



**Metrology Training  
International Pty Ltd**  
(ABN 60 106 623 116)

**A Technical Training Course  
for Metrologists, especially Staff in Calibration  
and Testing Laboratories.  
Based on the ISO Guide to  
the Expression of Uncertainty in Measurement.**

# **ESTIMATING MEASUREMENT UNCERTAINTY**

The following applies to a 3 day course.  
Shorter duration courses cover  
as much of the material as practicable.

## **COURSE OVERVIEW**

The ISO Guide to the Expression of Uncertainty in Measurement, first published in 1993, is the internationally recognised statement of the methodology of metrological specification and evaluation of measurement uncertainty. It is the result of over a decade of work by the leading international organisations in legal and technical metrology and science.

This course presents an overview of the ISO "Guide to the Expression of Uncertainty in Measurement" and provides a practical approach to calculation of measurement uncertainty and provides invaluable training for calibration staff. It covers the basic process from specification of the measurement model through to evaluation of the final figure of measurement uncertainty. It is a comprehensive course with sufficient depth for calibration and test house staff to be able to make their own estimates of uncertainty of measurement.

## **WHO SHOULD ATTEND**

Professional or experienced technical staff who are required to undertake measurement uncertainty estimation or who are required to oversee this work should attend. Senior staff in accredited laboratories that need to understand uncertainty estimation in order to conform to ISO 17025 should also attend. The course has a practical bias and is suitable for testing laboratories as well as calibration laboratories. It is also suitable for laboratory managers, quality assurance staff and others requiring a general knowledge of how to use the ISO GUM.

## **COURSE DETAILS**

This course runs from 9 am to 5 pm with two tea/coffee breaks and a lunch break each day or equivalent hours as arranged. The fee covers a set of notes and other materials, refreshments at the tea breaks and light lunches.

Course participants are strongly encouraged to bring their own laptop PC with EXCEL or similar spreadsheet otherwise they must bring a battery powered scientific calculator with statistic functions. It is recommended that attendees obtain their own copy of the ISO "Guide to the Expression of Uncertainty in Measurement" and bring this to the course.

The course materials include a CD ROM, containing a text book, proforma spreadsheets, uncertainty freeware and international publications on the ISO GUM.

Many companies require their staff to complete an appraisal of their learning at all courses. Those attendees who complete an end of course test and score a pass will be issued with a Certificate of Completion. All others will receive a Certificate of Attendance.

## **PREREQUISITES**

The course is at graduate level, but is presented in a manner that attendees with experience in and a good understanding of at least one field of testing and who have good basic skills in algebra and numerical calculation will be able to complete the course.

## **THE PRESENTER**

The course is presented by Mr Ron Cook, an experienced metrologist with extensive practical experience in applying the Guide to many fields of precision measurement. He is a Chartered Professional Engineer, an Honorary Fellow of the Metrology Society of Australia and a member of the Instrument Society of America. He has worked in the aircraft industry, defence research and for over 20 years in the CSIRO National Measurement Laboratory. Mr Cook has presented uncertainty estimation courses to a wide range of staff throughout Australia, Asia and South Africa. In 2003 he retired from CSIRO and founded Metrology Training International Pty Ltd, a company devoted to technical training for metrologists. Courses have since been presented throughout Australasia.

## **COURSE OUTLINE**

### **DAY 1**

Introductory comments and background information covering the ISO Guide. Review of nomenclature and definitions. The prime sources of uncertainty and their nature. Statistics for the metrologist. Worked examples using own notebook computer or calculator. Creating simple measurement models. Calculation of standard uncertainties, combined and expanded uncertainties. Class exercises in uncertainty estimation. Reporting uncertainty.

### **DAY 2**

More advanced concepts, including degrees of freedom, Student's t distribution and its application, correlation, higher order terms, asymmetric distributions. Further class exercises, illustrative examples and more complex exercises. The CD ROM contents. Revision exercise.

### **DAY 3**

Review of revision exercise. Monte Carlo calculations. Further class exercises and worked examples. Course revision. Proficiency appraisal test. Note: Examples relevant to the client's industry will be presented following generic simpler examples.

## **OTHER COURSES:**

**A detailed proposal will be forwarded with a quote on request.**

## **COURSE FEES:**

**Depends on Client requirements. No obligation quotes given.**

**Download a quotation request form from the MTI web page:** <http://www.uncertainty.com.au>

**or contact:** Mr Ron Cook, Metrology Training International, Tel 613 9504 3479, Fax. 613 9504 347 or

E-mail: [mettrain@optusnet.com.au](mailto:mettrain@optusnet.com.au)