Advanced techniques in mechanical engineering design

Academic Year: (2021 / 2022) **Review date: 02/06/2021 11:27:46**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: MUÑOZ ABELLA, MARIA BELEN

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

The previous training as ingeneer in the industrial and production field

OBJECTIVES

SPECIFIC
-Geometric analysis capability , manufacturing and technological characteristics of a mechanical assembly for design.
-Knowledge and use of solid modeling software.
-Knowledge of heuristics and approximate solutions for solving optimization problems in mechanics.
-Ability to identify and apply the methods and techniques most appropriate in mechanical optimization.
- Ability to use optimization softwares.

GENERAL
- Apply the acquired knowledge and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts environments.
- Ability of analysis and synthesis , organization and planning , abstraction and deduction.
- Ability to propose original solutions to an engineering problem in the field of machines or transport.
- Evaluate the performance and impact of a particular technology in the field of machine engineering or transport.

DESCRIPTION OF CONTENTS: PROGRAMME

-Introduction to computer aided design .
- Design and virtual modeling of mechanical assemblies .
- Design of mechanical elements using finite element method .
- General concepts of optimization.
- Methods of local optimization
- Methods of global optimization . Genetic algorithms .
- Other optimization techniques. Neural Networks.

LEARNING ACTIVITIES AND METHODOLOGY

-Lectures: 2 ECTS . To achieve the skills of the subject .
- Practical classes : 2 ECTS . To start developing skills.
-Practical Project : 1.5 ECTS . Selfmade work to complete and integrate the development of all skills in solving a case .
- Final exam: 0.5 ECTS .Too assess the knowledge acquired.

ASSESSMENT SYSTEM

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

- Classroom performance: 25 %
- Project: 25 %

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

- Final exam: 50 %

It is required that the grade of the exam is superior to 3.5/10 in order to pass.
In the extraordianry call we follow the general UC3M exams normative

BASIC BIBLIOGRAPHY

- A. C. Ugural MECHANICAL DESIGN: AN INTEGRATED APPROACH, McGraw-Hil, 2004

- Charles E. Knight THE FINITE ELEMENT METHOD IN MECHANICAL DESIGN, PWS-KENT Publishing Company, 1993

- D. G. Ullman THE MECHANICAL DESIGN PROCESS, McGraw-Hil, 2002

- Goldberg, D Genetic algorithms in search, optimization and machine learning, Addison-Wesley. , 2003

- Haykin,S.. Neural Networks. A comprehensive foundation. , Prentice Hall. , 1994

- J. Arora Introduction to optimum design, Elsevier, 2004

- O.C. Zienkiewicz, R.L. Taylor EL MÉTODO DE LOS ELEMENTOS FINITOS, CIMNE, 2004

- Rao, S. Engineering Optimization. Theory and Practice., John Wiley&Son, 1996

- Singiresu S. Rao THE FINITE ELEMENT METHOD IN ENGINEERING, Elsevier Inc, 2005

BASIC ELECTRONIC RESOURCES

- . Abaqus Student Edition: https://academy.3ds.com/en/software/abaqus-student-edition

- . Tutorial Abaqus: https://abaqus-docs.mit.edu/2017/English/SIMACAEGSARefMap/simagsa-m-Caebeam-sb.htm