Universidad Rey Juan Carlos

TEACHING GUIDE

COMPUTER NETWORKS

GRADO EN INGENIERÍA BIOMÉDICA (INGLÉS) (3º y 4º curso) (2374)

ACADEMIC YEAR 2026-27

Q2803011B UNIVERSIDAD REY JUAN CARLOS
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Publication date: 04-07-2026

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I.-Subject Identification	
Type	OBLIGATORIA
Teaching period	2 course, 1Q semester
Nº of credits	6
Language in wich the subject is taught	English

II.-Presentation

This course is the first one that the student looks into the field of computer networks in general and Internet in particular. An introduction to the protocol architectures in computer networks is included on its contents, focusing on TCP/IP protocols. The subject has a strong focus on practical applications that will allow the student to train in test environments in the laboratory with the studied frameworks.

III.-Learning outcomes

CG01 . Analyze and synthesize problems related to biomedical engineering, solve them and communicate them efficiently.
CB1. Proven knowledge and understanding of an area of study based on general secondary education and at a level which, although supported by advanced text books, also includes certain aspects that imply knowledge from the forefront of the field of study.
CB5 . That students have developed the learning skills needed to undertake further studies with a considerable degree of autonomy.
CE11. Identify, use and adapt telecommunication technologies that offer reasonable solutions to biomedical engineering problems
CE13 .Build, operate and manage telecommunication services and applications in biomedical engineering, understood them as systems for capturing, coding, transporting, representing, processing, storing, reproducing, managing and presenting multimedia information.
CE19. Use the fundamentals of programming for the development of computer programs in modern programming languages, as well as to understand and use different operating systems, databases and hospital information systems. To apply them in networks, systems and telematic services for hospital management.

- Key for degrees not adapted to RD 822/21: **CB** - basic competences, **CG** - generic competences, **CE** - specific competences, **CT** - transversal competences.
- Key for degrees adapted to RD 822/21: **CON** - knowledge, **COM** - competences, **HAB** - skills.

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IV.-Contents

IV.A.-Syllabus

I. Introduction to computer networks
•General concepts
•Network topologies
•Protocol hierarchies
•Network architectures: OSI, and TCP/IP reference models
II. Link layer
•Latency, bandwidth, transmission rate
•Transmission media
•Link layer
•Medium access control
•Error dectetion
•Ethernet technologies
•Network devices
III. Network layer
•Comparison of connection oriented service and connectionless service.
•Comparison of virtual-circuit and datagram networks.
•Comparison of reliable and unreliable networks.
•Network addressing
•Internetworking
•Routing
•IP protocol
•IP packet
•IP address
•Subnetting
•ICMP
•DHCP
•ARP
•Routing
IV. Transport layer
•Port
•Connection-oriented transport
•Connectionless transport
•UDP
•UDP datagram
•UDP service
•TCP
•TCP segment
•TCP service
V. Application Layer: DNS and HTTP
•DNS
•DNS servers
•DNS maps
•DNS messages
•HTTP
•Client/server model
•HTTP messages
•HTTP forms
•HTTP cache/proxy

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IV.B.-Training activities	
Type	**Title**
Theoretical sessions	Units 1 - 5
Experimental and/or technological laboratories	Labs. 1 -7
Resolution of exercises, problems, case studies	Exercises and questions to resolve regarding the theoretical contents
Test and/or exams	Midterm 1 - 2
Academic tutorials	Tutorships on-site or virtual using MS Teams and emails

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V.-Student workload	
Theoretical sessions	24
Resolution of exercises, problems, case studies, etc.	6
Practical sessions in experimental, technological and clinical laboratories, fieldwork, etc.	24
Tests and/or exams	6
Academic tutorials	30
Related activities: conferences, seminars, etc.	18
Preparation of theoretical sessions and self-study	12
Preparation of practical tasks, exercises, case studies, projects, etc.	40
Preparation for tests and/or exams	20
Total student workload	180

VI.-Methodology and academic programme

Type	Period	Content
Theoretical sessions	Week 1 to Week 2	Unit 1. Introduction
Theoretical sessions	Week 3 to Week 4	Unit 2. Link Layer
Theoretical sessions	Week 5 to Week 8	Unit 3. Network Layer
Theoretical sessions	Week 9 to Week 11	Unit 4. Transport Layer
Theoretical sessions	Week 12 to Week 15	Unit 5. Application Layer
Experimental and/or technological laboratories	Week 1 to Week 3	Lab 1. Ethernet
Experimental and/or technological laboratories	Week 3 to Week 4	Lab 2. Switches
Experimental and/or technological laboratories	Week 5 to Week 6	Lab 3. IP
Experimental and/or technological laboratories	Week 7 to Week 8	Lab 4. IP Routing
Experimental and/or technological laboratories	Week 9 to Week 10	Lab 5. TCP, UDP
Experimental and/or technological laboratories	Week 11 to Week 12	Lab 6. DNS

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Experimental and/or technological laboratories	Week 14 to Week 15	Lab 7. HTTP
Active methodologies or innovative teaching	Week 3 to Week 14	Multiple choice questions based on games with rewards
Active methodologies or innovative teaching	Week 9 to Week 10	Brief presentation about specific topics
Tests and/or exams	Week 9 to Week 11	Midterm 1
Tests and/or exams	Week 15 to Week 17	Midterm 2
Academic tutorials	Week 1 to Week 14	Tutorships on-site or virtual using MS Teams and emails

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VII.-Assessment methods

The general assessment method is continuous as established in the *Regulation for the Assessment of Learning Outcomes* of Rey Juan Carlos University.
All the assessment systems established in the degree report must be employed, except for those that have a minimum weight of 0%, which can be used by professors in the academic years they consider relevant. Each assessment system may be applied through one or more assessment activities, consistent with the system. No assessment activity can exceed individually 60% of the overall grade for the subject.
The sum of non re-evaluable activities cannot exceed 40% of the overall grade for the subject and, in general, should not have an established minimum grade (except for practical activities in which, strictly speaking, the conditions of the ordinary call cannot be reproduced in the extraordinary call).
Those students who do not manage to pass the subject in the ordinary call, or do not attend this first call, may attend the extraordinary call only for failed re-evaluable assessment activities.
The distribution and characteristics of the assessment activities are described below.

VII.A.-Description and weight of the assessment activities

Ordinary assessment:
•AA1: Midterm 1: Units 1, 2, 3. Minimum grade: 5. Re-evaluable activity.
•AA2: Midterm 2: Units 4 and 5. Minimum grade: 5. Re-evaluable activity.
•AA3: Mandatory delivery of the practices at Aula Virtual. The assessment consists of seven practical exercises and the final grade will be based on the average score across all seven. Minimum grade: 5. Re-evaluable activity.
The overall grade is calculated as 45% AA1 + 45% AA2 + 10% AA3. To pass the whole course it is necessary to get an overall grade >= 5.

Extraordinary assessment:

Students must retake the re-evaluable activities in which the minimum grade is not achieved.

Note: practices evaluation and exams will not be kept for different academic courses.

Advance assessment:
It will be carried out in the same way as the extraordinary assessment.

VII.B. Assessment of students with academic exemption from class attendance

Having Academic Exemption from Class Attendance (DAAC) does not imply that students are automatically exempt from participating in the continuous assessment activities or in the training activities of compulsory attendance as established in the teaching guide. Once the exemption has been granted, students must contact the subject's teaching staff, who will propose the adaptations he/she may consider relevant, as long as they guarantee the acquisition and adequate assessment of the learning goals established. Students must maintain adequate communication with the teaching staff so that they may provide information on the dates for training and assessment activities, if these are not established in the programme and available for students at the time of achieving the exemption.
Subject with possibility of academic exemption: Yes.

VII.C. Review of assessment activities

In accordance with the Regulation for the Assessment of Learning Outcomes of Rey Juan Carlos University.

VII.D.-Students with a disability or special educational needs

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In order to guarantee equal opportunities, non-discrimination, universal accessibility and academic success, students with disabilities or especial education needs may request curricular adaptations to follow their studies. These adaptations will be provided by the Unit of Attention to People with Disabilities of Rey Juan Carlos University, in accordance with the regulation which regulates the service for the Attention of People with Disabilities at the University. This Unit will issue a report for curricular adaptations, so that students with disabilities or special education needs must contact the service (at e-mail discapacidad.programa@urjc.es) in order to provide relevant information for different educational alternatives.

VII.E.-Academic behaviour, academic integrity and honesty

Rey Juan Carlos University is fully committed to the highest standards of academic integrity and honesty, so studying at the URJC means assuming and subscribing to the values of integrity and academic honesty set out in the University's Ethical Code. To support this process, the University has Rey Juan Carlos University's Academic Conduct Regulation as well as different tools (anti-plagiarism, supervision...) that offer a collective guarantee for the full development of these essential values.

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VIII.-Teaching resources and materials
Basic bibliography
Computer networks: top-down approach,7a ed. James F. Kurose Pearson, 2017.
Computer networks 6th. Andrew S. Tanenbaum and David J. Wetherall. Pearson, 2021
TCP/IP Illustrated, 2nd ed. Kevin R. Fall, Richard W. Stevens, Addison-Weasley, 2012
Consultation bibliography
Computer networks: a systems approach, 5th ed. Larry L. Peterson, Bruce S. Davie. Morgan Kaufmann, 2011

IX.-Professors	
Name and surname	JOSÉ FELIPE ORTEGA SOTO
E-mail address	felipe.ortega@urjc.es
Department	Teoría de la Señal y Comunicaciones y Sistemas Telemáticos y Computación
Campus	Fuenlabrada
Category	Titular de Universidad
Academic degree	Doctor
Person responsible for the subject	No
Tutorial timetable	Para consultar las tutorias póngase en contacto con el/la profesor/a a través de correo electrónico
Number of quinquennia	1
Number of sexennia	1
No. of positive evaluations by Docentia	2
Name and surname	ÓSCAR PRIETO GORDO
E-mail address	oscar.prietog@urjc.es
Department	Teoría de la Señal y Comunicaciones y Sistemas Telemáticos y Computación
Campus	Fuenlabrada
Category	Profesor/a Asociado/a
Person responsible for the subject	Yes
Tutorial timetable	Para consultar las tutorias póngase en contacto con el/la profesor/a a través de correo electrónico
Number of quinquennia	1

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Number of sexennia	0
No. of positive evaluations by Docentia	1

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