



Teaching Guide

Identifying Data					2020/21
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	Hybrid				
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	<p>1. Modifications to the contents None.</p> <p>2. Methodologies *Teaching methodologies that are maintained All. *Teaching methodologies that are modified None.</p> <p>3. Mechanisms for personalized attention to students Online instead of in-person tutoring.</p> <p>4. Modifications in the evaluation None. *Evaluation observations:</p> <p>5. Modifications to the bibliography or webgraphy None.</p>				

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		
Coñecer en profundidade os distintos elementos cos que se pode construír unha rede de comunicacións. Capacidade de analizar as vantaxes e inconvenientes de cada topoloxía e protocolo de rede. Coñecer os algoritmos que incorporan os protocolos, e os seus contornos de aplicabilidade.	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	A5 A17 A31 A34 A38 A55 B3 C6	30	45	75
ICT practicals	A5 A31 A34 B1 B3 C3	28	45	73
Personalized attention		2	0	2

(*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 of the subject.
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
ICT practicals	Question solving about the ICT practicals.

Assessment

Methodologies	Competencies / Results	Description	Qualification
Guest lecture / keynote speech	A5 A17 A31 A34 A38 A55 B3 C6	It will be evaluated through two online exams, one in the middle of the term and the other on the official date of the subject exam. Each of the examinations will count for half of the mark for the guest lecture / keynote speech methodology.	50
ICT practicals	A5 A31 A34 B1 B3 C3	It will be evaluated by means of the work report on the practices carried out by the student.	50

Assessment comments

Evaluation in the case of part-time students: the same as in the general case.

At the second opportunity, only one final exam will be taken online 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.

According to article 14, paragraph 4, of the UDC evaluation regulations, the copied practices will be void, both the original and the copy, and will suppose a zero in the practice in question.

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.