

## Introduction

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Knowledge of the uncertainty of measurement of calibration and testing results is fundamentally important for laboratories, their customers and all institutions using these results for comparative purposes. Competent laboratories know their performance and the uncertainty associated with the results. Uncertainty of measurement is a very important measure of the quality of a result of a calibration or test method.

This course is intended to develop an understanding of uncertainty in calibrations & metrology (including Chemical testing). It helps participants to have an idea of evaluating and calculating uncertainty for laboratories. The participants would know how to develop initial estimates of uncertainty from currently available data as well as how to organize a strategy to systematically evaluate their own calibration and test results. It helps participants to understand the concept of the GUM in application to their calibration or testing.

## Objectives

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The students should accomplish the following objectives by the end of the course:

1. Understand the current application of measurement uncertainty for conformance to ISO/IEC 17025 requirements.
2. Identify international definitions and other terms used in scientific measurement for defining the estimation of uncertainty
3. Reasonable appreciation of the GUM (Guide to Uncertainty of Measurements) applications.
4. Identify the accreditation body requirements for determining expanded uncertainty of measurements.

## Who Should Attend

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Technical Managers, Quality Managers, Laboratory Managers, Supervisors, Signatories of calibration and test reports & certificates, Laboratory Quality Personnel.

## Course Content

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### Day 1

- Programme Overview
- Introduction to Uncertainty of Measurement
  - ISO/IEC 17025 Requirements
  - Signatories Responsibilities
  - Why is uncertainty of measurement important?
- History Pertaining to Measurement Uncertainty
  - Previous Estimating Methods
  - Measurement System
  - Measurement
  - SI System of Units
  - Measurement & Uncertainty of Measurement
- Estimating Measurement Uncertainty
  - Measurement Uncertainty
  - Source of Uncertainty
  - Nomenclatures & Definitions
  - Error vs uncertainty

### Day 2

- Estimating Measurement Uncertainty
  - Statistical Techniques Commonly Use in Estimating Measurement Uncertainty
    - Probability, Population & Normal Distribution
    - Mean, Standard Deviation and Variance
    - Repeatability & Reproducibility
    - Confidence Limits, Criterion of Detection and Limits of Detection
    - Degrees of freedom, Common Types of Distribution Charts

- ESDM & Student's t-Distribution
- Fitted Curves for Some Calibration works
- Partial Differentiation
- ISO Guide to the Expression of Uncertainty of Measurement (GUM)
  - General
  - Terms specific to ISO
  - How to calculate the uncertainty of Measurement
  - Using the GUM method to estimate measurement uncertainty

### Day 3

- Applying the ISO Guide to Uncertainty Calculation
  - Practical considerations
  - Measurement Uncertainty Determination
    - Developing a model for determining measurement uncertainty
    - Establishing sources of uncertainty
    - Uncertainty calculation: standard uncertainties, combined uncertainties, expanded uncertainties
  - Reporting results
  - Practical Guidance on Evaluating Uncertainty Components
- Practical Case Workshop
  - Participants will be guided by a step-by-step determination of all potential input quantities, standard uncertainties, combined uncertainties, expanded uncertainty & final reporting

## Course Presenter

**DR. STEPHEN WONG** – is a Certified Trainer by the HRDCorp. He is an excellent Quality Consultant, trainer and qualified Lead Assessor for both ISO 9000 and ISO/IEC 17025. He is also an effective management trainer. He holds a PhD, MBA degree (University of Wales, UK), Chemistry degree (University Malaya), Diploma in Marketing (CIM, UK) and Certified Diploma in Accounting & Finance (ACCA, UK). He has 35 years of management & training experience, including 25 years in quality training and consultancy.

He was a member (1991-2002) of the Malaysian National Accreditation Council of the Department of Standards Malaysia and still sits on three other national committees on Quality and Environmental in relation to ISO. Mr. Stephen Wong has been a key member of the TC 176 and TC 207 national committees responsible to CASCO for the development of the ISO 9001, ISO/IEC 17025 and ISO 14001 standards and other conformity assessment standards. He is also a member of the IATCA (now IPC) representing MRCA in the development of the ISO 19011 Auditing Standard for the ISO 9000 and the ISO 14000.

## Registration Guidelines & Procedures

1. Early registration is encouraged. Participants shall be registered on a first-come-first-served basis.
2. Register by completing attached form and return by e-mail to [admin@wks-h.com](mailto:admin@wks-h.com)
3. Payment of fee should be made 4 days before course commence.
4. Please made cheque payable to WKS HOLDINGS SDN BHD or transfer the payment to our Public Bank account no: 3078894831 and send us a copy of the transfer slip.
5. Notification of cancellation must be in writing received 4 working days prior to commencement of course (20% of course fee will be retained). Otherwise, full fee will still be charged.
6. WKS reserves the right to cancel or postpone the course in the event of unforeseen circumstances. However, in such an event, participants would be informed as early as it could possibly permit.

## Registration form

Please register the following for the course on "Uncertainty of Measurement"

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

*(please attached extra list if more than two participants)*

**Reminder: Participants need to bring a laptop and scientific calculator.**

Name & Address of Company: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contact Person: \_\_\_\_\_

Designation: \_\_\_\_\_

Tel: No: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Method of Payment:

Please made cheque payable to **WKS HOLDINGS SDN BHD** or transfer the payment to our **Public Bank account no: 3078894831** and send us a copy of the transfer slip.

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**WKS HOLDINGS SDN BHD (198401017072)**

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# UNCERTAINTY of MEASUREMENT

An Appreciation of the Guide to  
Uncertainty of Measurement (GUM)  
Applications to **Metrology and  
Chemical Testing**

## Administrative Details

Date: 6 – 8 May 2024

Time: 0900 – 1700

Venue: Plaza Mayang,  
Petaling Jaya

Fees: RM 1,650 per participant  
HRDCorp Claimable

Organized & Managed by  
**WKS HOLDINGS SDN BHD**



Reg. No.: Q109988-1