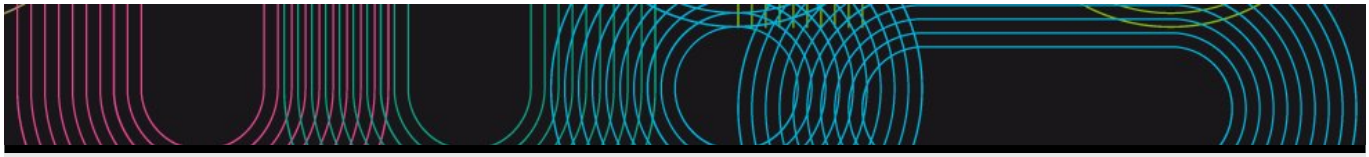

IDENTIFYING DATA				
CAD / CAM / CAE Advanced Systems				
Subject	CAD / CAM / CAE Advanced Systems			
Code	V04M183V01107			
Study programme	Máster Universitario en Industria 4.0			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Cerqueiro Pequeño, Jorge			
Lecturers	Cerqueiro Pequeño, Jorge Pereira Domínguez, Alejandro Villar García, Marcos			
E-mail	jcerquei@uvigo.es			
Web	http://masterindustria40.webs7.uvigo.es/wordpress/			
General description	The aim of this course is to train the students in the selection of the most suitable CAD, CAM and CAE systems according to the specific case of application, in the frame of the Industry 4.0 paradigm. The course will make the students to get involved in the practical use of the different tools available within those systems, allowing them to explore their capabilities and limitations, going all the way to the elaboration of benchmarking analysis and specification documents about such systems.			

Skills	
Code	
A1	Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
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.
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
B3	Descion making
B7	Computer skills related to the field of study.
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
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

Learning outcomes	
Expected results from this subject	Training and Learning Results
Knowing the most appropriate CAD/CAM/CAE environments to be implemented in the context of Industry 4.0.	A1 B1 B7 C23

Selecting the appropriate CAD/CAM/CAE solutions to be implemented in response to specific demands, including the design and definition of integrated design and manufacturing systems.	A2 B1 B3 C24 D1 D2
Applying advanced design and engineering tools to the modelling of complex mechanical parts and assemblies.	A2 B3 B7 C24 D1 D2
Applying advanced computer-assisted manufacturing and production engineering tools within the Industry 4.0 framework.	A2 A4 B1 B3 C23 C24 D1 D2

Contents	
Topic	
1. CAD/CAM/CAE systems in Industry 4.0.	1.1. Engineering processes in Industry 4.0. 1.2. CAx functionalities in Industry 4.0.
2. Integrated design and manufacturing systems.	2.1. Integration of systems. 2.2. CAx integrated systems -PDM and PLM- for design and manufacturing.
3. Solid modelling (CAD) systems oriented to the product.	3.1. Hierarchies of entities in 3D CAD systems. 3.2. Parametric solid modelling. 3.3. Product structure. 3.4. The 'design intent'. 3.5. Elaboration of technical documentation.
4. Computer-aided manufacturing (CAM) systems.	4.1. Typologies of CAM systems. 4.2. CAM systems to support different manufacturing processes. 4.3. CAD-CAM connectivity for product engineering.
5. Computer-aided engineering (CAE) systems.	5.1. Typologies of CAE systems. 5.2. CAE systems for supporting design. 5.3. CAE systems for manufacturing support. 5.4. CAD-CAM-CAE connectivity.
6. Applications of CAD-CAM-CAE systems.	6.1. Applications of CAD systems to design. 6.2. Applications of CAM systems to manufacturing. 6.3. Applications of CAE systems to engineering.
7. Selection of AD-CAM-CAE systems.	7.1. Evaluation of engineering needs and elaboration of technical specifications. 7.2. Analysis of CAx systems specifications. 7.3. Methodology for the selection of CAx systems.
Practical exercise nr. 1.	Elaboration of a practical assignment about a mechanical system using advanced CAD tools.
Practical exercise nr. 2.	Elaboration of a practical assignment related to the manufacturing engineering by machining of mechanical parts, using advanced CAM tools.
Practical exercise nr. 3.	Elaboration of a practical assignment involving the simulation of a mechanical system using advanced CAE tools.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	8	18	26
Autonomous problem solving	4	19	23
Practices through ICT	9	14	23
Objective questions exam	1	0	1
Presentation	1	0	1
Systematic observation	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

Lecturing	Exhibition by the professor of the contents on the matter that is object of study, its theoretical bases and/or work guidelines aiming to the assignments that the student has to develop.
Autonomous problem solving	Activity in which the students develop assignments and/or exercises related with the subject. The student/to has to perform the analysis and resolution of the problems and/or exercises by himself in an autonomous way.
Practices through ICT	Activities to apply the gained knowledge in a certain context and to acquire basic and procedimental skills related to the matter by using ITC tools.

Personalized assistance

Methodologies	Description
Autonomous problem solving	Activity in which problems and/or exercises related with the subject are formulated. The student has to perform the analysis and resolution of the problems and/or exercises by hinself in an autonomous way. For all the teaching modalities contemplated in the Contingency Plan, the tutorial sessions of could be carried out through telematic means -email, videoconference, FAITIC forums, etc.- under the modality of prior concertation of virtual place, date and hour.

Assessment

	Description	Qualification	Training and Learning Results			
Objective questions exam	Tests composed of objective questions. Mid-term and final assessment.	40	A1	B1 B7	C23	D2
Presentation	Presentations. Assignments. Projects. Report of Laboratory activities.	40	A2 A4	B1	C24	D1
Systematic observation	Systematic observation. Complementary activities of continuous assessment.	20	A4	B3 B7	C24	D1 D2

Other comments on the Evaluation

Students who do not pass the subject in continuous training at the first opportunity of each academic year, in which the distribution of evaluation weights is as stablished above, will have the possibility of having an exam of objective questions, worth 100% of the final mark, in successive calls that are not the first opportunity of each academic year.

Ethical commitment: Students are expected to behave ethically. If unethical behaviour is detected (copying, plagiarism, use of unauthorised electronic devices,...), the student will be considered to be ineligible to pass the subject. Depending on the type of unethical behaviour detected, it could be concluded that the student has not reached the necessary skills to overcome the subject. Students are expected to behave in a respectful and dignified manner and to collaborate with the teaching system, teaching staff, coordination and administrative and services personnel of the Master's degree. Any question due to the lack of ethical and dignified behaviour of the student body may have repercussions on the evaluation of the subject.

Sources of information

Basic Bibliography

Fernández, Mario, **INDUSTRIA 4.0: Tecnologías y Gestión en la Transformación Digital de la Industria**, 1ª, Editor independiente, 2020

Garijo Gómez, Egberto, **Diseño y Fabricación con CATIA V5: Módulos CAM, Mecanización por arranque de viruta**, 1ª, Vision Libros, 2015

Stark, John, **Product Lifecycle Management (Volume 2): The Devil is in the Details**, 3ª, Springer International Publishing, 2016

Tickoo, Sham, **CATIA V5-6R2015 for Engineers and Designers**, 1ª, Amazon Media EU S.à r.l., 2016

Ulrich, Karl; Eppinger, Steven; Yang, Maria C., **Product Design and Development**, 7ª, McGraw-Hill Education, 2019

Complementary Bibliography

DASSAULT SYSTÈMES, **3DS ACADEMY**, 2020, DASSAULT SYSTÈMES, 2020

Pereira, Alejandro, **Fundamentos de DELMIA: Caso práctico de simulación de celda robotizada**, 2019, El Autor, 2019

Rodal Montero, Enrique, **Industria 4.0: Conceptos, tecnologías habilitadoras y retos**, 1ª, Ediciones Pirámide, 2020

Stark, John, **PLM Vision and Strategy in the Industry 4.0 World: Product Lifecycle Management in 2021**, 1ª, Amazon.com Services LLC, 2018

Tickoo, Sham, **SOLIDWORKS 2019 for Designers**, 17ª, CADCIM Technologies, 2018

Tran, Paul, **SOLIDWORKS 2020 Intermediate Skills**, 1ª, SDC Publications, 2019

Tutorial Books, **CATIA V5-6R2015 Basics Part II: Part Modeling**, 1ª, Tutorial Books, 2015

Tutorial Books, **CATIA V5-6R2015 Basics Part III: Assembly Design, Drafting, Sheetmetal Design and Surface Design**, 1ª, Tutorial Books, 2015

Recommendations

Other comments

The communication with the students will be made through the FAITIC distance learning platform, for which it will be necessary that the student accesses the course space in the platform previously to the start of the lecturing period.

Before the realisation of the evaluation tests, it is recommended that the students consult with the FAITIC platform to confirm the tests' date, place, recommendations, etc., as well as the needs regarding using manuals or any another material for carrying out the tests and elaborating the home assignment works.