

Course guide 340663 - DPMO - Design and Prototype of Molds

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Unit in charge:	Vilanova i la Geltrú School of Engineering		
Teaching unit:	702 - CEM - Department of Materials Science and Engineering.		
Degree:	BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Optional subject).		
Academic year: 2024	ECTS Credits: 6.0 Languages: Catalan, English		

LECTURER		
Coordinating lecturer:	OSCAR MARTIN RAYA	
Others:	Sergi Menargues Muñoz Oscar Martín Raya	

PRIOR SKILLS

3D design knowledges

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. D10. Knowledge of beginning of science and material technology to select materials and its processes as well as its repercussion into design, redesign development of products.

2. D.27 Advanced MODELAJE in 3D knowledge.

3. D28. Knowledge of ANIMACION and basic 3D simulation.

6. G5. Mastery of rendering techniques, spatial design, standardization, computer-aided design, knowledge of fundamentals of industrial design.

7. D9. Ability to analyze and solve machine and mechanism design problems.

8. D31. Knowledge of current rules, legislation and project transaction.

Transversal:

04 COE. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thoughtbuilding and decision-making. Taking part in debates about issues related to the own field of specialization.

05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

TEACHING METHODOLOGY

They will realise an introduction to the dimensioned and designs of moulds and dies. Filling mold simulations will be done with PROCAST. As well as several practical exercises, individually and in group during class hours, all of them real samples. In "theory" classes, problems and simulations will be done and will be marked.

LEARNING OBJECTIVES OF THE SUBJECT

This course pretends to announce to the future designers some of basic and practical rules that have to apply before realising the product design. They will purchase competitions in the numerical simulation, the design in 3D. This should be able to know the viability of manufacturing a product by its process. Engineering report writing will also be worked on.



STUDY LOAD

Туре	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

Unit 1. Introduction to processes: HPDC, Forging, Semisolid

Description:

Review of HPDC manufacturing processes, forging and semi-solid work. There will be a brief review of the knowledge given in other subjects of the department in order to be able to apply them to the design of the mold of the subject.

Related activities:

These sessions are theoretical.

Full-or-part-time: 5h

Theory classes: 5h

Unit 2. Mold design

Description:

- Design of aluminum injection parts. General guidelines.
- Injection machines. Selection criteria in $f = (piece, N^{o} Cavities and Mold)$.
- Aluminum injection molds. Parts and operation.

Full-or-part-time: 10h

Theory classes: 10h

Unit 3. Simulation by finite elements method of the filled of molds with PROCAST.

Description:

Mathematical introduction to finite elements. Explanation of the operation of the PROCAST program

Full-or-part-time: 2h

Theory classes: 2h

Unit 4. Report writing

Description:

- Creation of your own report template.
- Basic rules for writing reports in engineering.

Related activities:

Apart from the theoretical explanation, during the different deliveries of the subject the reports will be improved and revised so that at the end of the subject all the students have their own good report format.

Full-or-part-time: 1h Theory classes: 1h



ACTIVITIES

Task 1. Easy 1. Introduction to Procast

Description:

This task consists of making a first simulation of the filling of a mold by gravity with the PROCAST program. At the end of the task a report must be submitted.

Full-or-part-time: 2h

Practical classes: 2h

Task 2. Easy 2. Introduction to Procast II

Description:

This task consists of doing a second simulation of filling a gravity mold with the PROCAST program using different tools in the program. At the end of the task a report must be submitted.

Full-or-part-time: 2h

Practical classes: 2h

Task 3. Virtual mold

Description:

This task consists of performing a simulation by HPDC starting from only a given piece, therefore a virtual mold will have to be generated with the program to be able to simulate its filling. Once the simulation has been completed, a report must be written.

Full-or-part-time: 2h

Practical classes: 2h

Task 4. Group's piece.

Description:

This task has a special score (as indicated in the evaluation section). It is about doing a simulation of the piece given to each group to develop their subject project. In this simulation they will have to verify if the changes and optimization of the design that have done to adapt the piece to the process are correct, as well as to make a first approximation to the parameters with which the piece has to inject. Once the simulation has been completed, a report must be made.

Full-or-part-time: 10h

Practical classes: 10h

Task 5. Forging

Description:

In this task, the groups will be proposed a piece to do with the forging process. They will have to make a first sketch of the process (parameters, preliminary design of matrix, ...). And make a report.

Full-or-part-time: 2h

Practical classes: 2h



Task 6. Motorbike

Description:

In this task, the groups are given a piece that has had a defect. The groups will have to simulate the conditions under which this piece has occurred in order to deduce the reason for the defect. Once the simulation has been completed, a report must be submitted.

Full-or-part-time: 2h

Practical classes: 2h

Task 7. Group's project

Description:

This task has a special score (as indicated in the evaluation section). It is about doing a simulation of the whole piece given to each group to develop their subject project. Once the part has been validated, the channels and arrangement of the parts in the mold must now be validated. Process parameters such as temperatures, speeds, etc. must also be validated. In this task a minimum of 2 simulations must be done. Once the simulations have been done, a report must be made.

Full-or-part-time: 12h

Practical classes: 12h

Mold design

Description:

- Optimized design of an aluminum injection piece.
- Design of the complete casting of the designed piece.
- Final design of the mold of the piece and casting.

Full-or-part-time: 10h

Practical classes: 10h

GRADING SYSTEM

The grade of the course will be obtained applying the following criteria: Practical project mark: 30% (According to: Mold mark 50%; Piece mark 20%; Project mark 30%) Mid-term exam mark: 15% Simulations mark: 30% (According to: Class exercices 30%; Piece simulation 30%; Project simulation 40%) Presentation mark: 25%

Final mark: 0,30 (Practical project) + 0,15 (Mid-term exam) + 0,30 (simulations) + 0,25 (Presentation) Due to the continuous assessment method, and the characteristics of the different assessment acts, there is no re-assessment activity in this subject.

BIBLIOGRAPHY

Basic:

- Nou llibre.