity
- Instrument selection criteria
- **Case Study:** Instrument selection for a pharmaceutical QC laboratory.

Module 2: Principles of Metrology

- Introduction to metrology

- SI units and standards
- Traceability concepts
- Calibration hierarchy
- International metrology organizations
- **Case Study:** Establishing traceability in accredited laboratories.

Module 3: Calibration Fundamentals

- Calibration concepts
- Calibration procedures
- Calibration intervals
- Calibration documentation
- Acceptance criteria
- **Case Study:** Developing calibration schedules for analytical laboratories.

Module 4: Measurement Uncertainty

- Sources of uncertainty
- Error analysis
- Uncertainty calculations
- Confidence intervals
- Reporting uncertainty
- **Case Study:** Uncertainty evaluation for analytical balances.

Module 5: Calibration of Analytical Balances

- Balance operating principles
- Routine verification
- Weight standards
- Calibration methods
- Performance monitoring
- **Case Study:** Balance calibration failure investigation.

Module 6: Temperature Measurement and Calibration

- Temperature sensors
- Thermocouples and RTDs
- Calibration procedures
- Temperature mapping
- Data logging systems
- **Case Study:** Calibration of laboratory incubators.

Module 7: Pressure and Vacuum Instrument Calibration

- Pressure measurement fundamentals
- Pressure gauges
- Vacuum systems
- Calibration equipment
- Troubleshooting techniques
- **Case Study:** Calibration program for laboratory pressure instruments.

Module 8: pH, Conductivity and Electrochemical Instruments

- pH measurement principles
- Electrode maintenance
- Conductivity standards
- Calibration procedures
- Instrument validation
- **Case Study:** Root cause analysis of pH measurement deviations.

Module 9: Spectroscopic Instrument Calibration

- UV-Visible spectroscopy
- FTIR systems
- Atomic absorption instruments
- Performance qualification
- Calibration verification
- **Case Study:** Qualification of UV-Visible spectrophotometers.

Module 10: Chromatography Instrument Calibration

- HPLC systems
- GC systems
- Detector calibration
- System suitability testing
- Performance verification
- **Case Study:** Calibration strategy for HPLC systems.

Module 11: Instrument Qualification and Validation

- DQ, IQ, OQ, PQ concepts
- Qualification protocols
- Validation documentation
- Regulatory requirements
- Lifecycle management
- **Case Study:** Qualification of a new analytical instrument.

Module 12: Preventive Maintenance and Reliability

- Maintenance planning
- Reliability engineering
- Predictive maintenance
- Failure analysis
- Spare parts management
- **Case Study:** Reducing instrument downtime through predictive maintenance.

Module 13: ISO/IEC 17025 and Regulatory Compliance

- ISO/IEC 17025 requirements
- Laboratory accreditation
- Audit preparation
- Documentation systems
- Corrective actions
- **Case Study:** Accreditation audit readiness assessment.

Module 14: Digital Calibration and Smart Laboratories

- Calibration management software
- Electronic calibration records
- IoT-enabled instruments
- Smart laboratory concepts
- Digital transformation strategies
- **Case Study:** Implementing a paperless calibration system.

Module 15: Advanced Calibration Management and Best Practices

- Risk-based calibration
- Calibration KPIs
- Trending and analytics
- Continuous improvement
- Future laboratory technologies
- **Case Study:** Enterprise-wide calibration optimization program.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com