Experimental Mechanics

Academic Year: (2019 / 2020) **Review date: 18-12-2019**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: SAN ROMAN GARCIA, JOSE LUIS

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

MACHINE DESIGN

OBJECTIVES

By the end of this subject, students will be able to have:
1.- Understand the specific technical structure and theoretical-technical bases, as well as the key concepts and aspects, of metrology.
2.- Knowledge of the fundamentals of metrology that includes the contribution to the development of this science at the forefront scientific knowledge.
3.- The ability to apply their knowledge and understanding to identify, formulate and solve design problems of a measurement chain.
4.- A systematic understanding of the different methods for calculating uncertainties of a measurement system and the ability to use them.
5.- The ability to design measurement chains and conduct experimental tests, interpret the data and draw conclusions.
6.- Workshop and laboratory skills in the testing of machines.
7.- The ability to select and use measuring equipment appropriate to the specific objectives of an experimental test.
8.- An understanding of test methods and techniques applicable in machine testing and their limitations.
9.- Function effectively as an individual and as a member of a team.

DESCRIPTION OF CONTENTS: PROGRAMME

1: Introduction

2: Measuring Systems. Concepts of Metrology "
2.1. Metrology: definitions.
2.2. Concepts and measures.
2.3. Fundamental concepts of a measurement chain.

3: "Calibratión and uncertainty. "
3.1. Introducción.
3.2. Calibration.
3.3. Uncertainty.
3.4. Results of calibration.

4: Design of a chain of measurement "
4.1. Design with a view to its maintenance.
4.2. Design with a view to their calibration.
4.3. Development of the measuring function.

5: "Experimental techniques in mechanical engineering extensometry. Application to the monitoring of fatigue tests"
5.1. MESURE OF DEFORMATION
5.1.1. Introduction
5.1.2. Electrical strain gauge
5.1.3. Types of strain gages
5.2. RECOMMENDATIONS, PROCEDURES AND CRITERIA FOR THE SELECTION OF GAGE

5.2.1 Introduction
5.2.2 Selection Parameters Banda
5.2.3. Selection Procedures Bands
5.3. SURFACE PREPARATION FOR THE ACCESSION OF GAGE
5.4. TECHNICAL GAUGES
5.4.1. Wheatstone Bridge
5.4.2. Balanced bridge
5.4.3. Calibration
5.4.4. Setting the active branches
5.4.5. Determination of the principal stresses
5.4.6. Temperature compensation

Item 6: "Experimental techniques in mechanical engineering: Photoelasticity."
6.1. Photoelasticity
6.1.1. Dimensional elasticity in Cartesian coordinates
6.1.1.1. Plane strain state
6.1.1.2. Curves representative of a plane elastic state:
Isostatic
Isoclines
Isochromatic
6.1.2. Theory of Photoelasticity
6.2. INTRODUCTION TO THE STRESS ANALYSIS METHOD PHOTOSTRESS

Practice No. 1: Experimental methods in mechanical engineering. Determination by gage techniques, stress and strain in mechanical. "

Practice No. 2: Experimental methods in mechanical engineering. Determination by photoelastic techniques, stress and strain in mechanical. "

LEARNING ACTIVITIES AND METHODOLOGY

Lectures, classroom exercises and / or laboratories and individual work.

ASSESSMENT SYSTEM

The student will be evaluated using the criteria of Bologna. Specifically individually scored the work done by the student during the course related to this matter. The attendance to the practices and the presentation of the corresponding work is obligatory condition to be able to appear to exam. The final exam will have a weight of 50% in the final grade.

WORK REQUIREMENT (assessment)
1. MUST BE A WORK RELATED TO THE MATERIALS DEVELOPED IN THE COURSE. THE WORK MAY BE SUBJECT FOR STUDENT (CONSENSUS WITH THE COORDINATOR OF COURSE) OR FOCUS ON THE FOLLOWING:
a. Sources of uncertainty in experimental methods. Identification and quantification of the same document according to CEA-ENAC-LC/02 (www.ENAC.es). Design of a measurement chain.
2. The work consists of:
a. REPORT ON THE SUBJECT PROPOSAL WILL minimum content:
i. INTRODUCTION.
ii. OBJECTIVES.
iii. DEVELOPMENT
iv. CONCLUSIONS
v. REFERENCES (must measure the timeliness of bibliographic sources consulted and proper referencing throughout the development of the report)
b. POWER POINT PRESENTATION FORMAT maximum of 15 minutes.
3. THE WORK MAY BE MADE IN GROUPS OF TWO STUDENTS.

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- JCGM 106 Evaluation of measurement data ¿ The role of measurement uncertainty in conformity assessment, Joint Committee for Guides in Metrology, 2012
- Karl Hoffmann An Introduction to Measurements using Strain Gages, Hottinger Baldwin Messtechnik GmbH, 1989