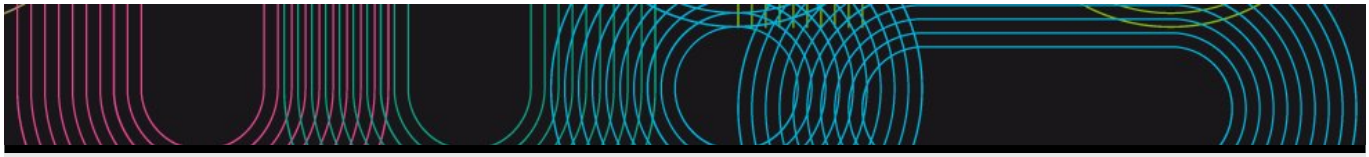

IDENTIFYING DATA				
External practices				
Subject	External practices			
Code	V04M183V01206			
Study programme	M.U. Industry 4.0			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Cerqueiro Pequeño, Jorge Peláez Lourido, Gustavo Carlos Garrido Campos, Julio			
Lecturers	Cerqueiro Pequeño, Jorge Garrido Campos, Julio Peláez Lourido, Gustavo Carlos			
E-mail	jgarri@uvigo.es gupelaez@uvigo.es jcerquei@uvigo.es			
Web	http://masterindustria40.webs7.uvigo.es/wordpress/			
General description	Compulsory subject through which students carry out a period of practice in companies, technology centres or institutions, which allows them to develop practical skills and make contact with the reality of industrial agents by integrating into their teams within activities and / or projects related to the subjects of the master.			

Skills	
Code	
A2	Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	Students are able to integrate knowledge and deal with the complexity of making judgements based on information which, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgements.
A4	Students should be able to communicate their findings - and the ultimate knowledge and reasons behind them - to specialist and non-specialist audiences in a clear and unambiguous manner
B1	Organization and planning skills
B2	Problem solving.
B3	Descion making
B4	Information management capacity.
B5	Oral and written communication in your own language.
B6	Knowledge and use of the English language.
B7	Computer skills related to the field of study.
C1	Knowing the concepts of product life cycle to learn how to apply them with an integral approach, with sustainability criteria through software tools and infrastructure and digital media.
C2	To know and apply the principles and tools of Lean Manufacturing in the processes of design and development of products of the Industry 4.0 to materialize proposals of innovation through concurrent engineering and ICT of collaborative engineering.
C3	Learn the basics of cloud computing, components, tools and its orientation as an Internet-based service.
C4	Know and apply tools and techniques to capture, store, smart analysis and visualize massive data.
C5	To know and know how to implement in the factories the architectures, technologies and protocols used in communication systems and local industrial networks.
C6	Knowing the role of cyber security in the factories of the future, the methods, techniques and limitations to be able to implement safe industrial infrastructures.
C7	To know the fundamentals of Artificial Intelligence and its most important practical applications for its implementation in the design and manufacturing processes.

C8	Know how to use artificial intelligence methods to model, design and develop applications based on reasoning and inference engines to be implemented in the Industry.
C9	Know the principles, techniques and systems that comprise the concept of Industrial Internet of Things (IIoT) and its relationship with design and manufacturing
C10	Knowing how to implement robust, flexible and fault-tolerant industrial control systems, through data acquisition and decision making systems appropriate to each situation.
C11	Know and use the elements and principles of operation of cyberphysical systems resulting from the integration of physical, computational and communication processes.
C12	Develop cyberphysical systems for application to product and process solutions in factories, using Systems Engineering procedures.
C13	Use the integration of different data sources for the definition of flexible, reliable and efficient supply chain management systems, supported by the Industrial Internet of Things and optimized logistics management software tools
C14	Know the concepts, principles and tools of intelligent manufacturing systems, which facilitate access to information and production data through automated tools for capturing, processing and displaying information
C15	To know and apply the additive manufacturing technologies, the materials used and the application strategies in the design and manufacture of products.
C16	Develop models, mock-ups and prototypes using additive manufacturing techniques and tools
C17	Know the advanced techniques and tools of metrology, calibration and accreditation.
C18	Develop advanced dimensional verification strategies for application to components and products in the connected industry
C19	To know, use and know how to implement principles, applications, components, instrumentation and installations of advanced robotic systems for industry.
C20	To know and know how to apply principles, techniques and equipment of immersion in virtual, augmented and hybrid reality for its implementation in the industry
C21	To know and be able to use modeling and simulation tools by finite elements, finite differences and computerized fluid dynamics (CFD) as tools of Assisted Engineering (CAE)
C22	Select the appropriate finite element difference (FEM) and computerized fluid dynamics (CFD) modeling and simulation tools to solve design and manufacturing engineering problems
C23	Know and select the most suitable advanced CAD/CAM/CAE environments to be integrated and implemented in the Industry.
C24	Knowing how to apply advanced design, manufacturing and engineering tools to the modeling and manufacturing of complex mechanical parts and assemblies in the industry
C25	Know and be able to use techniques and tools for mathematical modeling and simulation of discrete event systems and dynamic systems for application in production environments.
C26	Apply simulation tools to solve specific problems in plant management and integrate them into the implementation process of the 4.0 paradigms.
C27	To know and apply the engineering techniques and tools for the industrialization of the product in Lean contexts
C28	Developing strategies for the use of innovation capacity in design and manufacturing in industrial companies
C29	To know and integrate rigorously the procedures and techniques necessary for the elaboration and implementation of research, development and innovation projects in the context of Industry 4.0
C30	To develop critical/self-critical and communication skills in a research project, with excellence and quality criteria in national and international fields
C31	Know the advanced computer tools for mathematical calculation and their use in design and manufacturing engineering applications
C32	Select and apply advanced calculation tools for solving mathematical problems in the field of design engineering and manufacturing
C33	Identify and develop key skills and abilities in multidisciplinary teams for the processes of implementation and evolution towards industry 4.0
C34	Develop skills for competency-based management of people in high-performance teams in the context of Design and Manufacturing
D1	Ability to understand the meaning and application of the gender perspective in different areas of knowledge and in professional practice with the aim of achieving a more just and equal society
D2	Incorporate criteria of sustainability and environmental commitment into professional practice. To acquire skills in the equitable, responsible and efficient use of resources
D3	Multidisciplinary teamwork

Learning outcomes

Expected results from this subject	Training and Learning Results

The student is exposed to real situations in the company to experience and channel his professional potential	A3 A4 B4 B5 B6 C33 C34 D1 D2 D3
The student has to integrate in multidisciplinary teams.	A3 A4 B4 B5 B6 C34 D1 D2 D3
The student recognizes and adapts to the different levels and types of work environment to which he or she is exposed.	A3 A4 B1 B4 B5 B6 B7 C33 C34 D1 D2 D3

The student interacts with the teams where he or she integrates with professional criteria of responsibility and autonomy at work.	A2 A3 A4 B1 B2 B3 B4 B5 B6 B7 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 D1 D2 D3

Contents	
Topic	
Previous activities to the allocation of the destination	- Preparation of CV - Interview with the personnel of the máster commissioned of the external practices - Interview with the responsible personnel of the institution or company where will be developed the practices.
Allocation of destination	- Allocation of Activities and preparation of Dossier - Identification and Allocation of functions to develop
Realisation of the period/s of practices:	- Integration in a group of work - development of activities during the stay that have relation with the subjects and aims of the máster. - Preparation of a dossier of activities made and functions exerted.

Planning			
	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	0	149	149
Report of practices, practicum and external practices	0	1	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Practicum, External practices and clinical practices	The student develops the activities in a context related to the exercise of his/her professional career, during a determined period, carrying out the functions assigned and foreseen in the internship proposal. Objectives: - To reflect on professional practice. - To put knowledge and skills into practice in a real professional environment. Mode: Guided. Nature: Practical. Scenario: They are developed in external non-academic spaces (companies, institutions, technological centres, laboratories, ...) of academic-professional interest for the students. Groups: Individual During the activity, the students will collect data, carry out personal interviews... depending on the activity itself and what the teachers request. Write a report of the practices.

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	To put students in contact with companies, institutions,... so that they can do the internship. To follow up the activities and transmit observations to the students once the internship is over. Control and Evaluation of the internship.

Tests	Description
Report of practices, practicum and external practices	- Preparation of evaluation activities and evaluation criteria/indicators - Review of the evidence of the evaluation activities. - Communication of the results (publication of notes and data and/or review procedure)

Assessment

	Description	Qualification	Training and Learning Results			
Report of practices, practicum and external practices	Preparation of a report by the student reflecting the characteristics of the work carried out. The students must describe the tasks and procedures developed, show the results obtained or observations made, as well as the analysis and treatment of data. The report evaluates knowledge, skills and attitudes. Objectives: To evaluate higher thinking. Analysis, synthesis and evaluation are valued.	100	A2 A3 A4	B1 B2 B3 B4 B5 B6 B7	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34	D1 D2 D3

Other comments on the Evaluation

Sources of information

Basic Bibliography

Universidade de Vigo. EEI, **Regulamento de prácticas en empresa da Escola de Enxeñería Industrial**, https://eei.uvigo.es/eei_gl/escola/normativa/practicas-empresa/index.html, Universidade de Vigo, 2012

Universidade de Vigo, **Regulamento de prácticas académicas**, https://secretaria.uvigo.gal/uv/web/normativa/public/show/298, Universidade de Vigo, 2012

Ministerio de Educación, Cultura y Deporte, **Real Decreto 592/2014, de 11 de julio, por el que se regulan las prácticas académicas externas de los estudiantes universitarios.**, https://www.boe.es/buscar/act.php?id=BOE-A-2014-8138, BOE, 2014

UVigo, **Instrucións sobre o procedemento para a realización das prácticas académicas externas: Curriculares**, https://www.uvigo.gal/sites/uvigo.gal/files/contents/paragraph-file/2019-04/instrucion_curriculares_, UVigo, 2013

Complementary Bibliography

Universidade de Vigo, **Instrucións sobre o procedemento para a realización das prácticas académicas externas: Extracurriculares**, https://www.uvigo.gal/sites/uvigo.gal/files/contents/paragraph-file/2019-04/instrucion_extracurricul, UVigo, 2013

Universidade de Vigo, **Nomeamento de titores/as nas prácticas académicas extracurriculares**, https://secretaria.uvigo.gal/uv/web/normativa/public/show/299, UVigo, 2013

Recommendations

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or no totally face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a way but agile and effective when being known in advance (or with a wide in advance) by the students and the faculty through the tool normalised and institutionalised of the educational guides DOCNET.

=== ADAPTATION OF The METHODOLOGIES ===
The educational methodologies will give , to be necessary, adapting them to the telematic means that put the disposal of the faculty, in addition to the documentation facilitated through FAITIC and other platforms, email, etc.
When it was not possible to face-to-face teaching, in the measure of the possible, will prevail the teaching of the theoretical contents by telematic means as well as those contents of practices of resolution of problems, classroom of computing, and others, that can be virtualized developed by the students of way guided, tried keep the attendance presenciality for the experimental practices of laboratory, whenever the groups fulfil with the rule established in the moment by the pertinent authorities in sanitary matter and of security. In the case of not being able to be given of face-to-face form, those contents no virtualizable will give or replace by other (autonomous work guided, etc.) that allow to achieve equally the competitions associated to them.

* Educational methodologies that keep

* educational Methodologies that modify

* Mechanism no face-to-face of attention to the students (tutorials)
The tuitorials will be able to develop indistinctly of face-to-face form (whenever
it was possible to guarantee the sanitary measures) or telematic (email and others) respecting or adapting the schedules of tutorials planned. Besides, it will do an adaptation methodological to the students of risk, facilitating him additional specific information, to accredit that it can not have access to the contents given of conventional form.
* Modifications (proceed) of the contents to give

* additional Bibliography to facilitate to car-learning
Will be able to be added along the course to facilitate the self-learning

* Other modifications

=== ADAPTATION OF The EVALUATION ===
Will keep those proofs that already come making of telematic form and, in the measure of the possible, will keep the face-to-

face proofs adapting them to the valid sanitary rule. The proofs will develop of face-to-face form except Rectoral Resolution that indicates they have to do of form non face-to-face, making gave way through the distinct tools put the disposal of the professors. Those no attainable proofs of telematic form will be replaced by other (deliveries of autonomous work guided, etc.)

* Proofs already made
Proof *XX: [previous Weight 00%] [Weight Proposed 00%]
...

* Pending proofs that keep
Proof *XX: [previous Weight 00%] [Weight Proposed 00%]
...

* Proofs that modify
[previous Proof] => [new Proof]

* New proofs
does not proceed
* additional Information
keep the criteria of evaluation adapting the realisation of the proofs, in the case to be necessary and by indication in Rectoral Resolution, to the telematic means put the disposal of the teachers