UNIVERSIDADE DA CORUÑA

Teaching Guide			
Identifying Data			2024/25
Subject (*)	IoT and Ambient Intelligence Technologies for Building Smart Cities	Code	630541013
Study programme	Máster Universitario en Desafíos das Cidades		

Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	5

Language	SpanishGalicianPortuguese		
Teaching method	Face-to-face		
Prerequisites			
Department	Enxeñaría de Computadores		
Coordinador		E-mail	
Lecturers	Fernández Caramés, Tiago Manuel	E-mail	tiago.fernandez@udc.es
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General description	The objective of this subject is to know the fundamental concepts on the acquisition of sensory data from IoT (Internet of Things) systems for Smart Cities, including its advantages and limitations. In addition, the subject is aimed at understanding the potential and impact of implementing smart services based on the use of IoT in Smart Cities and the use of mobile platforms by citizens for their interaction with such services. Furthermore, the implications of intelligent environments are studied for the specification, development and implementation of information systems.		

Study programme competences / results	
Code	Study programme competences / results
A7	CE4.1 - Understand the ongoing digital transformation processes, becoming familiar with analytical and urban modeling tools to apply them in decision-making processes (reactive and preventive) in urban planning and management, based on analytical information.
A8	CE4.2 - Plan and recommend intelligent information gathering systems in order to monitor sustainability, quality of life and urban intelligence.
B2	CB7 - That students know how to apply their acquired knowledge and problem-solving skills 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 incomplete or limited information, including reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B8	CG3 - To acquire high-level knowledge, tools and resources to meet the research and professional expectations of students and society in the study of urban development, planning and management.
C2	CT2 - Use the basic tools of information and communication technologies (ICT) necessary for the exercise of their profession and for lifelong learning.
C5	CT5 - Value the importance of research, innovation and technological development in the socioeconomic and cultural advancement of society.

Learning outcomes			
Learning outcomes	Study programme competences / results		
To know the fundamental concepts on the acquisition of sensory data from IoT (Internet of Things) systems for Smart Cities, including its advantages and limitations.	AC8	BC8	
To understand the potential and impact of implementing smart services based on the use of IoT in Smart Cities and the use of mobile platforms by citizens for their interaction with such services.	AC7	BC2 BC5	CC2 CC5

To understand the implications of intelligent environments in the specification, development and implementation of information systems.	AC7	BC3	CC2 CC5

Contents	
Topic	**Sub-topic**
Introduction to Smart Cities	Essential concepts. Architectures.
Sensing	Sensing and actuation for Smart Cities. Data collection for Smart Cities: connection interfaces and data acquisition.
Communication networks	Operation principles. Types of communications technologies. WAN, LPWAN, WLAN and WBAN technologies.
Ambient Intelligence	Computation and intelligent interfaces. Platforms for providing smart services.
Smart Citizen	Internet of Everything. Internet of Things. Internet of People.
Applications	Applications for Smart Cities. Ambients for assisted living.

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
ICT practicals	A7 B8 B2 B3 C2	20	0	20
Supervised projects	A7 A8 B2 B3	0	60	60
Workbook	B8 B3 B5 C5	0	4	4
Mixed objective/subjective test	B8 B2 B3	1	25	26
Seminar	B8 C5	10	0	10
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
ICT practicals	ICT labs that make use of sensors/actuators and embedded systems.
Supervised projects	Supervised project oriented towards the application of the acquired theoretical/practical knowledge to the field of Smart Cities.
Workbook	Reading of teaching material, watching of videos and search of multimedia content.
Mixed objective/subjective test	Written test that evaluates the theoretical and practical parts of the subject.
Seminar	Delivery of the theoretical contents of the subject.

Personalized attention

Methodologies	Description
ICT practicals Supervised projects	The professors will guide the students throughout the ICT practicals and during the execution of the supervised project. Part-time students and with attendance exemption academic waiver: it will not be required the attendance to the practical lessons, which will be flexible with the delivery and defence dates. In the same way, tutoring will be adapted to the scheduling restrictions of the part-time students.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
ICT practicals	A7 B8 B2 B3 C2	Delivery of the ICT practical reports.	20
Supervised projects	A7 A8 B2 B3	Delivery of a supervised project related to the field of Smart Cities.	40
Mixed objective/subjective test	B8 B2 B3	Evaluation exam on the theoretical and practical contents delivered in the subject.	40

Assessment comments
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 performed progressively, with clear deadlines. The objective test will be divided into two parts: one oriented towards evaluating the practical developments and a second one about the theoretical content. Part-time students: attendance to the practical part will not be required and its delivery will follow a flexible schedule. SECOND CALL AND EXTRA CALLS The students will have the opportunity to maintain the grades obtained during the ICT practicals and the supervised project. Such students will carry out a mixed test, establishing the final grade according to the same percentages applied for the first call. The rest of the students (including part-time students) will take a single mixed test (60% of the total grade) and will carry out a supervised project (40% of the total grade). OTHER COMMENTS No grades will be preserved from one course to another. The fraudulent performance of tests or assessment activities, once verified, will directly involve the qualification of failed in the call in which it is committed: the student will be qualified with "failed" (numerical grade 0) in the corresponding call of the academic year, both if the offense is committed in the first opportunity as in the second. For this, the qualification will be modified in the first opportunity report, if necessary. All aspects related to "academic exemption," "study dedication," "continuity," and "academic fraud" will follow current academic regulations of UDC.

Sources of information

Basic	- Samuel Greengard (2015). The Internet of Things. MIT Press - Adrian McEwen (2013). Designing the Internet of Things. Wiley - Carol L. Stimmel (2015). Building smart cities: analytics, ICT, and design thinking. Taylor & Francis - Anthony M. Townsend (2014). Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia. W. W. Norton & Company - D. J. Cook, J. C. Augusto, V. R. Jakkula (2009). Ambient intelligence: Technologies, applications, and opportunities. Elsevier
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
This subject will comply with the different regulations for university teaching, respecting the gender perspective (e.g. non-sexist language will be used).

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.