Presentation On

Engineering Metrology/ME401B (R16)

UNIT – I / Introduction

Presenter

Dr. Reddy Sreenivasulu

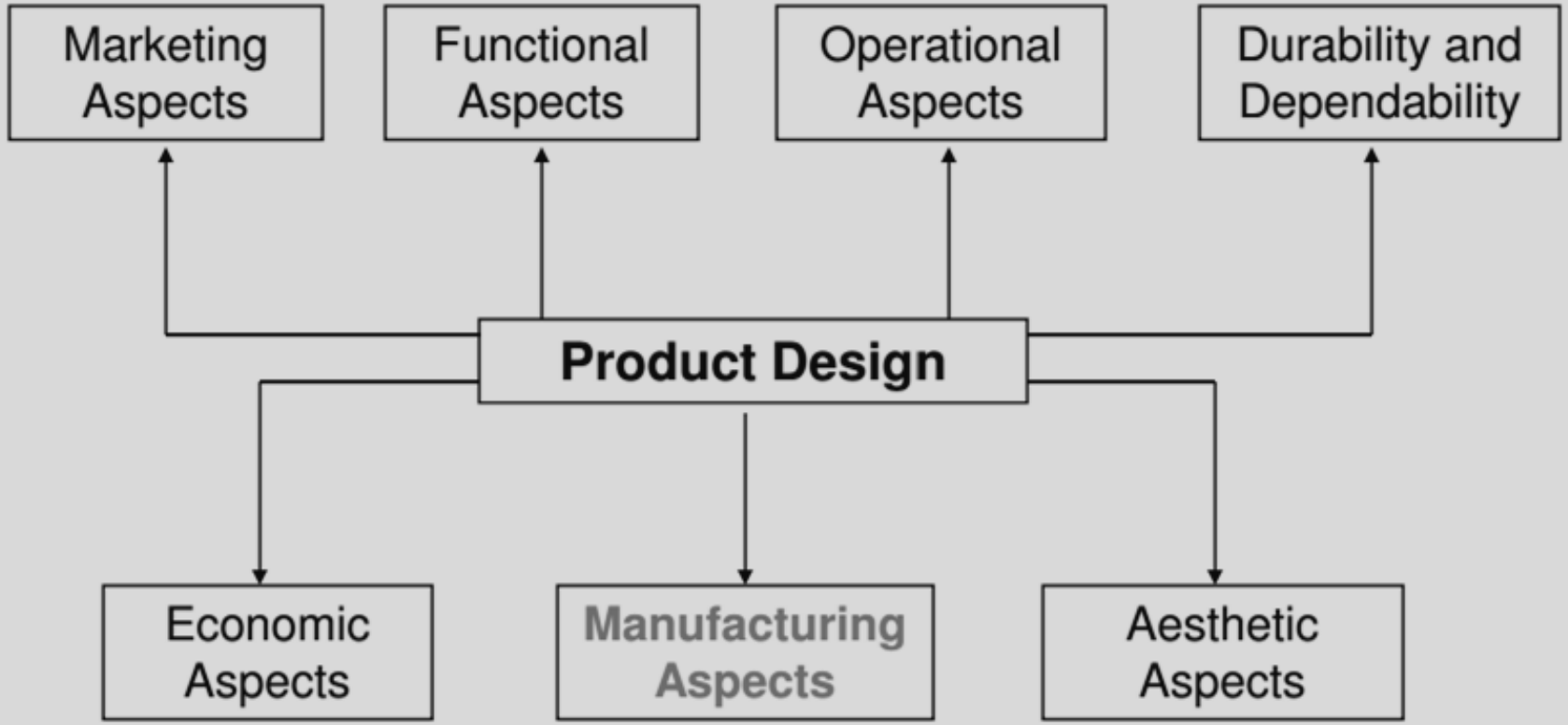
B.Tech(NITW), M.E(OU),Ph.D(AU)

Department of Mechanical Engineering

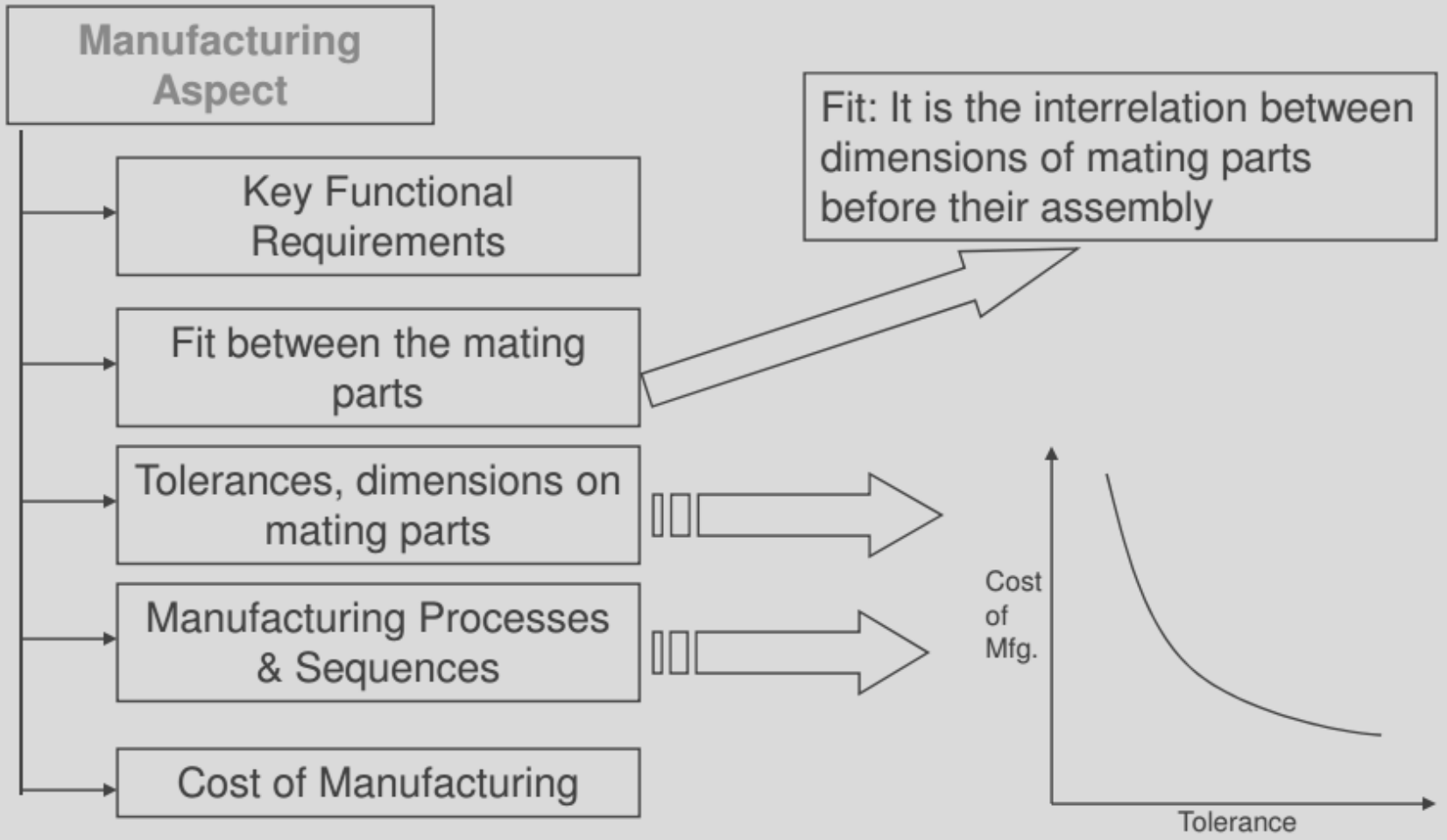
R.V.R & J.C. College of Engineering (Autonomous)

Guntur, Andhra Pradesh, India.

Product Design for Manufacturing

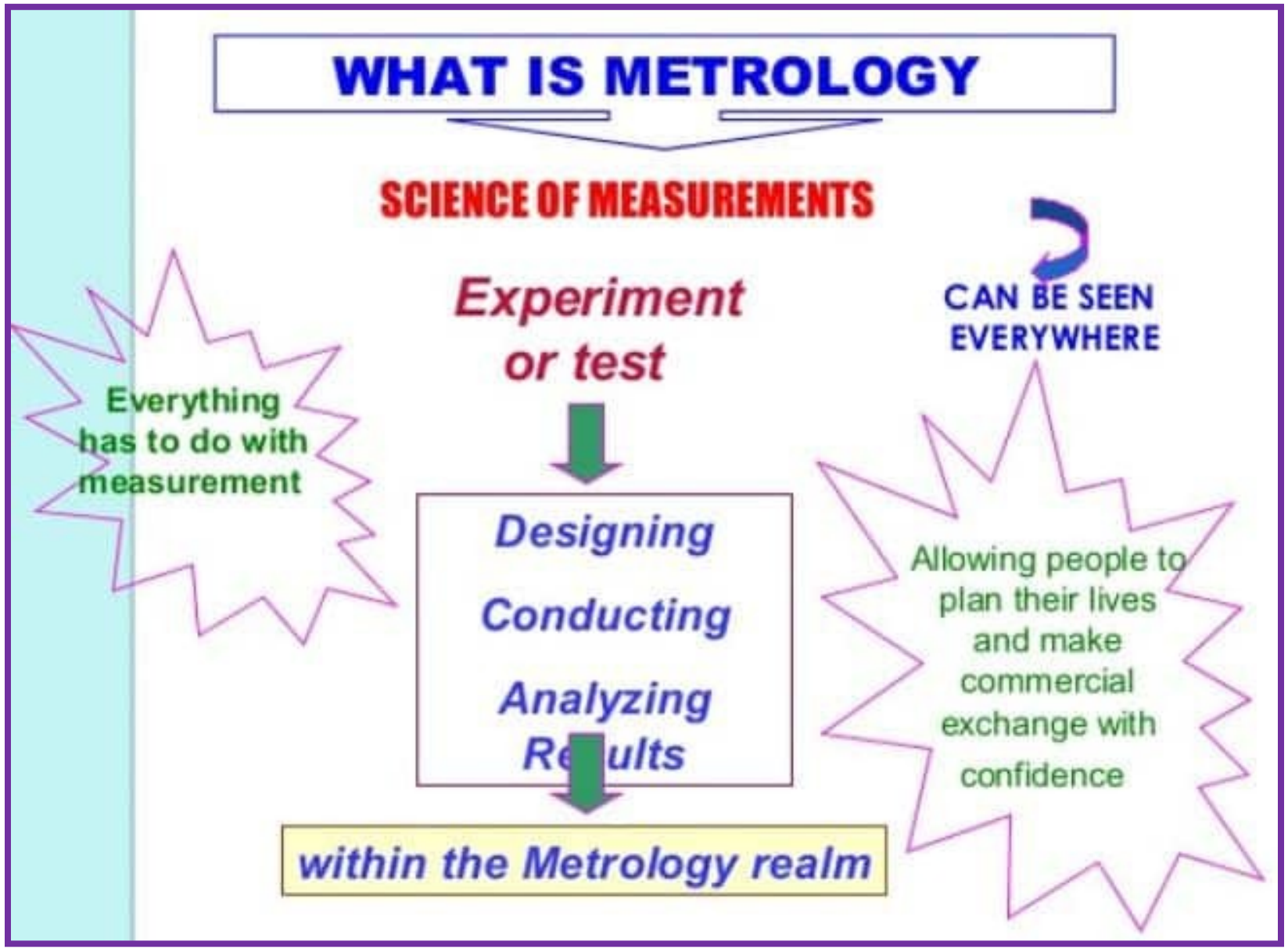


Role of Metrology in Design for Manufacturing



Need of Inspection

- To ensure the material, parts and components conform to the established standards
- To meet the interchangeability of manufacture
- To provide the means of finding the problem area for meeting the established standards
- To produce the parts having acceptable quality levels with reduced scrap and wastage
- To purchase good quality of raw materials, tools and equipment that govern the quality of finished products
- To take necessary efforts to measure and reduce the rejection percentage
- To judge the possibility of rework of defective parts


WHAT IS METROLOGY
SCIENCE OF MEASUREMENTS
Experiment or test
CAN BE SEEN EVERYWHERE
Everything has to do with measurement
Designing
Conducting
Analyzing
Results
Allowing people to plan their lives and make commercial exchange with confidence
within the Metrology realm

Definition

- ***Metrology*** is the name given to the science of pure measurement.
- ***Engineering Metrology*** is restricted to measurements of length & angle
- Measurement is defined as the process of numerical evaluation of a dimension or the process of comparison with standard measuring instruments

Needs of Measurement & Metrology

1) To determine the true dimensions of a part.
2) To convert physical parameters into meaningful numbers.
3) To test if the elements that constitute the system function as per the design.
4) For evaluating the performance of a system.
5) To ensure interchangeability with a view to promoting mass production.
6) To establish the validity of design and for finding new data and new designs
7) To ensure that the part conforms to established standard
8) To meet interchangeability of manufacture
9) To maintain customer relations
10) To find shortcomings in manufacture
11) Helps to purchase good quality of raw materials
12) Helps co-ordination of different departments
13) To take decision on defective parts

Objectives of Measurement & Metrology

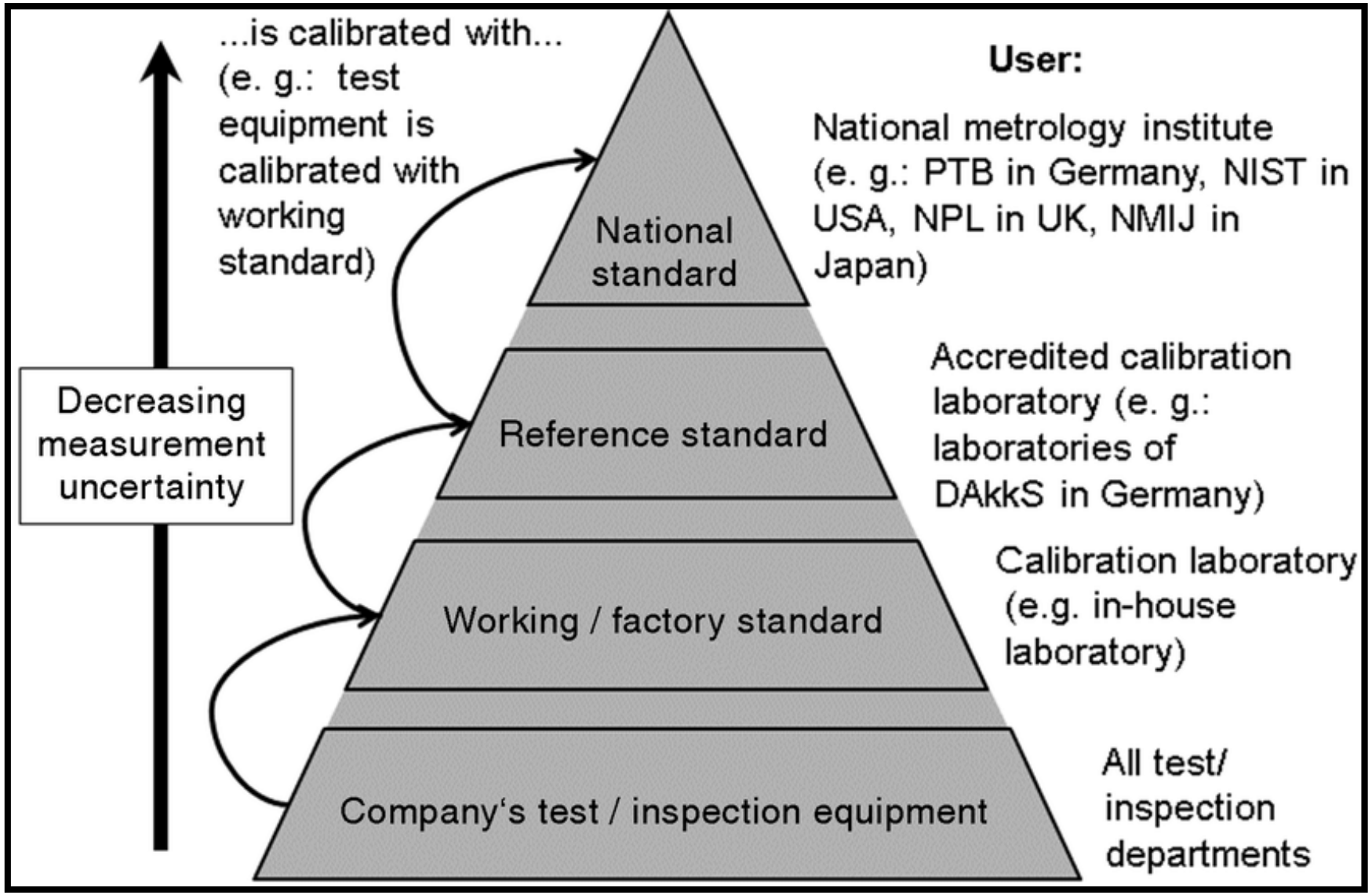
- Although the basic objective of a measurement is to provide the required accuracy at a minimum cost, metrology has further objectives in a modem engineering plant with different shapes which are:
  - To minimize the cost of inspection by efficient and effective use of available facilities,
  - To minimize the cost of rejection and re-work through application of statistical quality control techniques.
  - To maintain the accuracies of measurement.
  - To determine the process capabilities and ensure that these are better than relevant component tolerances.
  - To do complete evaluation of newly developed products.

Elements of Metrology

- Standard
  - The most basic element of measurement is standard without which no measurement is possible.
  - **Standard is a physical representation of unit of measurement.**
  - Different standards have been developed for various units including fundamental units as well as derived units.
- Workpiece
  - Workpiece is the object to be measured/measured part
  - Variations in geometry and surface finish of the measured part directly affect measuring system's repeatability
  - Compressible materials like plastic or nylons pose a different type of problem that any gauge pressure will distort the material. This can be avoided by fixing of gauging pressure as suggested by the industry so that everyone will get uniform results

Effects of elements of metrology on Precision and Accuracy

- Factors affecting the standard of measurement
  - Coefficient of thermal expansion
  - Elastic properties of a material
  - Stability with time
  - Calibration interval
  - Geometric compatibility
- Factors affecting the workpiece to be measured
  - Coefficient of thermal expansion of material
  - Elastic properties of a material
  - Cleanliness, surface finish, surface defects such as scratches, waviness etc.,
  - Adequate datum on the workpiece
  - Thermal equalization


...is calibrated with... (e. g.: test equipment is calibrated with working standard)
Decreasing measurement uncertainty
National standard
Reference standard
Working / factory standard
Company‘s test / inspection equipment
User:
National metrology institute (e. g.: PTB in Germany, NIST in USA, NPL in UK, NMIJ in Japan)
Accredited calibration laboratory (e. g.: laboratories of DAkkS in Germany)
Calibration laboratory (e.g. in-house laboratory)
All test/ inspection departments


THANKS
Any Questions
You can find me at rslu1431@gmail.com
OR rsreenivasulu@rvrjc.ac.in