

220121 - Mechanical Design and Manufacturing

Coordinating unit:	205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering		
Teaching unit:	712 - EM - Department of Mechanical Engineering		
Academic year:	2019		
Degree:	BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)		
ECTS credits:	3	Teaching languages:	Spanish

Teaching staff

Coordinator:	José Antonio Ortiz Marzo
Others:	José Antonio Ortiz Marzo Comas Cespedes, Esteve

Opening hours

Timetable: It's necessary to specify the schedule by e-mail.

Prior skills

Students must have achieved the objectives of graphic expression methods, materials technology and theory of machines and mechanisms

Teaching methodology

The teaching methodology is divided into two parts:

- On-site sessions to introduce the contents, in an expositive way with multimedia material and practical examples, short videos representative of the explained process, visits to the workshops and mechanical laboratories (depending on availability, visits to external companies), and resolution of basic problems, specially in module 2, where real cases of application are developed with the discussion of resolution alternatives.
- Autonomous work of study and performance of exercises, activities and group work.

Learning objectives of the subject

The basic objective is the knowledge of the different manufacturing processes of the most common components and their application according to the type of components depending on the surface finish and dimensional tolerances required. The student should also know and make use of the information available from the different suppliers or manufacturers of the technologies and processes involved. For this, references are given to specific websites or catalogs. There is an important part of this information that is in English, therefore, the student will have to make an effort to know technical English, as you will find when you start working professionally.

The student will have learned how to balance the engines and wheels of cars. You will also know the usefulness of flywheels.

The student, at the end of the course, will be able to identify and select the processes involved in the manufacture of components of the automotive sector. In this way, the available resources can be optimized, reducing production time and costs, increasing their quality and indirectly reducing energy consumption and waste volume.



220121 - Mechanical Design and Manufacturing

Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Self study:	45h	60.00%

220121 - Mechanical Design and Manufacturing

Content

<p>Module 1: Welding processes</p>	<p>Learning time: 13h Theory classes: 5h Self study : 8h</p>
<p>Description: Topic 1. Introduction to Welding process. Basic concepts. Classification. Design. Quality and Safety Regulations. Topic 2. Welding Processes. Welding with electrodes, MIG / MAG, TIG: Features and applications. Resistance welding. Automation of processes.</p> <p>Related activities: Activity 1 Activity 2 Activity 4</p> <p>Specific objectives: At the end of module 1, the student should be able to name the different welding processes and select a particular process, depending on the type of part and material to be welded. The student will know the necessary safety elements.</p>	
<p>Module 2: Machining processes with rotary machines</p>	<p>Learning time: 22h Theory classes: 9h Self study : 13h</p>
<p>Description: Topic 4. General concepts. General scheme. Type of machine tools. Material based tools. surface coatings. Topic 5. Lathe. Type and geometry of cutting tools. Basic operations. Calculation of working conditions. Examples</p> <p>Related activities: Activity 1 Activity 2 Activity 4 Activity 5</p> <p>Specific objectives: At the end of module 2, the student should be able to name different machining processes and select a machining process, depending on the part geometry and material work, select the type of machine tool and the sequence of operations required.</p>	

220121 - Mechanical Design and Manufacturing

<p>Module 3. Mechanical optimization in the automobile.</p>	<p>Learning time: 30h Theory classes: 12h Self study : 18h</p>
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<p>Description:</p> <p>Topic 6: Balanced wheels. Static and dynamic balancing. Balancing of rotating masses punctual. Balanced "in situ".</p> <p>Topic 7: Balanced engines. Forces and moments of shaking. Balancing a single cylinder engine. Balancing multi-cylinder engines online. Application to a 4 cylinder 4 stroke engine.</p> <p>Topic 8: Flywheels of inertia. Reduction of forces and moments. Approximate calculation of the steering wheel. Application to motors.</p> <p>Related activities:</p> <p>Activity 1 Activity 3 Activity 5</p> <p>Specific objectives:</p> <p>At the end of module 3, the student should be able to know and understand the most common applications of dynamics in the car: flyers and balanced calculation of axles and engines.</p>	
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<p>Module 4. Other manufacturing processes</p>	<p>Learning time: 10h Theory classes: 4h Self study : 6h</p>
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<p>Description:</p> <p>Topic 9. Hot forming. Characteristics of the processes. Classification. Applications.</p> <p>Topic 10. Cold forming. Characteristics and classification of processes. Examples.</p> <p>Topic 11. Prototyping technologies of plastic material. Classification and main characteristics. Applications.</p> <p>Related activities:</p> <p>Activity 1 Activity 2 Activity 5</p> <p>Specific objectives:</p> <p>At the end of module 4, the student should be able to name different manufacturing processes of components of the automotive sector.</p>	
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220121 - Mechanical Design and Manufacturing

Planning of activities

ACTIVITY 1: THEORETICAL CLASSES	Hours: 58h Theory classes: 26h Self study: 32h
<p>ACTIVITY 2: MANUFACTURING WORK</p> <p>Description: The students will have to present a work of manufacture in English language, with relation Road Safety.</p> <p>Support materials: In Atenea a document will be shared with the appropriate instructions for carrying out the work. Depending on the selected work theme, specific initial documentation will be provided for its proper development.</p> <p>Descriptions of the assignments due and their relation to the assessment: Group work. They will be delivered in the corresponding task, through the digital campus ATENEA, before the respective evaluation test.</p> <p>Specific objectives: Teamwork. Strengthen skills in third language. Practical oral presentation of a work.</p>	Hours: 6h Self study: 6h
(ENG) EXAMEN PARCIAL	Hours: 4h Self study: 4h
ACTIVITY 4: MANUFACTURING FINAL TEST	Hours: 4h Theory classes: 2h Self study: 2h
ACTIVITY 5: FINAL TEST OPTIMIZATION MECHANICAL	Hours: 3h Practical classes: 2h Self study: 1h

220121 - Mechanical Design and Manufacturing

Qualification system

The final grade of the course depends on four evaluation acts:

- 2nd activity (Work Manufacturing), weight 10%
- 3rd activity (Mechanical Optimization Work), weight: 10%
- 4th activity (Manufacturing test), weight: 50%
- 5th activity (Mechanical Optimization test), weight: 30%

Any student who wishes to improve his grade may try it at the exam planned at the end of the course. The best mark is preserved.

Regulations for carrying out activities

Activity 2, obligatory, it will be done in a group and you must present a work by group.
Activity 3, obligatory, it will be done in a group and you must present a work by group.
Activities 4 and 5 (exams), it will be conducted individually.

Bibliography

Basic:

Salueña, X.; Nápoles, A. Tecnología mecánica [on line]. 2a ed. Barcelona: Edicions UPC, 2001 [Consultation: 08/01/2016]. Available on: <<http://hdl.handle.net/2099.3/36437>>. ISBN 8483014491.

Salueña, X; Casals, J.; Ortiz, J.A. El universo de la tecnología mecánica [Recurs electrònic]. Barcelona: Edicions UPC, 2003. ISBN 8483017253.

Kalpakjian, S.; Schmid, S. R. Manufactura, ingeniería y tecnología [on line]. 5a ed. México: Prentice Hall, 2008 [Consultation: 04/10/2018]. Available on: <http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5323>. ISBN 9789702610267.

Ham, C.W.; Crane, E.J.; Rogers, W. L. Mecánica de máquinas. México: McGraw-Hill, 1979.

Norton, Robert L. Diseño de maquinaria: síntesis y análisis de máquinas y mecanismos. 4ª ed. México: McGraw-Hill, 2008. ISBN 9789701068847.

Lafita, F.; Mata, H. Vibraciones mecánicas en ingeniería. Madrid: INTA, 1964.

Complementary:

Coromant, Sandvik. El mecanizado moderno: manual práctico. Sverige: Sandvik Coromant, 1994. ISBN 919722992X.

Khamashta, M.; Álvarez, L.; Capdevila, R. Problemas de cinemática y dinámica de máquinas, Vol. 2, Problemas resueltos de dinámica de mecanismos planos. 2ª ed. Terrassa: Departament d'Enginyeria Mecànica, 1994. ISBN 8476530358.

Paul, Burton. Kinematics and dynamics of planar machinery. Englewood Cliffs: Prentice Hall, 1979. ISBN 0135160626.

Norton, Robert L. Diseño de maquinaria: síntesis y análisis de máquinas y mecanismos. 3ª ed. México: McGraw-Hill, 2005. ISBN 9701046560.

Shigley, J.E.; Uicker, J.J. Teoría de máquinas y mecanismos. México: McGraw-Hill, 1982. ISBN 968451297X.

Others resources:

Throughout the course, Internet addresses are given for consultation and copies of articles to read that complement the explanations given in class.