



## Teaching Guide

Identifying Data					2019/20
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	Galician				
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.				

## 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 afrontarse.

## 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 in the classroom, as well as illustrative examples of the subject.
ICT practicals	Explanation and monitoring of ICT practices on the subject contents. The OMNET++ INET simulator, the Cisco Packet Tracer program and a network emulation tool based on virtualization will be used.

Personalized attention	
Methodologies	Description
ICT practicals	Resolución de dúbidas sobre as prácticas da asignatura.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Guest lecture / keynote speech	A5 A17 A31 A34 A38 A55 B3 C6	Evaluarase mediante exame escrito.	50
ICT practicals	A5 A31 A34 B1 B3 C3	Evaluarase mediante a memoria de traballo sobre as prácticas realizada polo alumno.	50

Assessment comments



The evaluation will be made on the final exam and on the written reports of the practices.

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

At the second opportunity, only the final exam will be assessed. 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

<b>Basic</b>	- R. S. Koodli, C. E. Perkins (2007). Mobile Inter-networking with IPv6: Concepts, Principles and Practices. Wiley
<b>Complementary</b>	

#### 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.