

TRAINING BROCHURE

Metrology and calibration of mechatronic systems training



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Metrology and calibration of mechatronic systems

Price: € 2,365 excl. VAT *

Duration: 3 consecutive days

Contact: training@hightechinstitute.nl, +31 85 401 3600

Score: 8.5 ★★★★★☆

Intro

This course focuses on the various aspects related to metrology and calibration of precision modules/systems. Participants will acquire theoretical background and practical insights incl. do's & don'ts - both on system design level as on detailed engineering level - related to metrology and calibration that are essential to successfully develop and build precision modules/systems.

If on-site training is not feasible, we will transition to a live, interactive online (virtual) or hybrid format. If this transition is necessary, we will contact you in advance for your approval.

Objective

After completion of the course, the participants understand the basic aspects, risks and concepts related to metrology and calibration and are able to judge solutions and implications on system level.

Intended for

This course is intended for mechatronics designers, system engineers and architects who are involved in the multi-disciplinary development of accurate motion modules/systems in which metrology and calibration play an important role in the overall system accuracy.

Prerequisites: Technical education (BSc or higher), with at least two years of experience and preferably completion of the course "Mechatronics system design" (Metron1&2) or the former Philips-CTT course Metron.

Certified by



Certification

This course is certified by [the European society for precision engineering & nanotechnology \(euspen\)](#) and [the Dutch Society for Precision Engineering \(DSPE\)](#) and leads to the [ECP2-certificate](#).

Course leader

[Dr. Rens Henselmans](#)
[Dr. Adrian Rankers](#)

Trainers

[Dr. Rens Henselmans](#)
[Prof. Jan van Eijk](#)
[Dr. Stefan Bäumer](#)
[Dr. René Klaver](#)
[Jef Horijon MSc](#)
[Dr. Adrian Rankers](#)

** Prices are subject to change. Price correction will be applied at the end of the year.*

Keep me posted



Program

Day 1

Introduction

Metrology definitions

- SI system and traceability
- Definitions (repeatability, reproducibility, uncertainty etc.)
- Components of a measurement system

Short range sensors

- Sensor terminology (range, resolution, sensitivity etc.)
- Sensor types (capacitive, inductive, optical etc.)

Long range sensors

- Displacement interferometry (principle, components, error sources etc.)
- Encoders (theory, various types)

Day 2

Case introduction

- Measurement machine for freeform optics
- Case will be used and developed throughout course
- Analysis of existing solutions
- Performance estimation (uncertainty calculation)

Mechatronic context

- Control theory summary
- Influence of sensor properties
- Influence of sensor placement
- Applying corrections

Metrology on system level

- Design principles for low uncertainty
- Error types
- Rules of Abbe and Bryan
- System loops
- Quantity of concern
- Error budgeting basics

Day 3

System calibration

- Calibration terminology
- Calibration instruments & artefacts
- Self-calibration and reversal techniques
- Application examples
- Use of calibration data

Machine Vision

Case SMT system

- Vision metrology
- Calibration of series products
- Data logistics for field replacement units

Remarks from participants:

- "Most important items I have learned: Broad overview of calibration strategies." > Peter Schaap , ASML
- "Well organized, nice lecturers, good material." > Niels Bosch , ASML