Guia docente				
Datos Identificativos				2022/23
Asignatura (*)	Internet de las Cosas Aplicado a la Industria (IIoT)		Código	730542015
Titulación	Master Universitario Erasmus Mundus en Sostibilidade e Industria 4.0 aplicada ao Sector Marítimo			
Descriptores				
Ciclo	Periodo	Curso	Tipo	Créditos
Máster Oficial	2º cuatrimestre	Primero	Optativa	6
Idioma	Inglés			
Modalidad docente	Presencial			
Prerrequisitos				
Departamento	Ciencias da Computación e Tecnoloxías da InformaciónEnxeñaría Industrial			
Coordinador/a	Becerra Permuy, Jose Antonio	Correo electrónico	jose.antonio.becerra.permuy@udc.es	
Profesorado	Becerra Permuy, Jose Antonio Guerreiro Santalla, Sara Quintián Pardo, Héctor Timiraos Díaz, Miriam	Correo electrónico	jose.antonio.becerra.permuy@udc.es sara.guerreiro@udc.es hector.quintian@udc.es miriam.timiraos.diaz@udc.es	
Web				
Descripción general	This course is focused on providing the students with practical knowledge in the Internet of Things (IoT) and, specifically, regarding its application to industrial environments (Industrial Internet of Things, IIoT). The theoretical lessons will cover a broad view of all relevant aspects of IoT, while practical lessons will prepare the students for carrying out the implementation of those theoretical concepts.			

Competencias / Resultados del título	
Código	Competencias / Resultados del título
B2	CB6 - Acquire and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, usually in a research context.
B3	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
B4	CB8 - That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B5	CB9 ? That students are able to communicate their conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized publics in a clear and unambiguous way.
B6	CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B7	CG1 ? To display the adequate intercultural competence to successfully navigating within multicultural learning environments and to implement basic management principles suitable for a multicultural working environment.
B8	CG2 ? To express an attitude of intellectual inquisitiveness and open-mindedness.
B11	CG5 ? To have the capability to identify, formulate and solve engineering problems within realistic constraints.
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.

Resultados de aprendizaje	
Resultados de aprendizaje	Competencias / Resultados del título

The students will be able to understand and implement the basic theoretical concept of Internet of Things in industrial environments.		BM1 BM2 BM3 BM4 BM5 BM6 BM7 BM10 BM12	CM2 CM3 CM4 CM6 CM7

Contenidos	
Tema	**Subtema**
Introduction.	- Background and definitions. - Involved technologies. - IoT vs. IIoT. - Relationship with Industry 4.0.
Devices.	- Sensors and endpoints. - Actuators. - Hardware platforms. - Low level communication.
Communication networks.	- Types of networks. - Gateways. - Protocols.
Data processing.	- Edge, fog, and cloud computing. - Data analytics and machine learning application. - Software platforms.
User interfaces.	- Standalone. - Cloud-based.
Security.	- Firewalls. - Encryption. - Authentication.

Planificación				
Metodologías / pruebas	**Competencias / Resultados**	**Horas lectivas (presenciales y virtuales)**	**Horas trabajo autónomo**	**Horas totales**
Prueba mixta	B4 B11 B13 C2	2.5	0	2.5
Sesión magistral	B2 B6 B8 C2 C3 C4	21	21	42
Prácticas de laboratorio	B3 B6 B8 C2 C3 C4	21	21	42
Trabajos tutelados	B3 B4 B5 B6 B7 B8 B11 B13 C2 C3 C4 C6 C7	0	61.5	61.5
Atención personalizada		2	0	2
(*)Los datos que aparecen en la tabla de planificación són de carácter orientativo, considerando la heterogeneidad de los alumnos				

Metodologías	
Metodologías	**Descripción**
Prueba mixta	It will consist of a written test with short and / or multiple choice questions, in order to check the consolidation of the most important theoretical concepts seen in the subject.

Sesión magistral	Activity in the classroom that serves to establish the fundamental concepts of the subject. It consists of oral presentation making profuse use of audiovisual media and seeking the participation of students by posing practical cases and asking questions, in order to facilitate learning and foster a critical spirit.
Prácticas de laboratorio	Through this activity, students will implement small systems in the laboratory that will exemplify the concepts seen in the lectures, so that they can test some of the methods and techniques in the real world, and assess the problems (and their implications) that arise in the implementation of IoT systems.
Trabajos tutelados	Completion of one or more assignments throughout the term, carried out autonomously and supervised by the teachers, which will involve putting into practice the concepts seen in the lectures. At least the final work will be done in groups and students will submit a report and they will also have to make a presentation to the teacher and their classmates.

Atención personalizada	
Metodologías	**Descripción**
Trabajos tutelados Prácticas de laboratorio	Laboratory practice: personalized attention in laboratory practices will consist of solving conceptual or procedural doubts that may arise during students' work. Supervised projects: it will be necessary to show the progress that is being made to offer the appropriate guidance, resolve doubts and ensure the quality of the work. These tutorials will be carried out in groups and in person in the teacher's office or using Teams.

Evaluación			
Metodologías	**Competencias / Resultados**	**Descripción**	**Calificación**
Trabajos tutelados	B3 B4 B5 B6 B7 B8 B11 B13 C2 C3 C4 C6 C7	Development of one or more individual projects or in small groups. It will be necessary to deliver the materials (document and presentation) in a timely manner following the instructions. At least the final work will require oral presentation by all members of the working group. Not to perform the presentation will result in a score of zero in this activity. Nomenclature used in the observations section for this activity: P: mark obtained in the supervised project (70% of the final mark).	70
Prueba mixta	B4 B11 B13 C2	It will consist of a written exam with short and / or multiple choice questions, in order to check the consolidation of the most important theoretical concepts seen in the subject. General evaluation criteria: * Correct answers. Nomenclature used in the observations section for this activity: E: mark obtained in this test (30% of the final mark).	30

Observaciones evaluación
In order to pass the subject, the student must meet the following requirements (score between 0 and 10 in all activities):1) P> = 5.2) E> = 5.If all the above requirements are not met, the maximum qualification mark that can be obtained, in the corresponding opportunity, will be 4.5 points. If the required requirements are met, the final mark will be calculated as follows:FINAL MARK = 0.7 × P + 0.3 * EGeneral 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. - No part time or lecture attendance exemption are allowed in this degree.

Fuentes de información

Básica	- Veneri, G., & Capasso, A. (2018). Hands-On Industrial Internet of Things. Packt Publishing Ltd. - Dow, C. (2018). Internet of Things Programming Projects. Packt Publishing Ltd.
Complementária	- Lea, P. (2018). Internet of Things for Architects. Packt Publishing Ltd. - Ravulavaru, A. (2018). Enterprise Internet of Things Handbook. Packt Publishing Ltd.

Recomendaciones
Asignaturas que se recomienda haber cursado previamente
Asignaturas que se recomienda cursar simultáneamente
Tecnologías Facilitadoras de la Industria 4.0/730542010
Asignaturas que continúan el temario
Gemelos Digitales en Sistemas Marinos/730542022
Otros comentarios
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 environmentaly 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.