

## 60815 - Machine Design Criteria

### Información del Plan Docente

<b>Academic Year</b>	2017/18
<b>Subject</b>	60815 - Machine Design Criteria
<b>Faculty / School</b>	110 - Escuela de Ingeniería y Arquitectura
<b>Degree</b>	532 - Master's in Industrial Engineering
<b>ECTS</b>	6.0
<b>Year</b>	1
<b>Semester</b>	First semester
<b>Subject Type</b>	Optional
<b>Module</b>	---

### **1.General information**

#### **1.1.Introduction**

Machine Design Criteria is a compulsory subject of 6 ECTS credits, which means 150 work hours, corresponding to 60 hours of presential lessons (theory, problems, CAD laboratory...) and 90 hours of non-presential learning (Mentored practical assignments, personal study time).

The subject focuses on these main contents:

- Design criteria to develop components or mechanical assemblies.
- Machine elements performance characterization.
- Critical analysis of solutions for components and mechanical assemblies.

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

- Undertand the mechanical design requirements
- Design criteria to develop components or mechanical assemblies.
- Machine elements performance characterization.

## 60815 - Machine Design Criteria

- Critical analysis of solutions for components and mechanical assemblies.

### 2.2.Importance of learning goals

### 3.Aims of the course and competences

#### 3.1.Aims of the course

The subject and its learning outcomes are aligned with the following approaches and aims:

The content of machine design criteria focuses on two main points: On the one hand obtaining knowledge about different design criteria for components or mechanical assemblies and applying them; on the other hand being able to identify and characterize the most common machine elements with a critical point of view.

Within the first point, the importance of applying a proper design methodology to consider all the relevant factors that influence mechanical design is shown. Within the second, the student will understand the behavior of each elements in a mechanical assembly, whether it is part of a joint or a transmission, being able to identify and calculate the different loads involved and assess design alternatives

#### 3.2.Competences

### 4.Assessment (1st and 2nd call)

#### 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 5.Methodology, learning tasks, syllabus and resources

#### 5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

- Lectures, where the teacher presents the theoretical contents related to mechanical design criteria and mechanical elements characterization supported by different examples from real industrial cases.
- Case study sessions, where students solve different exercises and standard problems.
- Practice sessions in small groups, where students will use test benches, different mechanical assemblies and the software required for the proposed exercises.
- Assignments will consist of different tasks made under the teacher's supervision.

#### 5.2.Learning tasks

The course includes the following learning tasks:

- **Type 1 Lectures** (30 hours). Theory classes of machine design criteria and characterization of machine elements. These sessions consists on the teacher's explanations supported with common teaching resources. (Power Point presentations...).
- **Type 2 Practice sessions** (15 hours). Problem-solving sessions of machine design criteria and characterization of machine elements. These sessions consists on introducing and solving problems and case studies by means of common teaching resources. (Power Point presentations...)
- **Type 3 Laboratory practice sessions** (12 hours). Practice sessions of Mechanical Design and Machine Elements. They are based on the explanation of exercises and individual attention to the students to guide them in solving those exercises.

## 60815 - Machine Design Criteria

- **Type 6 Guided practical assignments** (23 hours). Assignments that students carry out in small groups with the guidance and supervision of the teacher. Students will present the final results to the class.
- **Type 7 Autonomous work and study**. Individual study time needed to consolidate a proper learning process.
- **Type 8 Assessment**. In addition to the grading function, the assessment is also a learning tool for the students to check their degree of understanding of the course.
- **Tutorials**. Teacher's office hours for students to solve doubts, guidance with the course, help with exercises and assignments, etc.

### 5.3.Syllabus

The course will address the following topics:

1. Design methodology
2. Analysis of the influence of the manufacturing process on the design
3. Tolerances and design
4. Other factors in mechanical design: Load types, drives, materials...
5. Stiffness-based design
6. Design based on weight and volume criteria
7. Other design criteria: Assembly, transportation...
8. Characterization of joining, transmission, conversion and other elements in machines
9. Characterization of other machine elements

#### Laboratory practice sessions

1. Functional analysis of the tolerances of a machine
2. Machine assembly and disassembly methodologies.
3. Injected plastic components design criteria.
4. Comparison of several mechanical designs for the same function.
5. Theoretical and experimental spring analysis.

### 5.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

### 5.5.Bibliography and recommended resources

- Castany Valeri, Javier. Análisis de la funcionalidad de los elementos de máquinas / Javier Castany Valeri, Angel Fernández Cuello, Francisco Serraller Sánchez Zaragoza : Prensas Universitarias de Zaragoza, 2000
- Javierre Lardiés, Carlos. Criterios de diseño mecánico en tecnologías industriales / Carlos Javierre Lardiés y Ángel Fernández Cuello . - 1ª ed. Zaragoza : Prensas Universitarias de Zaragoza, 2012
- Budynas, Richard G.. Diseño en ingeniería mecánica de Shigley / Richard G. Budynas, J. Keith Nisbett ; revisión técnica, Jesús Manuel Dorador González ... [et al.] . - 9ª ed. México [etc.] : McGraw-Hill, cop. 2012
- Deutschman, Aaron D.. Diseño de máquinas : teoría y práctica / Aaron D. Deutschman, Walter J. Michels, Charles E. Wilson . - 3a.reimp. México : Compañía Editorial Continental, cop. 1985 (imp. 1989)
- Orlov, P.. Ingeniería de diseño / P. Orlov ; traducido del ruso por José Puig Torres . - 2a. ed. Moscú : Mir, 1985