25840 - Design and development of plastic pieces

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	271 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS	7.5
Year	
Semester	First Four-month period
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

Brief presentation of the course

The development and manufacture of products designed with plastic is a transversal activity that concerns almost all industrial sectors: automotive, appliances, household items, furniture, footwear, etc.

To be successful in the design, development and manufacture of a plastic product it is necessary to know how to integrate from the beginning the chosen material, part design, the type of process and conditions, as well as machine and tools to be used.

Therefore, this course focuses on concepts, methodologies and skills that allow to a future engineer to understand this complex system in which many interrelated factors are involved.

The contents of the course are selected to ensure that the future engineer will be able to locate and analyze the great amount of problems that arise in the design, development and manufacture of a plastic product, regardless of the department to which he belongs (design and development, production or quality), proposing a work plan that integrates all the above factors.

1.2.Recommendations to take this course

To follow this subject properly it is recommended that students have studied the courses related to "Product Design" and/or "Product Development".

1.3.Context and importance of this course in the degree

Context and meaning of the subject in the degree

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Future design engineers who choose subjects related to "Product Design" or "Product Development" surely have to work during his professional life in the field of design and development of plastic components. Due to the flexibility and versatility of this type of materials today creativity and exploration of new products are unlimited. Moreover, design and plastic are absolutely linked in the current industrial context.

1.4.Activities and key dates

The course is composed fundamentally by practical classes and another training activities, which are the following:

1. Master Class

2. Practical sessions cabinet

3. Visits to companies of plastic sector

4. Practical sessions

5. Seminars with technologist guest.

6. Personal student work

7. Development of a final course dossier

8. Defense of the final academic work

Therefore, the key dates during the development of the course are:

Dates for the practical sessions

Dates for visits to the companies and/or seminars

Date for the defense of final academic work (during semester)

2.Learning goals

2.1.Learning goals

The student will pass the subject, if he is able to
1: relate materials properties with design specifications

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2: relate materials properties with their influence on the processes of plastics transformation
3: know how each transformation process determines the design of a product
4: understand which are the differences between performing a design and sizing with plastic instead of using a conventional material
5: know the basic principles of design of the tooling used by different transformation techniques.
6: know the physical structure of machinery and tooling according to the transformation technique.
7: establish the relationship between process conditions and part quality for the following processes: injection, extrusion, thermoforming.

2.2.Importance of learning goals

Importance of learning outcomes obtained in the course:

The most important aspect of this subject, is to reach the integration of the technical knowledge with the industrial reality. Knowing how to relate and combine the theoretical knowledge with the skills is a key factor for the personal progress in any discipline or industrial sector. Knowing how to use both parts is the profile requested by any industrial company since it allow to know how to identify a problem, to use the available resources, and then, to design and to present a plan work for giving a solution to the problem.

3.Aims of the course and competences

3.1.Aims of the course

The subject and its expected results are linked to the following approaches and objectives

The design of plastic parts is a widespread activity that shows significant differences with the mechanical design using metallic materials. This subject aims to be a successful starting point and approach to the work in the Plastic sector industry composed of 6,000 technicians and technologists in Aragon and 100.000 technicians and technologists in Spain.

The course is oriented to the work performed in design cabinets but it also involves to the students in the Production Engineering and Quality Departments of the typical companies in this sector.

It is important to highlight that this course is one of the few official teachings existing in Spain about these technologies, and has its natural continuity in the Master of Design and development of plastic components, coordinated by the Department of Mechanical Engineering / Mechanical Engineering Area. Teachers belong to the research and development university group TIIP, with more experience of Spain and with a large number of contacts with companies in the Plastic industry sector. Business experiences with this sector have helped to design the course content.

3.2.Competences

After to pass the course, students will be more competent to ...

1: Designing and sizing plastic parts

2: Working in a context of teamwork, with production and/or quality departments

3: place oneself in the industrial environment of plastic processing companies

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4: Feeling comfortable, active participant and member of a development process.

5: know and understand the limitations of the design methods when they are applied to plastic design.

4.Assessment (1st and 2nd call)

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

The student must demonstrate the achievement of the intended learning outcomes through the following evaluation activities

1: Active participation in practical classes.

2: Participation in seminars and visits to industrial companies.

These two activities will be evaluated by means of 40% of total score

3: Develop a case study, the academic work and finally to defend it.

The activity number 3 will be the 60% of the total score

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The designed learning strategy for this subject is based on the following:

The learning process presented to the student, has the following methodological phases, but not chronological, because all of them are involved, in some extent, in the different topics.

A) Preliminary phase

Study of concepts based on attendance at the theoretical sessions and personal student work.

B) Maturing phase

Fixing the knowledge acquired through:

* Seminars with teaching tools like simulators type and RPGs.

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* Seminars about on cabinet lab work.

C) Experimental phase through:

* Workshop and laboratory

* Visits to a companies

* Final academic work.

5.2.Learning tasks

The program offered to the student to help him to achieve the expected results includes the following activities ...

43 hours of seminar work, based on role-playing games and simulators.

34 hours of master classes

11 hours of practical work in workshop

55 hours of personal student study

40 hours of development of final academic work

5 hours of tutorials and presentation of the academic work

10 hours of companies visits

5.3.Syllabus

THEORETICAL PROGRAMME	Hours
Polymers. Thermoplastics, thermosets and elastomers. Additives and blends	3
Relationship between properties and processing/transformationconformado/transformación	3
Rheology	2

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Polymer degradation	1
Testing methods	2
Plastic parts design	1
Plastic parts sizing	6
Description of injection process	2
Structure of an injection mould	3
Melt flow inside an injection mould	1
Injection machine structure	1
Clamping group	1
Injection unit	1
Subsystems	1
Description of extrusion process	1
Extrusion machine structure	1
Structure of an extrusion mould	1
Description of blowing process	1
Blowing machine structure	1
Structure of a blowing mould	1
TOTAL HOURS	34

5.4.Course planning and calendar

The final academic work must contain at least the following sections:

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● 3D design of the plastic part and the relevant 2D drawings.

● Selection of suitable materials.

● Sizing of the part based on theoretical calculations.

● Description of tooling and transformation process to be used.

● Short study of costs of material and equipment to be used, and also process costs.

5.5.Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

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