Experimental techniques and test virtual machine

Academic Year: (2021 / 2022) **Review date: 15/06/2021 17:08:49**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: SAN ROMAN GARCIA, JOSE LUIS

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

The previous training as ingeneer in the industrial and production field

OBJECTIVES

In this course, the following skills of the engineering studies will be promoted:
- Improve the knowledge of mathematical methods, analytical, numerical and experimental aspects of engineering machines.
- Design, calculate and product design with the knowledge and control of the uncertainty.
- Apply the acquired knowledge and solve problems in new or unfamiliar environments within broader contexts and multidisciplinary environments.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Stress analysis and fatigue design methods by MEF.
2. Methodology for quantifying uncertainties in MEF methods. Application to the design of virtual laboratories
3. Concepts of metrology. Relationship between uncertainty and tolerance design.
4. Experimental techniques in mechanical engineering: extensometry. Monitoring application to fatigue tests.
5. Experimental techniques in mechanical engineering: photoelasticity. Monitoring application to fatigue tests.
6. Design of static and dynamic test machines controlled metrological quality.

LEARNING ACTIVITIES AND METHODOLOGY

The training activities include:
- Lectures, where knowledge that students should acquire are presented. To facilitate their development students receive class notes and have basic reference texts that facilitates follow lessons and develop further work.
- Performing related to the topic of the subject requiring the application of the concepts acquired works.
- Lab, where students experimentally verify the theoretical concepts and results seen in class.
- Lab in computer classroom, where you work with high-level programs that address the issues raised in the subject.

ASSESSMENT SYSTEM

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

The evalauation of the student is performed on attendance, practices, work and exam. It is compulsory to present a work related to the topics covered in lectures or other issues related to fatigue or test calculation of interest for the student.
The rating of the subject is distributed among the exam, the work and practices. The shares allocated will vary, depending on the extent and / or difficulty of the work used for the continuous assessment in the ranges: 40% -70% (work) and 60% -30% (exam).
It is required that the grade of the exam is superior to 3.5/10 in order to pass.
In the extraordinary exam, the work can also be presented with the percentages of the ordinary call

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plus the exam. The exam can also will count the 100% of the grade. The final grade will be the maximum of the two possibilities.

BASIC BIBLIOGRAPHY

- null Notes of the subject published in Aula Global, UC3M.

ADDITIONAL BIBLIOGRAPHY

- null Errors Due to Misalignment of Strain Gages., Micro-Measurements, V. Tech Note TN-511, 2010

- null Errors Due to Transverse Sensitivity in Strain Gages., Micro-Measurements, V. Tech Note TN-509, 2010

- null Errors Due to Wheatstone Bridge Nonlinearity., Micro-Measurements, V. Tech Note TN-507-1, 2010

- null Evaluation of measurement data. Supplement 1 to the ¿Guide to the expression of uncertainty in measurement¿. Propagation of distributions using a Monte Carlo method, Joint Committee for Guides in Metrology, 2008

- null GUM Evaluation of measurement data ¿ Guide to the expression of uncertainty in measurement, JCGM 1002008, 2008

- null Shunt Calibration of Strain Gage Instrumentation., Micro-Measurements. Tech Note TN-514, 2004

- Hills, R.G., and Trucano, T.G. Statistical validation of engineering and scientific models: Background., Sandia Natl. Lab., 1999

- null Strain Gage Thermal Output and Gage Factor Variation with Temperature., Micro-Measurements, V. Tech Note TN-504-1, 2010

- Montero, W., Farag, R., Díaz, V., Ramirez, M., and Boada, B.L. Uncertainties associated with strain-measuring systems using resistance strain gauges, J. Strain Anal. Eng. Des., 2011

- Oberkampf, W.L., and Barone, M.F. Measures of agreement between computation and experiment: Validation metrics., J. Comput. Phys., 2006

- Watson, R.B. Bonded Electrical Resistance Strain Gages,, Springer, Boston, MA, , 2008

- null The Three-Wire Quarter-Bridge Circuit., Micro-Measurements, V, 2010