

		Guía D	ocente		
Datos Identificativos					2021/22
Asignatura (*)	Tecnoloxías Facilitadoras da Industria 4.0			Código	730542010
Titulación	Master Universitario Erasmus Mund	r Marítimo			
		Descri	iptores		
Ciclo	Período	Cu	rso	Tipo	Créditos
Mestrado Oficial	2º cuadrimestre	Prim	neiro	Obrigatoria	6
Idioma	Inglés		'		
Modalidade docente	Presencial				
Prerrequisitos					
Departamento	Enxeñaría de Computadores				
Coordinación	Fernández Caramés, Tiago Manuel Correo electrónico tiago.fernandez@udc.es				
Profesorado	Fernández Caramés, Tiago Manue	I	Correo electrónico tiago.fernandez@u		@udc.es
	Fraga Lamas, Paula			paula.fraga@uc	lc.es
Web	www.master-seas40.unina.it/progra	amme/course	es/syllabi/		
Descrición xeral	The main objective of this course is	to provide th	ne students with the es	sential concepts b	ehind the latest and most popul
	Industry 4.0 enabling technologies, together with knowledge regarding the threats which could affect industrial connected				
	systems.				

	UNIVERSIDADE DA CORUÑA
Plan de continxencia	1. Modifications to the contents

2. Methodologies

- No changes will be performed.

- *Teaching methodologies that are maintained
- None.
- *Teaching methodologies that are modified
- Guest lectures and Mixed test: due to the exceptional situation, given the impossibility of being able to teach in a completely face-to-face way, virtual tools provided by the university will be used, which can be complemented with other tools.
- ICT practicals: the labs that require specific equipment will be replaced with simulated or virtualized ones. Eventually, alternative practices will be proposed that do not require such equipment. These practicals may be oriented towards autonomous work to address conciliation and/or connectivity problems.
- 3. Mechanisms for personalized attention to students
- Tutoring sessions (student attention) will be conducted electronically (e.g., through email, Teams, Moodle), which can be complemented with each other tools. In some of such tools, prior appointments will be agreed.
- 4. Modifications in the evaluation
- There will be no modifications.
- 5. Modifications to the bibliography or webgraphy
- There will be no modifications.

Competencias / Resultados do título Código Competencias / Resultados do título A3 CE3 - Demonstrate knowledge, understanding and competences in applying information	
A3 CE3 - Demonstrate knowledge, understanding and competences in applying information	
design, construction and operation (IDM).	n systems and data management tools during ship
B2 CB6 - Acquire and understand knowledge that provides a basis or opportunity to be original ideas, usually in a research context.	inal in the development and / or application of
B3 CB7 - That students know how to apply the acquired knowledge and their ability to solve within broader (or multidisciplinary) contexts related to their area of study.	problems in new or unfamiliar environments
B4 CB8 - That students are able to integrate knowledge and face the complexity of making j incomplete or limited, includes reflections on the social and ethical responsibilities linked judgments.	, ,
B5 CB9 ? That students are able to communicate their conclusions -and the knowledge and and non-specialized publics in a clear and unambiguous way.	d ultimate reasons that sustain them- to specialized
B6 CB10 - That students have the learning skills that allow them to continue studying in a wa	yay that will be largely self-directed or autonomous.
B7 CG1 ? To display the adequate intercultural competence to successfully navigating within implement basic management principles suitable for a multicultural working environment	G

B8	CG2 ? To express an attitude of intellectual inquisitiveness and open-mindedness.
B10	CG4 ? To have the capability to think creatively and explore new ideas outside of current boundaries of the field
B13	CG7 ? To have the capability to critically analyse, synthesise, interpret and summarise complex scientific processes.
C2	CT2 - Mastering oral and written expression in a foreign language.
C3	CT3 - Using ICT in working contexts and lifelong learning.
C4	CT4 - Acting as a respectful citizen according to democratic cultures and human rights and with a gender perspective.
C6	CT6 - Acquiring skills for healthy lifestyles, and healthy habits and routines.
C7	CT7 -Developing the ability to work in interdisciplinary or transdisciplinary teams in order to offer proposals that can contribute to a
	sustainable environmental, economic, political and social development.
C8	CT8 -Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of
	society.

Resultados da aprendizaxe			
Resultados de aprendizaxe			ias /
	Resulf	ados do	título
To acquire, understand and put in practice knowledge regarding the most important Industry 4.0 enabling technologies.	AM3	BM1	CM2
		BM2	СМЗ
To be able to understand the key concepts related to the most popular Industry 4.0 information management systems.		ВМ3	CM4
		BM4	CM6
To be able to understand the implications at a security level of the diverse Industry 4.0 technologies and the basics of potential		BM5	CM7
cyberthreats and the essential protection techniques.		BM6	CM8
		BM7	
		ВМ9	
		BM12	

	Contidos
Temas	Subtemas
Introduction to Industry 4.0	-Basics
	- Similar concepts
	- Industry 4.0 technologies
	-Industry 5.0 and Society 5.0
	- Practical cases
	- The Shipyard 4.0 Project
Sensing and Actuation Networks	-Essential concepts
	- Common sensors and actuators
	- Communication networks and standards
	- Cybersecurity
	- Practical shipbuilding applications

Cloud and Edge Computing	- Cloud Computing: essential concepts and traditional architecture
	- Edge Computing: definition, types and advanced architectures
	- Cybersecurity
	- Practical shipbuilding applications
Cyber-Physical Systems	- Essential concepts
	- Hardware and software
	- Communications networks and protocols
	- Cybersecurity
Augmented, Mixed and Virtual Reality	- Practical industrial cases - Basics
Augmented, wixed and virtual Neality	- Basics
	- Hardware and Software
	- Cybersecurity
	- Practical shipbuilding applications
Blockchain	- Basics
	- Types of blockchains
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	- Communications architecture
	- Cybersecurity
	cyssissedin,
	- Practical industrial and shipbuilding applications
Unmanned Vehicles	- Essential concepts
	- Types of vehicles
	- Cybersecurity
	- Practical applications for the shipbuilding industry
Additive Manufacturing	- Essential concepts
	Turns of addition many featuring to short size
	- Types of additive manufacturing technologies
	- Cybersecurity
	- Applications for the shipbuilding industry

Information Management Systems	- Basics
	- Architectures
	- Popular information management software (e.g., ERP, PLM, MES)
	- Cybersecurity

	Planificació	ón		
Metodoloxías / probas	Competencias /	Horas lectivas	Horas traballo	Horas totais
	Resultados	(presenciais e	autónomo	
		virtuais)		
Sesión maxistral	B2 C8	19	19	38
Prácticas a través de TIC	A3 B3 B6 C3	9	9	18
Traballos tutelados	B2 B3 B5 B7 B8 B10	9	45	54
	B13 C4 C6 C7			
Presentación oral	B5 C2	1	10	11
Proba mixta	B4 C2	1	25	26
Atención personalizada		3	0	3

Metodoloxías				
Metodoloxías	Descrición			
Sesión maxistral	Lectures on the content of the subject			
Prácticas a través de	ICT practicals to put in practice the concepts learned on the lectures			
TIC				
Traballos tutelados	Project to put in practice the concepts learned in the theory lectures and the ICT practicals			
Presentación oral	Oral presentation on the results of the supervised project			
Proba mixta	Test to assess the learned practical and theoretical concepts			

Atención personalizada			
Metodoloxías	Descrición		
Traballos tutelados	The professors will tutor the students and will guide them during the practical lessons and the supervised project.		
Prácticas a través de			
TIC			

Avaliación				
Metodoloxías Competencias		Descrición	Cualificación	
	Resultados			
Traballos tutelados	B2 B3 B5 B7 B8 B10	Evaluation of a deliverable whose development fuses theory and practice, and which	30	
	B13 C4 C6 C7	is guided by the professors		
Presentación oral	B5 C2	Evaluation of a oral presentation on the results of the supervised project	10	
Prácticas a través de	A3 B3 B6 C3	Evaluation of the results and knowledge acquired during the ICT practicals	20	
TIC				
Proba mixta	B4 C2	Evaluation of the competences acquired in the subject	40	

Observacións avaliación



FIRST CALL

The practical part of the subject will consist in developing practical examples about the content of the theory lessons. Its evaluation will be perform progressively, with clear deadlines. Such a practical part could be replaced with the development of a mobile application or a individual assignment. The objective test will be divided into two parts: one oriented towards evaluating the practical developments and a second one about the theoretical content.

SECOND CALL

The students will have the opportunity to maintain the marks obtained during the ICT practicals and the supervised project. Such students will carry out a mixed test, establishing the final mark according to the same percentages applied for the first call. The rest of the students will take a single mixed test (60% of the total mark) and will carry out a supervised project (40% of the total mark).

OTHER COMMENTS

In case of detecting plagiarism, the student will be evaluated as failed (0) and the situation will be communicated to the master direction and to the corresponding authorities to take the appropriate measures.

General EMJMD Sustainable Ship and Shipping SEAS 4.0 evaluation rules:

- Students will have only two oportunities to pass a course. If failing to do so, they may be forced to leave the degree.

(2016). Smart pipe system for a shipyard 4.0. MDPI

- No part time or lecture attendance exemption are allowed in this degree.

Fontes de información - Alasdair Gilchrist (2016). Industry 4.0: The Industrial Internet of Things . Apress - Mohammad Dastbaz, Peter Cochrane (2019). Industry 4.0 and Engineering for a Sustainable Future. Springer - Paula Fraga-Lamas, Tiago M Fernández-Caramés, Óscar Blanco-Novoa, Miguel Vilar-Montesinos (2018). A Review on Industrial Augmented Reality Systems for the Industry 4.0 Shipyard. IEEE - Tiago M Fernández-Caramés, Paula Fraga-Lamas (2019). A review on the application of blockchain to the next generation of cybersecure industry 4.0 smart factories. IEEE - Óscar Blanco-Novoa, Tiago M Fernández-Caramés, Paula Fraga-Lamas, Miguel Vilar-Montesinos (2018). A Practical Evaluation of Commercial Industrial Augmented Reality Systems in an Industry 4.0 Shipyard. IEEE - Tiago M Fernández-Caramés, Oscar Blanco-Novoa, Iván Froiz-Míguez, Paula Fraga-Lamas (2019). Towards an autonomous industry 4.0 warehouse: A UAV and blockchain-based system for inventory and traceability applications in big data-driven supply chain management. IEEE - Paula Fraga-Lamas, Diego Noceda-Davila, Tiago M Fernández-Caramés, Manuel A Díaz-Bouza, Miguel Vilar

Bibliografía complementaria

material que continuan e tentano
Materias que continúan o temario
usas Aplicado á Industria (IIoT)/730542015
Materias que se recomenda cursar simultaneamente
Materias que se recomenda ter cursado previamente
Recomendacións

To help in achieving a sustainable environment and to get the objective of number 5 action of the "Ferrol Green Campus Action Plan" (Healthy and environmentally and socially sustainable research and teaching): The assignments to be done in this course: Will be required in digital format. Will be delivered using Moodle, with no need to print them. In case it is necessary to print them: Plastics won't be used. Two side printing will be used. Recycled paper will be used. Printing drafts will be avoided. A sustainable use of the resources should be done, together with the prevention of negative impacts on the environment. Anbsp;



(*)A Guía docente é o documento onde se visualiza a proposta académica da UDC. Este documento é público e non se pode modificar, salvo casos excepcionais baixo a revisión do órgano competente dacordo coa normativa vixente que establece o proceso de elaboración de guías