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Chapter 1 : ME MM Notes, METROLOGY AND MEASUREMENTS Lecture Notes â€“ MECH 5th SEM Anr

Metrology is the science of measurement. It establishes a common understanding of units, crucial in linking human activities. Modern metrology has its roots in the French Revolution's political motivation to standardise units in France, when a length standard taken from a natural source was proposed.

This page is the first part of a series of pages explaining the science of good measurement. Uncertainty Budgets , Part 4: The use of the word about implies there is some uncertainty in your estimate. In metrology we must always consider this uncertainty when making a measurement. Confidence in Measurements Related to uncertainty is the concept of confidence. This is assigning limits to our uncertainty. We would be more confident in saying that the bolt is mm plus or minus 10 mm than we would be in saying it is within 5 mm. In metrology we must be very clear about the level of our uncertainty at a given confidence level. We can carry out an uncertainty evaluation which includes analysis and experiments to determine the uncertainty of a measurement. Most uncertainties follow the normal distribution. Many Variable Quantities are Distributed Normally: When parts are manufactured the machines are set and the finished parts are checked using measurements. By using the same standards of measurement we know that a nut made in China will fit to a bolt made in the USA. Calibration is the way that the standards are transferred from one country to another, and from one instrument to another. The primary reference standards for the SI units of measurement are held in France and each country compares their national standards against these. Calibration simply means comparing one measurement with another. For example when a ruler is made it might be compared with a reference ruler to determine where the markings are positioned. This is a simple calibration. The markings will not be at exactly the same positions as the ones on the reference ruler; there will be some uncertainty in the calibration process. The reference ruler itself will also not have markings at exactly the right positions since there was some uncertainty when it was calibrated. The ruler has uncertainty from both the reference standard used to calibrate it and from the calibration process, therefore an instrument must always have a greater uncertainty than the instrument which was used to calibrate it. When an instrument is calibrated the uncertainty of the calibration should always be evaluated. Uncertainty of measurement is inherited down the chain of calibrations so that uncertainty increases the further we get from the primary reference standard. Traceability from the primary reference, through accredited metrology laboratories and on to industrial metrology departments ensures that we are all working to common standards and know the uncertainty of measurements. Accuracy, precision and trueness Within MSA accuracy is defined as the sum of trueness and precision. Precision describes how closely repeated measurements of the same quantity show the same results. Repeatability measures how the results of a measurement vary when the measurement is repeated under the same conditions and within a short period of time. Reproducibility measures how the results of a measurement vary when the measurement is repeated under changed conditions and over long periods of time. This is be explained in detail over the next pages. There are some simple rules which allow us to state, at a given statistical confidence level, whether a measurement proves or disproves conformance. It is also possible that the result may be inconclusive in which case we may wish to make further measurements with reduced uncertainty. In order to prove conformance, at a given confidence level, we must add the expanded uncertainty U , at that confidence level, to the LSL and subtract the expanded uncertainty from the USL. This site uses cookies. By continuing to use this website, you agree to their use. To find out more, including how to control cookies, see here: Cookie Policy Search for:

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Chapter 2 : Industrial Metrology | The Sempre Group

introduction to measurements will be a general description of what measurements means and then of course, we will later look at what mechanical measurements are. When you do any measurement, in whatever field it is, the measurement process is prone to some.

What is Metrology written by: Do you know what the distance is between the earth and the sun in millimeters? These are questions that can only be answered if you learn more about metrology. This study covers both the experimental and theoretical aspects of measurement and the determination of the levels of uncertainty of these aspects. The study of measurement is a basic requirement in any field of science and technology, most importantly in engineering and manufacturing. Since metrology is the study of measurement, it is expected to enforce, validate and verify predefined standards for traceability, accuracy, reliability, and precision. All of these are factors that would affect the validity of measurement. Although these standards vary widely, these are mandated by the government, the agencies, and some treaties. Consequently, these standards are verified and tested against a recognized quality system in calibration laboratories. The experimental aspect of metrology is that which deals with the investigation of the relationship among variables. These variables are established depending on set of observations being considered or classified. As such, it is in this aspect that hypotheses are established and tested. On the other hand, the theoretical aspect of metrology deals with the various concepts and principles underlying the study. This aspect is based on established theories and concepts which are derived from empirical observations which satisfy the baseline requirements. In other words, the theoretical aspect is expected to be functional and working. In order to thoroughly grasp the concept of measurement, metrology is divided into three subfields. These three subfields in metrology are: Each of these subfields is distinctly different from the other. Scientific or Fundamental Metrology. This subfield deals with the establishment of units of measurement, unit systems, and quantity systems. The units of measurement sets standards adopted conventionally and by law, of the definite magnitude of a physical quantity. On the other hand the units systems are composed of the traditional systems, metric systems, and the natural systems. There are also some unit systems that are derived from a set of fundamental units. The quantity systems are the standard systems used in the control of measure, net weight, or number of constant quantity packed goods. Moreover, scientific metrology goes beyond than just the establishment of units, and includes the realization of these standards to the users in the society; and the development of new methods in measurement. Applied or Industrial Metrology. Applied metrology is rather specific in its applications, which are primarily various industrial processes including manufacturing among others. This metrology subfield intends to establish the importance of measurement in the industry. Moreover, it also ensures the appropriateness of measurement instruments including the maintenance, quality control, and proper calibration of these instruments. For the protection of life, the environment, health, and public safety, regulatory requirements of measurement and measurement instruments have to be looked after. These are the concerns of legal metrology. With the objective of regulating appropriate rules and regulations pertaining to measurement, and measurement instruments as well; the consumers are definitely protected and guaranteed that fair trade is observed.

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Chapter 4 : What is Metrology? What Does Metrology Mean?

Engineering Metrology and Measurements is a core subject for mechanical, production, and allied disciplines in all the major universities in India. Although there are a few good books.

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Chapter 5 : METROLOGY & MEASUREMENT - BEWOOR - Google Books

Engineering metrology is restricted to the measurement of length, angles and other quantities which are expressed in linear or angular terms. For every kind of quantity measured, there must be a unit to measure it.

Chapter 6 : Metrology and Measurement Systems

OBJECTIVES: To provide knowledge on various Metrological equipments available to measure the dimension of the components. To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

Chapter 7 : Key Principles in Metrology and Measurement Systems Analysis (MSA) - Dr Jody Muelaner

Metrology and measurement in general Including measuring instruments in general, preferred numbers, standard measures, general aspects of reference materials, etc. Quantities and units, see

Chapter 8 : 17 - Metrology and measurement. Physical phenomena

Metrology is the science of measurement and is important in areas such as science, manufacturing and trade. Metrology enables us to know the accuracy of measurements and to ensure common standards are used.

Chapter 9 : Metrology - Wikipedia

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