

## 28811 - Mechanical Engineering

### Información del Plan Docente

<b>Academic Year</b>	2018/19
<b>Subject</b>	28811 - Mechanical Engineering
<b>Faculty / School</b>	175 - Escuela Universitaria Politécnica de La Almunia
<b>Degree</b>	424 - Bachelor's Degree in Mechatronic Engineering
<b>ECTS</b>	6.0
<b>Year</b>	2
<b>Semester</b>	First semester
<b>Subject Type</b>	Compulsory
<b>Module</b>	---

### **1.General information**

#### **1.1.Aims of the course**

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

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

### **2.Learning goals**

#### **2.1.Competences**

#### **2.2.Learning goals**

#### **2.3.Importance of learning goals**

### **3.Assessment (1st and 2nd call)**

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

### **4.Methodology, learning tasks, syllabus and resources**

#### **4.1.Methodological overview**

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current subject (Mechanical Engineering ) is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities

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The organization of teaching will be carried out using the following steps:

– **Theory Classes:** Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

– **Practical Classes:** The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.

– **Laboratory Workshop:** Practical activities will be conducted in the computer room 1.1 software mechanism ( GIM 16.0) with the presence and teacher mentoring.

– **Individual Tutorials:** Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online

### 4.2.Learning tasks

<p>Programmed learning activities</p>	<p>The programme offered to the student to help the results is made up of the following activities...</p> <p>Involves the active participation of the student, in which the learning process are developed, already set out, the activities are the following:</p> <p>– <b>Face-to-face generic activities:</b></p> <p>– <b>Theory Classes:</b> The theoretical concepts are explained and illustrative examples are developed when necessary.</p> <p>– <b>Practical Classes:</b> Problems and practical exercises complementary to the theoretical concepts studied.</p> <p>– <b>Laboratory Workshop:</b> This work is carried out in groups of no more than 20 students.</p>
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	<p>– <b>Generic non-class activities:</b></p> <ul style="list-style-type: none"> <li>• Study and understanding of the theory</li> <li>• Understanding and assimilation of the practical cases solved in the practical classes.</li> <li>• Preparation of seminars, solutions to problems</li> <li>• Preparation of laboratory workshops, practical reports.</li> <li>• Preparation of the written tests for continuous exams.</li> </ul> <p>The subject has 6 ECTS credits, which represent 60 hours of work in the subject during the trimester, in other words, for 15 weeks of class.</p> <p>A summary of a weekly timetable guide can be found in the subject file. These figures are obtained from the subject file of the degree, taking into account the level of effort for the said subject is moderate.</p>
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Activity	Weekly school hours
Lectures	3
Laboratory Workshop	1
Other Activities	6

### 4.3.Syllabus

#### Chapter 1: Structural Analysis of Mechanisms Plans

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### **Introduction: Historical development of the theory of mechanisms and machines**

- \* Terminology mechanisms
- \* Classifications of elements and kinematic pairs of a mechanism
- \* Mobility and Degrees of Freedom: Criteria Grübler
- \* Act Grashoff Theorem and Graphical Analysis
- \* Obtaining a mechanism kinematic scheme

### **Chapter 2: Kinematic Analysis of Mechanisms Plans**

- \* Statement of the problem Kinematic
- \* Relative Movement Plano
- \* Relative Instant Center
- \* Determination of the instantaneous centers mechanism
- \* Theorem Aronhold -kennedy
- \* Calculation of speed of a mechanism analytically
- \* Calculation of speed of a mechanism graphically

### **Chapter 3: Dynamic Analysis of Mechanisms Plans**

- \* Dynamic Approach problem
- \* Calculation of acceleration of a mechanism analytically
- \* Calculation of acceleration of a mechanism graphically
- \* Forces of inertia mechanisms

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\* Balance mechanisms

### Chapter 4: Kinematic Analysis of Gear and Gear Trains

\* Gears: Gear Fundamental Law

\* Classification of Gears

\* Gear Trains

\* Classification Gear Trains

\* Applications: Differential of a vehicle

### Chapter 5: Theory of Mechanical Vibrations

\* Fundamental concepts in vibration

\* Systems degree of freedom

\* Free Vibrations in systems of one degree of freedom

\* Vibrations systems forced a degree of freedom

\* Resonance Phenomenon

### 4.4.Course planning and calendar

weeks	WEEKLY PLANNING SEMESTER	
1 <sup>a</sup>	Topic 1	Exercise No. 1 Continuous Assessment
2 <sup>a</sup>		

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3 <sup>a</sup> 4 <sup>a</sup> 5 <sup>a</sup> 6 <sup>a</sup>	Topic 2	Exercise No. 2 Continuous Assessment  1st Practice with software GIM (Topic 1 and 2)  1st Written Test (Topic 1 and 2)
7 <sup>a</sup> 8 <sup>a</sup> 9 <sup>a</sup>	Topic 3	Exercise No. 3 Continuous Assessment  2nd Practice with software GIM (Topic 3)  2nd Written Test (Topic 3)

The weekly schedule of the subject will be published at  
<http://www.eupla.unizar.es/asuntos-academicos/calendario-y-horarios>

The dates of the global evaluation test (**official calls**) will be published at  
<http://www.eupla.unizar.es/asuntos-academicos/examenes>

10 <sup>a</sup>	Topic 4	Exercise No. 4 Continuous Assessment
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11 <sup>a</sup>		
12 <sup>a</sup>		3rd Written Test (Topic 4)
13 <sup>a</sup>		Exercise No. 5 Continuous Assessment
14 <sup>a</sup>	Topic 5	4th Written Test ( Topic 5)
15 <sup>a</sup>		

### 4.5. Bibliography and recommended resources

#### Recommended resources:

Material	Fo
Topic theory notes	Paper/repository
Topic problems	
Topic theory notes	Digital/Moodle
Topic presentations	E-Mail
Topic problems	
Related links	
Educational software GIM 16	Web page: <a href="http://www.ehu.eus/compmech/s">http://www.ehu.eus/compmech/s</a>