

## Introduction

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 testings). 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

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 17025:2005 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

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

## Programme

### Day 1

0900	Programme Overview
0930	Tea Break
1000	Introduction to Uncertainty of Measurement <ul style="list-style-type: none"><li>▪ ISO/IEC 17025:2005 Requirements</li><li>▪ Signatories Responsibilities</li></ul>
	History Pertaining to Measurement Uncertainty <ul style="list-style-type: none"><li>▪ Previous Estimating Methods</li><li>▪ Measurement System</li><li>▪ Measurement</li><li>▪ SI System of Units</li><li>▪ Measurement &amp; Uncertainty of Measurement</li></ul>
	Estimating Measurement Uncertainty <ul style="list-style-type: none"><li>▪ Measurement Uncertainty</li><li>▪ Source of Uncertainty</li></ul>
1230	Lunch
1400	Estimating Measurement Uncertainty (Cont.) <ul style="list-style-type: none"><li>▪ Nomenclatures &amp; Definitions</li><li>▪ Statistical Techniques Commonly Use in Estimating Measurement Uncertainty<ul style="list-style-type: none"><li>- Probability, Population &amp; Normal Distribution</li><li>- Mean, Standard Deviation and Variance</li></ul></li></ul>
	Workshop 1 <ul style="list-style-type: none"><li>- Repeatability &amp; Reproducibility</li><li>- Confidence Limits, Criterion of Detection and Limits of Detection</li></ul>
	Workshop 2 <ul style="list-style-type: none"><li>- Degrees of freedom, Common Types of Distribution Charts</li></ul>
	Workshop 3 <ul style="list-style-type: none"><li>- ESDM &amp; Student's t-Distribution</li></ul>
	Workshop 4
1530	Tea Break
1545	Estimating Measurement Uncertainty (Cont.) <ul style="list-style-type: none"><li>• Fitted Curves for Some Calibration works</li><li>• Partial Differentiation</li></ul>
	Workshop 5
1645	Q & A

### Day 2

0900	ISO Guide to the Expression of Uncertainty of Measurement (GUM) <ul style="list-style-type: none"><li>▪ General</li><li>▪ Terms specific to ISO</li></ul>
	Workshop 6 & 7
1015	Tea Break
1030	Applying the ISO Guide to Uncertainty Calculation <ul style="list-style-type: none"><li>▪ Practical considerations</li><li>▪ Measurement Uncertainty Determination<ul style="list-style-type: none"><li>- Developing a model for determining measurement uncertainty</li><li>- Establishing sources of uncertainty</li><li>- Computing standard uncertainties, combined uncertainties, expanded uncertainties</li></ul></li><li>▪ Reporting results</li><li>▪ Practical Guidance on Evaluating Uncertainty Components</li></ul>
1230	Lunch
1400	Practical Case Workshop <ul style="list-style-type: none"><li>▪ Determination of the length of an object Participants will be guided by a step-by-step determination of all potential input quantities, standard uncertainties, combined uncertainties, expanded uncertainty &amp; final reporting</li></ul>
1530	Tea Break
1645	Continuation of Practical Case Workshop
1700	Q & A

### Day 3

0900	Summary of Measurement Uncertainty Calculation
0945	Tea Break
1000	Case study
1230	Lunch
1400	Summary of Concept
1430	Case study
1530	Tea Break
1600	Discussion
1645	End

## Course Presenter

**STEPHEN WONG** – is a Certified Trainer by the Human Resource Department (HRD) of the Ministry of Human Resource, Malaysia. He is an excellent Quality Consultant and trainer for ISO 9000 and ISO/IEC 17025 for many companies and laboratories. He is also an effective management trainer. He holds a degree in Chemistry (UM), Diploma in Marketing (CIM, UK) and Certified Diploma in Accounting & Finance (ACCA, UK). A qualified Lead Assessor for both the ISO 9000 and ISO/IEC 17025. He did his Business Management Studies in the Cranfield School of Management, UK. He has more than 28 years of management & training experience, including 18 years in quality training and consultancy. He has more than 30 years of working experience, mostly in top management and entrepreneurial development.

He was the Hon. Secretary (16 years) for the Institute of Quality Malaysia, an approved Quality Trainer for SIRIM since 1989 and a Quality and Management Consultant to some companies in Malaysia. He is a Council Member (since 1989) of the Malaysian Institute of Management and is also a well recognized trainer for MIM. He is also the Gen. Secretary of Malaysia Register of Certificated Auditors (MRCA) since its inception in 1998.

## 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 fax or e-mail.
3. Payment by crossed cheque / postal order made payable to WKS HOLDINGS SDN BHD together with registration form, to be received 4 days before course commence.
4. 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.
5. Registration fee is inclusive of course materials, refreshments and lunch.
6. Closing date is 4 days before commencement of the course.

## 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 scientific calculator for this course.**

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

Contact Person: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Tel: No: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

I/We enclosed a cheque no: \_\_\_\_\_ amount to RM \_\_\_\_\_ made payable to WKS HOLDINGS SDN BHD.

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

WKS reserves the right to cancel or postpone the course in the event of unforeseen circumstances.

**WKS HOLDINGS SDN BHD** (129630-A)  
1A-3A, Plaza Mayang, Jalan SS 26/9,  
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# UNCERTAINTY <sup>of</sup> MEASUREMENT

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

## Administrative Details

Date: 11 – 13 August, 2008  
Time: 0900 – 1715  
Venue: Plaza Mayang, PJ  
Fees: RM 1,050 per participant

Organized & Management by



**WKS HOLDINGS SDN BHD**

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