Teaching Guide				
Identifying Data				2020/21
Subject (*)	Industrial System Integration		Code	730497237
Study programme	Mestrado Universitario en Enxeñaría Industrial (plan 2018)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	Second	Optional	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Velo Sabin, Jose Maria	E-mail	jose.velo@udc.es	
Lecturers	Velo Sabin, Jose Maria	E-mail	jose.velo@udc.es	
Web	https://moodle.udc..es			
General description	Practical approach for the integration of industrial systems based on IoT as a product of integration of industrial systems within the concept of Industry 4.0			
Contingency plan	1. Modifications to the contents 2. Methodologies *Teaching methodologies that are maintained *Teaching methodologies that are modified 3. Mechanisms for personalized attention to students 4. Modifications in the evaluation *Evaluation observations: 5. Modifications to the bibliography or webgraphy			

Study programme competences	
Code	Study programme competences
A7	ETI7 - Ability to design electronic systems and industrial instrumentation.
A8	ETI8 - Ability to design and project automated production systems and advanced process control.
B1	CB6 - 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.
B2	CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of ??study.
B3	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.
B4	CB9 - That the students know how to communicate their conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized audiences in a clear and unambiguous way.
B5	CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B6	G1 - Have adequate knowledge of the scientific and technological aspects in Industrial Engineering.
B13	G8 - Apply the knowledge acquired and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts.
B14	G9 - Be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

B15	G10 - Knowing how to communicate the conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized publics in a clear and unambiguous way.
B16	G11 - Possess the learning skills that allow to continue studying in a self-directed or autonomous way.
C1	ABET (a) - An ability to apply knowledge of mathematics, science, and engineering.
C2	ABET (b) - An ability to design and conduct experiments, as well as to analyze and interpret data.
C3	ABET (c) - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
C6	ABET (f) - An understanding of professional and ethical responsibility.
C7	ABET (g) - An ability to communicate effectively.
C8	ABET (h) - The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
C9	ABET (i) - A recognition of the need for, and an ability to engage in life-long learning.
C11	ABET (k) - An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Learning outcomes			
Learning outcomes	Study programme competences		
Coñecer as diferentes tecnoloxías para a medición de variables de entorno e integración de sistemas industriais en xeral	AJ7 AJ8	BJ1 BJ3 BJ5	CJ1 CJ3
Coñecer o obxectivo, a operación, a tecnoloxía existente e saber dimensionar os sistemas e os actuadores de sensores industriais	AJ7 AJ8	BJ1 BJ3 BJ5 BJ16	CJ1 CJ6 CJ7
Coñecer as tecnoloxías de interconexión e integración entre sensores, actuadores e equipos	AJ7 AJ8	BJ1 BJ2 BJ3 BJ4 BJ5 BJ6 BJ13 BJ14 BJ15	CJ1 CJ2 CJ3 CJ8 CJ9 CJ11

Contents	
Topic	Sub-topic
Medición e obtención de variables en contornas industriais	IoT como produto da integración de sistemas industriais. Introdución ao ecosistema IOT
Elección y dimensionamiento de sistemas sensores y actuadores	IoT Hardware: arquitectura, sensores e actuadores. Plataformas IoT
Deseño e desenvolvemento de sistemas de interconexión e integración	Desenvolvementos con Arduino. Ethernet baseada en redes industriais. Internet industrial das cousas (IIoT) e Industria 4.0.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A7 A8 B1 B3 B5 B16 B6 C1 C6 C8 C9	9	15	24

Problem solving	A7 A8 B2 B3 B5 B13 C1 C2 C3	4	12	16
Objective test	A7 A8 B1 B2 B15 B14 C7	2	15	17
Laboratory practice	A7 A8 B1 B2 B3 B4 B5 C1 C2 C3 C11	5	12	17
Personalized attention		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	
Methodologies	**Description**
Guest lecture / keynote speech	A través do método expositivo, o profesor establecerá os fundamentos teóricos e prácticos sobre os distintos contidos que conforman a materia. Para estas sesións utilizaranse medios audiovisuais e manterase un diálogo cos alumnos para facilitar a aprendizaxe.
Problem solving	Propoñeranse exercicios, problemas ou traballos en grupo ou individualmente, relacionados cos contidos desenvolvidos nas clases expositivas.
Objective test	Proba final de avaliación consistente en preguntas teórico-prácticas ou tipo test para comprobar se o alumno adquiriu as habilidades establecidas na materia
Laboratory practice	Usarase o hardware / software necesario para desenvolvelos.

Personalized attention	
Methodologies	**Description**
Problem solving Laboratory practice	Asociados ás clases expositivas e prácticas, estarán dispoñibles para clarificar as súas posibles dúbidas e / ou problemas, clases particulares de tutoría ou en pequenos grupos.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Objective test	A7 A8 B1 B2 B15 B14 C7	Proba de avaliación final	50
Problem solving	A7 A8 B2 B3 B5 B13 C1 C2 C3	Realización de traballos, exercicios e problemas	20
Laboratory practice	A7 A8 B1 B2 B3 B4 B5 C1 C2 C3 C11	De asistencia obrigatoria. Valorarase o informe final de entrega e a actitude que o alumno mostrou durante o desenvolvemento da mesma.	30

Assessment comments
A solicitude de exención académica aceptarase na asistencia ás clases teóricas. Non así ás clases prácticas, que serán obrigatorias. Os criterios de avaliación para a segunda oportunidade son os mesmos que para a 1ª oportunidade

Sources of information	
Basic	- Tom Wanyama (2016). A Practical Approach To Industrial Systems Integration. McMaster University, Hamilton - (). Presentaciones del Profesor. - Perry Lea (2018). Internet of Things for Architects. Packet
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus
Other comments
A entrega dos traballos documentais que se realicen nesta materia realizarase a través de Moodle en formato dixital, sen necesidade de imprimilo