









GENERAL INFORMATION										
Course name		SI3. Appli		ed	simulation	to	Casting	of	advanced	
component				s of	aeronautic pa	rts	_			
Semester	2		Character		Optional	Type of module		ule	Specialisati on	
ECTS	3				Modality	Face-to-face				
Higher Education Institution					Mondragon Unibertsitatea					
Lecturer(s)					Daniel Bernal Gurutze Arruebarrena					
LEARNING AND TEACHING										
ESCO Occupation(s)				Manufacturing engineer Calculation engineer						
ESCO Skill & Competences (*no ESCO)				Casting processes Select material to process Produce sustainable products Create a product's virtual model Sustainable manufacturing						
Learning outcomes (Please refer to Appendix 4 for the interpretation of the acronym)				KU2, EA1, EP3						
Teaching methods				Lectures. Tutorials. Case Studies. Simulation-Based Learning.						
Assessment methods				Examinations. Case studies. Simulations and modelling exercises. Oral presentation & defence.						
CONTENTS										
Previous requirements (if necessary)										

Content index

This subject deals with the casting manufacturing processes, the <u>theoretical/practical</u> <u>concepts of the stages of filling/solidification of the metal</u> in the mould, which are very commonly found both in the most traditional industry of the sector and in the <u>industry of</u> <u>the highest added value (aeronautics and aerospace)</u>. The course will be divided into two blocks, a first theoretical block, in order to understand the fundamental concepts that apply to casting process technology; a second practical block, in which students will work with specific simulation tools for casting processes.

In the first theoretical block, the following subjects will be covered, from an integrative point of view:

- The role of <u>metallurgical quality and the</u> <u>treatment of liquid metal</u>.
- The effect of melting parameters and conditions on the properties of the manufactured part.
- Understanding how metal solidifies.
- Description and selection of <u>technologies for</u> <u>melting metals</u>.

In the second practical block, we will work with the <u>casting process simulation software Flow 3D Cast</u>. The following subjects will be covered:

- <u>Thermofluidic calculation</u> for the design of feeding systems to avoid turbulence, air entrapment, and misruns.
- Selecting the most suitable type of <u>casting</u> <u>process</u>, <u>defining the process conditions</u> that ensure adequate filling and solidification of the metal in the mould.











 Analyse the <u>effect of the main process</u> <u>parameters</u> on the defectology of the casting.

After completing these studies, the student will not only have a vision of the types of processes most commonly used for the manufacture of both <u>high value-added components</u> very present in the nearby industry (aeronautics, automotive, ...), but also in our day-to-day life. <u>Nowadays, companies are looking for professionals with specific skills in foundry</u>, as it is a very present sector in Europe, being Germany the first producer. For any more information do not hesitate to contact the lecturers, we will be happy to answer any of your questions.

SUPPORTING BIBLIOGRAPHIC REFERENCES

Groover, M. P. (2017). Groover's principles of modern manufacturing. materials, processes, and systems (Global edition, SI version). John Wiley & Sons, Inc. John Campbell. Introduction to Casting Practice: The 10 Rules of Castings, Complete Casting Handbook, Elsevier, 2004

https://www.flow3d.com/resources/

Baake E, Nacke B. Introduction and Fundamental Principles of Induction Melting. Vol 4C. ASM International; 2014. doi:10.31399/asm.hb.v04c.a0005895

Donachie, M. J., & Donachie, S. J. (2003). Superalloys. Libro. a technical guide (2a ed). ASM International.

Porter, D. ., Easterling, K. ., & Sherif, M. Y. (2009). Phase transformations in metals and alloys. Libro (3^a ed). CRC Press.

SOFTWARE

Flow 3D Cast Solid Works