UNIVERSIDADE DA CORUÑA

Guia docente			
Datos Identificativos			**2021/22**
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	**Correo electrónico**	jose.antonio.becerra.permuy@udc.es
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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.
Plan de contingencia	1. Modifications to the contents No changes will be made. 2. Methodologies * Teaching methodologies that are maintained All methodologies are maintained. * Teaching methodologies that are modified All methodologies will have to be adapted. Thus, lectures, laboratory practices, supervised project, and exam will be carried out using Teams and / or Moodle. The presentation of the supervised project will also be done through Teams. The physical devices used in all the methodologies will be replaced by simulators or they will be given to the students (depending on the final number of students enrolled and the availability of material). 3. Mechanisms for personalized attention to students Except for in-office tutorials, the same personalized attention mechanisms are maintained, namely: videoconferencing and messaging by Teams, Moodle and email, in this order of preference. Additionally, if the teaching staff observes that there are doubts common to a group of students, small group tutorials can be scheduled through videoconference by Teams. 4. Changes in the evaluation * Evaluation observations: There are no changes to the evaluation, apart from the fact that it will be carried out online using Moodle or Teams. 5. Modifications to the bibliography or webgraphy All the recommended bibliography was acquired by the center's library in PDF as well as on paper, so it could be provided to the students. In the event that this is not possible due to a copyright issue, the faculty would provide a free-access substitute.

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
Sesión magistral	B2 B6 B8 C2 C3 C4	21	31.5	52.5
Prácticas de laboratorio	B3 B6 B8 C2 C3 C4	21	31.5	52.5
Trabajos tutelados	B3 B4 B5 B6 B7 B8 B11 B13 C2 C3 C4 C6 C7	0	39.5	39.5
Prueba mixta	B4 B11 B13 C2	1	1.5	2.5
Atención personalizada		3	0	3
(*)Los datos que aparecen en la tabla de planificación són de carácter orientativo, considerando la heterogeneidad de los alumnos				

Metodologías	
Metodologías	Descripción
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	Single assignment proposed incrementally, carried out autonomously, and tutored by the teachers, which will involve putting into practice a large part of the concepts seen in the lectures. The work will be done in groups and the students will deliver a report and will also have to make a presentation to the teacher and their classmates.
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.

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 | Autonomous work in small groups. It will be necessary to deliver the materials (document and presentation) in a timely manner following the instructions. In addition, it will require oral presentation by all the members of the working group. Not to perform the presentation will result in a score of zero in this activity.

General evaluation criteria:
* Clarity, length and quality of the working memory.
* Clarity and quality of the oral presentation.
* Adequacy of the student's answers to the teacher's questions during the presentation.
* Attendance to tutoring sessions.

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.