# UNIVERSIDADE DA CORUÑA

| **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 | | | |
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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. | | | |

| **Competencias del título** | |
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| **Código** | **Competencias 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** | |
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| **Resultados de aprendizaje** | **Competencias del título** |
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| The students will be able to understand and implement the basic theoretical concept of Internet of Things in industrial environments. | BM1 | CM2 |
|---|---|---|
| | BM2 | CM3 |
| | BM3 | CM4 |
| | BM4 | CM6 |
| | BM5 | CM7 |
| | BM6 | |
| | BM7 | |
| | BM10 | |
| | BM12 | |

| Contenidos | |
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| **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 | | | | |
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| **Metodologías / pruebas** | **Competéncias** | **Horas presenciales** | **Horas no presenciales / 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. |

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| 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** | **Competéncias** | **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 |
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| 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 | |
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| **Básica** | - Veneri, G., &amp; 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 |
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| **Asignaturas que se recomienda haber cursado previamente** |
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| **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.  |

**(\*) La Guía Docente es el documento donde se visualiza la propuesta académica de la UDC. Este documento es público y no se puede modificar, salvo cosas excepcionales bajo la revisión del órgano competente de acuerdo a la normativa vigente que establece el proceso de elaboración de guías**