

DIM-IND-xxx Metrology

SEMESTER: Fall
CREDITS: 4,5 ECTS (3 hrs. per week)
LANGUAGE: English
DEGREES: IEM

Course overview

This course is an introduction to metrology. It gives an overview on uncertainty calculations and focus on dimensional and geometrical metrology focus on GPS standardization.

Prerequisites

Basic knowledge of statistics and technical drawing.

Course contents

Theory:

1.- Principles of Metrology. International System of Units. Definition of the fundamental Units. Royal Decrees [Regulations published by Executive Order]. Standardized notation. Main metrological vocabulary and concepts (VIM).

2.- Industrial Metrology. Dimensional measurement instruments and its metrological characteristics. Direct and Indirect Measurements. Measurement with basic systems. Tolerancing assessment. Dimensional tolerancing. ISO system. Geometrical tolerancing and form features. Classical systems of control. Microgeometrical tolerancing and waviness. Roughness standards. Nanometrology. Screw tolerancing. Gear tolerancing. Basic control processes.

3.- Scientific metrology. Trazability concepts, calibration and industrial verification fundamentals. National basic unit measurement standards . National Measurement Institutes. Dimensional Metrology Standards. Flatness datums and length measurement standards. Measurement datums. Calibration concept. Calibration System coherence.

4.- Legal Metrology. Definitions and concepts. OIML recomendations. Notified institutions. Metrological control institutions. Metrological verification institutions.

5.- Measurement variability. Control process uncertainty budget. Error causes in measurement. Uncertainty concept. Type A and B uncertainty contributions. Measurement corrections. GUM uncertainty budget.

6. Dimensional metrology quality. Quality assesment in a laboratory (ISO 17025). Organization of a dimensional metrology laboratory. Intercomparisons and result trazability. Standardization, certification and acreditation on Dimensional Metrology Laboratories. International and national comittees. Metrological reality for Spain and other countries.

Laboratory:

There will be six 2-hour sessions .

- P1.** Geometrical lab. Practices (profilemetry and roughness)
- P2.** Geometrical lab. Practices (vision machine and form measurement)
- P3.** CMM off line

- P4.** CMM on line
- P5.** Calliper calibration
- P6.** Screw measurement.

Textbook

- VIM and GUM

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade in the final exam of 4 over 10.

The overall grade is obtained as follows:

- Exams 60%.
- Continuous evaluation, homework, lab 40%.