Teaching Guide				
Identifying Data				2021/22
Subject (*)	Network Design		Code	614G01082
Study programme	Grao en Enxeñaría Informática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Fourth	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de Computadores			
Coordinador	Gonzalez Lopez, Miguel	E-mail	miguel.gonzalez.lopez@udc.es	
Lecturers	Gonzalez Lopez, Miguel Vazquez Araujo, Francisco Javier	E-mail	miguel.gonzalez.lopez@udc.es francisco.vazquez@udc.es	
Web	moodle.udc.es/course/view.php?id=44735			
General description	The goal of the subject is to introduce the most recent schemes in IP networks and Mobile Ad-hoc NETworks (MANETs). It covers topics like quality of service (QoS), IPv6, virtual private networks (VPNs), Mobile IP / IPv6, MANETs, classical routing algorithms both static and dynamic, as well as their particularization to the case of MANETs.			
Contingency plan	1. Modifications to the contents None. 2. Methodologies *Teaching methodologies that are maintained All. *Teaching methodologies that are modified None. 3. Mechanisms for personalized attention to students Online tutoring. 4. Modifications in the evaluation None. *Evaluation observations: 5. Modifications to the bibliography or webgraphy None.			

Study programme competences / results	
Code	Study programme competences / results
A17	Coñecemento e aplicación das características, funcionalidades e estrutura dos sistemas distribuídos, as redes de computadores e internet, e deseñar e implementar aplicacións baseadas nelas.
A55	Capacidade para seleccionar, deseñar, despregar, integrar e xestionar redes e infraestruturas de comunicacións nunha organización.
B1	Capacidade de resolución de problemas
B3	Capacidade de análise e síntese
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

Learning outcomes

Learning outcomes	Study programme competences / results		
To know in depth the different elements with which a communications network can be built. Ability to analyze the advantages and disadvantages of each topology and network protocol. Knowing the algorithms that incorporate the protocols, and their applicability environments.	A17 A55	B1 B3	C3 C6

Contents	
Topic	Sub-topic
1. Quality of service (QoS)	1.1 QoS at layer 2. 1.1.1 In wired networks (IEEE 802.1p). 1.1.2 In wireless networks (IEEE 802.11e). 1.2 QoS at layer 3. 1.2.1 Integrated services (IntServ). RSVP protocol. 1.2.2 Differentiated services (DiffServ). PHBs. Traffic classification, marking, metering (token bucket mechanisms), shaping, dropping. CBWFQ and LLQ queues. RED and WRED algorithms.
2. Analysis, design and addressing in IP networks. Advanced IP networks (IPv6)	2.1 IPv6: motivation, differences to IPv4, IPv6 extension headers, automatic address assignment, fragmentation, Neighbour Discovery (ND) protocol, multicast IPv6.
3. Virtual Private Networks (VPNs). IPsec.	3.1 VPNs: purpose, types, Level-2 VPNs (PPP) vs Level-3 VPNs (IPsec). 3.2 IPsec: fundamentals, authentication (AH), Encapsulated Security Payload (ESP), key exchange mechanisms: IKE.
4. IP mobility	4.1 Introduction to IP mobility. 4.2 Medium access in IEEE 802.11 wireless networks. DCF: CSMA/CA and RTS/CTS. HCF: EDCA. 4.3 Split-MAC enterprise WLAN architecture. CAPWAP protocol. 4.4 Mobile IP.
5. MANETs: Mobile Ad Hoc Networks	5.1 Motivation and fundamentals. 5.2 MAC layer. 5.3 Network layer. Static and dynamic routing algorithms: general case and particularization to MANETs. 5.4 Transport layer.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A55 A17 B3 B1 C6	21	51	72
Mixed objective/subjective test	A17 A55 B1 B3 C6	3	0	3
ICT practicals	B3 B1 C3	21	51	72
Personalized attention		3	0	3
(*)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	Theory lectures, as well as illustrative examples and problems of the subject.
Mixed objective/subjective test	The content of the lectures will be evaluated through two exams, one in the middle of the term and the other on the official date of the final exam.

ICT practicals	Explanation and monitoring of ICT practices on the subject contents. The OMNET++ INET simulator and a network emulation tool based on virtualization will be used.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech ICT practicals	Question solving about the lectures and the ICT practicals.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
ICT practicals	B3 B1 C3	It will be evaluated by means of the work reports on the practices carried out by the student. The due dates of the different work reports will be spaced throughout the term.	50
Mixed objective/subjective test	A17 A55 B1 B3 C6	The content of the guest lecture / keynote speech methodology will be evaluated through two exams, one in the middle of the term and the other on the official date of the final exam.	50

Assessment comments
Evaluation in the case of part-time students: the same as in the general case. If the student is unable to attend the first mid-term exam, provided that there is a justified reason, an alternative date will be found in agreement with the student. At the second opportunity, only one final exam will be taken for the guest lecture / keynote speech methodology. The practical grade will be that obtained during the course through the continuous evaluation of the student's work. The fraudulent performance of the evaluation tests or activities, once verified, will directly imply the grade of '0' in the subject in the corresponding opportunity.

Sources of information	
Basic	- R. S. Koodli, C. E. Perkins (2007). Mobile Inter-networking with IPv6: Concepts, Principles and Practices. Wiley
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Network Administration/614G01048
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Communications Software/614G01034 Administration of Infrastructures and Information Systems/614G01216
Other comments

(*)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.