



## IDENTIFYING DATA

### Means, Machines and Tools for Manufacturing

Subject	Means, Machines and Tools for Manufacturing			
Code	V04M141V01333			
Study programme	(*)Máster Universitario en Enxeñaría Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pérez García, José Antonio			
Lecturers	Pérez García, José Antonio			
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Web				
General description				

## Skills

Code	
A1	Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context.
A3	That students are able to integrate knowledge and handle complexity and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
A5	Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
C1	CET1. Project, calculate and design products, processes, facilities and plants.
C3	CET3. Conduct research, development and innovation in products, processes and methods.
C5	CET5. Technically and economically manage projects, installations, plants, companies and technology centers.
C8	CET8. Being able to integrate knowledge and handle complexity and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
C10	CET10. Possess learning skills that will allow further study of a self-directed or autonomous mode.
C11	CET11. Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Engineer.
C13	CTI2. Knowledge and ability to design, calculate and design integrated manufacturing systems.
D5	ABET-e. An ability to identify, formulate, and solve engineering problems.

## Learning outcomes

Expected results from this subject	Training and Learning Results
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A1  
A3  
A5  
C1  
C3  
C5  
C8  
C10  
C11  
C13  
D5

## Contents

Topic	
Unit 1.- Prototyping	Lesson 1.1.- Rapid Prototyping
Unit 2.- CAM	Lesson 2.1.- CAM for machining
	Lesson 2.2.- CAM for foundry processes
	Lesson 2.3.- CAM for polymer injection processes
Unit 3.- Machining	Lesson 3.1.- 3 and 5 axis machining centers
	Lesson 3.2.- Tooling for clamping parts and reference systems
Unit 4.- Molds and tools	Lesson 4.1.- Casting molds
	Lesson 4.2.- Molds for polymer injection
	Lesson 4.3.- Dies for sheet metal forming
	Lesson 4.4.- Molds for manufacturing with composites
Unit 5.- Industrialization of products	Lesson 5.1.- Part analysis
	Lesson 5.2.- Selection of the manufacturing process and optimization of the design
	Lesson 5.3.- Design of the mold
	Lesson 5.4.- Manufacturing of the mold
	Lesson 5.5.- Calculation of manufacturing costs

## Planning

	Class hours	Hours outside the classroom	Total hours
Project based learning	31	62	93
Project	2	4	6

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

	Description
Project based learning	- 12 sessions, one hour each, to be held at the IPF Area Workshop of the EEI (Lagoas Marcosende Campus) focused on learning both the CAM software and the manufacturing equipment that the student must handle during the course - 12 sessions, of two hours each, to be held in the Workshop of the IPF Area at the EEI (Campus Lagoas Marcosende) focused on the development of real projects of design and manufacture of tools and components.

## Personalized assistance

Methodologies	Description
Project based learning	The focus of the subject is eminently practical, confronting the student with the situation of solving real situations of design and manufacture of tools necessary in different manufacturing processes.
Tests	Description
Project	The focus of the subject is eminently practical, confronting the student with the situation of solving real situations of design and manufacture of necessary tools in different manufacturing processes. In practice, this will translate into the execution of a real project for the design and manufacture of an injection mold.

## Assessment

Description	Qualification	Training and Learning Results
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Project based learning	The student's work will be evaluated during the course in the elaboration of the project of the subject. It constitutes the Continuous Assessment of the subject.	50	A1 A3 A5	C1 C3 C5 C8 C10 C13	D5
Project	Both the final project report and the manufactured prototype will be evaluated. It constitutes the Final Test of the subject	50	A1 A3 A5	C1 C3 C5 C8 C10 C11 C13	D5

### Other comments on the Evaluation

#### First opportunity

The subject is evaluated based on two parameters:

- Continuous Assessment (50% of the Final Grade)
- Final Report of the Subject Project and prototype manufacturing (50% of the Final Grade)

Other considerations:

- For those students to whom the Directorate of the EEI has granted the waiver of Continuous Assessment, the Final Report of the Project of the subject acquires a value of 100% of the Final Grade of the Subject
- The characteristics of both the Continuous Assessment and the Project of the Subject will be communicated to the students during the presentation of the Subject

#### Second opportunity

The same criteria will be applied as those defined for the First Chance

#### FINAL CONSIDERATIONS:

In case of discrepancy between what is described in the versions in Galego, Castellano or English of this Teaching Guide, what is established in this version in Spanish will always prevail.

### Sources of information

#### Basic Bibliography

John G. Nee, **Fundamentals of Tool Design**, 6ª, SME, 2010

Camarero de la Torre, Julián, **Matrices, Moldes y Utillajes**, 1ª, CIE Dossat 2000, 2003

J.T. Black, Ronald A. Kohser, **Degarmo's materials and processes in manufacturing**, 12, Wiley, 2017

#### Complementary Bibliography

Dangel, R., **Injection Molds for Beginners**, 1ª, HANSER PUBLICATIONS, 2020

Campbell, John, **Complete Casting Handbook: Metal Casting Processes, Metallurgy, Techniques and Design**, 2ª, Elsevier, 2015

Tickoo, Sham, **CATIA V5-6R2014 for designers**, 12ª, Schererville, IN : Cadcam Technologies, 2015

Shoemaker, J., **Moldflow Design Guide A Resource for Plastics Engineers**, 1ª, Hanser, 2006

### Recommendations