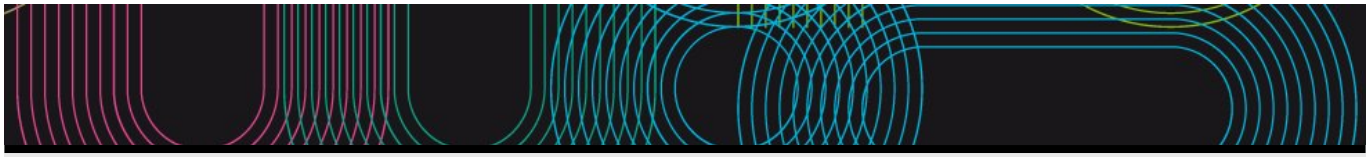

IDENTIFYING DATA				
Manufacturing technologies				
Subject	Manufacturing technologies			
Code	V04M196V01102			
Study programme	Máster Universitario en Fabricación Aditiva			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pérez García, José Antonio			
Lecturers	Pérez García, José Antonio Prado Cerqueira, María Teresa			
E-mail	japerez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Manufacturing technologies provide unprecedented transformation for the profitability and competitiveness of companies. Among the technologies that have recently transformed manufacturing is Additive Manufacturing.			

Training and Learning Results	
Code	
B1	Define printing methods, safety and efficiency criteria to adapt the design of objects to 3D printing.
B3	Identify production requirements to adapt them to the new additive production systems.
B4	Define quality, safety and environmental requirements in additive manufacturing environments for integration into the production control management system.
B8	Identify the stages of the additive manufacturing production process.
C2	To know and apply legal and environmental regulations, establishing protocols for the management of waste generated in the manufacturing process of the products.
D4	Combine and integrate different technologies in additive manufacturing processes.
D6	Design the different products according to the technical requirements offered by the different additive manufacturing tools and technologies.

Expected results from this subject	Training and Learning Results
Knowledge	B1 B3 B4 B8
Skill	C2
Competences	D4 D6

Contents	
Topic	
Module 1.- Introduction	- Introduction to the production cycle - Concurrent engineering - Classification of Manufacturing Technologies
Module 2.- Subtractive manufacturing techniques vs additive manufacturing techniques	- Subtractive manufacturing techniques - Additive manufacturing techniques - Hybrid manufacturing techniques

Module 3.- Classification of additive manufacturing techniques according to UNE-EN ISO ASTM 52900 and UNE-EN ISO 17296-2:2017	- Material extrusion (ME): FDM - Focused Energy Deposition (DED): DED-L, DED-arc. - Powder bed fusion (PBF): SLS, SLM, EBM. - Material projection (MJ). - Sheet laminate (LOM, UC). - Photopolymerization in tank or vat (VP): SLA. - Binder injection (BJ).
Module 4.- Joining processes derived from additive manufacturing techniques	- Stir additive manufacturing (FSAM) - Additive friction stir deposition (AFSD) - Others
Module 5.- CAD/CAE/CAM Technologies in Additive and Hybrid Manufacturing.	- Desing assisted by computer - Material selection - Preprocessing - Resolution - Post processing
Module 6.- Applicability of additive manufacturing	- Automotive sector - Aeronautic sector - Biomedical sector
Module 7.- Quality assurance	- Dimensional control - Surface quality control - Control of mechanical propertie
Module 8.- Management of additive manufacturing systems	- Production Vs. maintenance - Types of maintenance - TPM
Module 9.- Risk prevention and occupational health in additive manufacturing processes	- Basic concepts on safety and health at work - Working conditions and risk factors in additive manufacturing processes
Module 10.- Specific regulations on the development of additive manufacturing processes	- UNE-EN ISO/ASTM 52910:2020 - DIN SPEC 1071

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	3	3	6
Lecturing	10.5	15	25.5
Simulation	10.5	15	25.5
Project based learning	21	32	53
Project	2	30	32
Presentation	1	6	7
Objective questions exam	1	0	1

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

Methodologies

	Description
Introductory activities	2 Sessions of 1.5 hours each in which, after explaining to the students what the project-based learning methodology consists of, they will be informed of the roadmap to follow during the course
Lecturing	7 sessions of 1.5 hours each, in which the theoretical concepts included in the course agenda will be explained
Simulation	7 sesións de 1,5 horas cada unha, a realizar no Taller da Área IPF da EEI (Campus Lagoas Marcosende) centradas na aprendizaxe tanto do software CAM como dos equipos de fabricación que o alumno debe manexar durante o curso.
Project based learning	14 sessions of 1.5 hours, to be held in the Workshop of the IPF Area of the EEI (Campus Lagoas Marcosende) focused on the development of real projects for the design and manufacture of tools and components.

Personalized assistance

Methodologies	**Description**
Project based learning	A tutorial schedule will be established, both face-to-face and online through Remote Campus
Lecturing	A tutorial schedule will be established, both face-to-face and online through Remote Campus
Tests	**Description**
Project	A tutorial schedule will be established, both face-to-face and online through Remote Campus

Assessment

	Description	Qualification	Training and Learning Results
Project	The student will carry out a practical project. In its preparation, you will use the CAD/CAM/CAE Autodesk Inventor Professional software and the manufacturing equipment available in the manufacturing workshop of the IPF Area at the EEI Campus	50	
Presentation	The student will document and present the project developed during the course	20	
Objective questions exam	The exam will evaluate the theoretical concepts explained throughout the course	30	

Other comments on the Evaluation

FIRST CHANCE (January)

a) Continuous Assessment Modality

The continuous evaluation will be carried out during the teaching period of the subject. In this modality, all tests are compulsory. The contribution of each test to the total grade is as follows:

1) First Work Report. At the beginning of the project, the student will present a first report in which he will detail both the objectives of the work and the resources and the execution planning, having to demonstrate both the suitability of the chosen topic and the feasibility of its manufacture with the resources available in the workshop. Mechanic of the IPF Area at the EEI Campus Headquarters (10% of the qualification).

2) Second Work Report. Halfway through the project, the student will present a second report that reflects the status of the project's evolution, analyzes the degree of compliance with the initially planned plan and, if necessary, proposes possible corrective measures necessary to achieve final compliance with the planned objectives (20% of the grade)

3) Final Work Report. This report, which will constitute the memory of the work, will constitute the final documentation of the work, that is, calculations, plans, process sheets, costs, . (20% of the grade).

4) Presentation of the Work. After the delivery of the Final Work Report, the student will make a public presentation of it (20% of the grade).

5) At the end of the course, the student must take an evaluation exam of the different theoretical aspects developed during the course (30% of the grade).

To pass the subject in the first edition of the certificate by continuous evaluation, a minimum of 40% must be reached in each of the previously written tests. In the event that the student does not reach this minimum in any of the Continuous Assessment tests or, having reached it, does not achieve a minimum of 5 (scale 0 to 10) in the overall subject, it will be considered that they have not passed the exam. subject and must be submitted to the Second Chance (June/July).

In the case of not reaching the minimum in any continuous assessment test, and the sum of the qualifications is greater than 5 (scale 0 to 10), the record will include 4.9.

b) Overall Assessment Modality.

Those students who renounce the continuous evaluation methodology and therefore use the global evaluation methodology, will be evaluated solely on the basis of:

1. Final Work Report. This report, which will constitute the memory of the work, will constitute the final documentation of the work, that is, calculations, plans, process sheets, costs, . (50% of the grade).

2. Presentation of the Work. After the delivery of the Final Work Report, the student will make a public presentation of it (20% of the grade).

3. At the end of the course, the student must take an evaluation exam of the different theoretical aspects developed during the course. (30% of the grade) Maintaining the minimum grade requirements set forth in the previous case

SECOND CHANCE (June/July):

In the Second Opportunity all students will be evaluated following the guidelines established in the modality "b) Global evaluation" of the First Opportunity Ethical Commitment: The student is expected to present adequate ethical behavior, as stated in Articles 39, 40, 41 and 42 of the Regulation on the evaluation, qualification and quality of teaching and the learning process of the student body, approved in the Senate on April 18, 2023.

In the case of detecting unethical behavior (copying, plagiarism, use of unauthorized electrical devices, and others) it will be considered that the student does not meet the necessary requirements to pass the subject. In this case, the overall grade for this academic year will be fail (0.0).

NOTICE: In the event of discrepancies between the different language versions of the guide, what is included in the Spanish version will prevail.

Sources of information
Basic Bibliography
Complementary Bibliography
Tuhin Mukherjee, **Theory and Practice of Additive Manufacturing**, 978-1394202263, 1ª, John Wiley & Sons Inc, 2023
Jing Zhang, Yeon-Gil Jung, **Additive Manufacturing: Materials, Processes, Quantifications and Applications**, 9780128121559, 1ª, Elsevier, 2018
Martin Leary, **Design for Additive Manufacturing**, 9780128168875, 1, Elsevier, 2019

Recommendations