Experimental techniques in industrial metrology

Academic Year: (2022 / 2023) **Review date: 08-07-2022**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: SAN ROMAN GARCIA, JOSE LUIS

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students must be familiar with industrial manufacturing process and measuring procedures of physical magnitudes.

OBJECTIVES

Competences acquired by the student:
- Understand the importance of error and uncertainty in the expression of a measure.
- Analyze the components of error and uncertainty of a measurement.
- Calculate the uncertainty of an instrument or a process and propagate it for an industrial use.
- Analyse the uncertainty of the measuring instrument with respect to the manufacturing tolerances in an industrial process.
- Connect industrial metrology to the implementation of quality systems in industrial and commercial procedures taking into account legal and regulatory requirements.

Learning outcomes acquired by the student:
With the skills indicated the student will become aware of the importance of the implementation of metrology in any measurement process, considered in all the quality systems carried out in the industrial activities.

DESCRIPTION OF CONTENTS: PROGRAMME

Lecture 1: Introduction to the subject.

Lecture 2: "Measurement Systems. Concepts metrology".
2.1. Metrology: definitions.
2.2. Metrology concepts.
2.3. Fundamental concepts of a measurement device.
2.4. Standardization metrology and instrument classes.

Lecture 3: "Calculus of uncertainties".
3.1. Uncertainty model.
3.2. Calculus methods: propagation and Monte Carlo.
3.3. Relationship between Tolerance and Uncertainty.
3.4. Standard documents: GUM, EAL-R2, EA4-02.

Lecture 4: "Selection of a measurement device".
4.1. Selection according to its maintenance.
4.2. Selection according to its calibration.
4.3. Development of the measurement function.

Lecture 5: "Metrology and Quality".
5.1. Metrological systems function and ISO 9000 quality plan calibration.
5.2. Metrological confirmation. Design and implementation of systematic calibration, verification and validation.

LEARNING ACTIVITIES AND METHODOLOGY

The learning activities include:

- Theoretical Lectures, with the concepts the students should acquire. To facilitate their development the students have in Aula Global lecture notes and reference texts so they can follow the classes and

develop further work.

- Lectures of practical exercises in which they will have to apply concepts taught in theoretical lectures for a practical case. The work will be presented in class.

The lectures cover a total of 1,5 ECTS credits.

- Laboratory practices, where the student experimentally verifies the concepts and theoretical results seen in class.

- The working group will be composed by a maximum of 4 students.

The laboratory and the work exhibition cover 1,5 credit ECTS.

ASSESSMENT SYSTEM

The evaluation system includes continuous assessment of the students´ work and evaluation through a final written exam that will comprehensively evaluate the knowledge and skills acquired throughout the course.

The shares are 60% for the continuous evaluation and 40% for the written exam.

The extraordinary evaluation will be graded with an exam computing the 100%

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- CTI Reseau-Centres Techniques Industriels. Metrología. Práctica de la medida en la industria, AENOR Internacional, S.A.U., 1999.
- AENOR. UNE-EN ISO 10012 Sistemas de gestión de las mediciones. Requisitos para los procesos de medición y los equipos de medición, AENOR, 2003.
- JCGM 106. Evaluation of measurement data - The role of measurement uncertainty in conformity assessment, Joint Committee for Guides in Metrology, 2012.