| Teaching Guide | | | | | |
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| 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<br>Vazquez Araujo, Francisco Javier | | E-mail | miguel.gonzalez.lopez@udc.es<br>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<br>None.<br><br>2. Methodologies<br>*Teaching methodologies that are maintained<br>All.<br>*Teaching methodologies that are modified<br>None.<br><br>3. Mechanisms for personalized attention to students<br>Online instead of in-person tutoring.<br><br>4. Modifications in the evaluation<br>None.<br><br>*Evaluation observations:<br><br>5. Modifications to the bibliography or webgraphy<br>None. | | | | |

| Study programme competences | |
|---|---|
| Code | Study programme competences |
| 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 |
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| Learning outcomes | Study programme competences | | |
|---|---|---|---|
| Coñecer en profundidade os distintos elementos cos que se pode construir unha rede de comunicacións. Capacidade de analizar as vantaxes e inconvintes de cada topoloxía e protocolo de rede. Coñecer os algoritmos que incorporan os protocolos, e os seus contornos de aplicabilidade. | A17<br>A55 | B1<br>B3 | C3<br>C6 |

| Contents | |
|---|---|
| Topic | Sub-topic |
| 1. Quality of service (QoS) | 1.1 QoS at layer 2.<br>1.1.1 In wired networks (IEEE 802.1p).<br>1.1.2 In wireless networks (IEEE 802.11e).<br>1.2 QoS at layer 3.<br>1.2.1 Integrated services (IntServ). RSVP protocol.<br>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).<br>3.2 IPsec: fundamentals, authentication (AH), Encapsulated Security Payload (ESP), key exchange mechanisms: IKE. |
| 4. IP mobility | 4.1 Introduction to IP mobility.<br>4.2 Medium access in IEEE 802.11 wireless networks. DCF: CSMA/CA and RTS/CTS. HCF: EDCA.<br>4.3 Split-MAC enterprise WLAN architecture. CAPWAP protocol.<br>4.4 Mobile IP. |
| 5. MANETs: Mobile Ad Hoc Networks | 5.1 Motivation and fundamentals.<br>5.2 MAC layer.<br>5.3 Network layer. Static and dynamic routing algorithms: general case and particularization to MANETs.<br>5.4 Transport layer. |

| Planning | | | | |
|---|---|---|---|---|
| Methodologies / tests | Competencies | Ordinary class hours | 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 |
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| Methodologies | Description |
|---|---|
| ICT practicals | Question solving about the ICT practicals. |

| Assessment | | | |
|---|---|---|---|
| Methodologies | Competencies | 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 |
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| Evaluation in the case of part-time students: the same as in the general case.<br>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.<br>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 |
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| Subjects that it is recommended to have taken before |
| Network Administration/614G01048 |
| Subjects that are recommended to be taken simultaneously |
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| Subjects that continue the syllabus |
| Communications Software/614G01034<br>Administration of Infrastructures and Information Systems/614G01216 |
| Other comments |
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**(*)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.**