Universidad Rey Juan Carlos

TEACHING GUIDE

Programming in Network Environments

GRADO EN INGENIERÍA BIOMÉDICA (INGLÉS) (1º y 2º curso) (2384)

ACADEMIC YEAR 2026-27

Q2803011B UNIVERSIDAD REY JUAN CARLOS
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I.-Subject Identification	
Type	OBLIGATORIA
Teaching period	3 course, 2Q semester
Nº of credits	3
Language in wich the subject is taught	English

II.-Presentation

In the current context, characterized by increased life expectancy and the consequent ageing of the population, care systems for chronic patients, prevention, and continuous health monitoring play a fundamental role in the provision of healthcare services. In this scenario, information and communication technologies applied to health, such as telemedicine, telecare, and home healthcare, are key tools for improving the efficiency, accessibility, and quality of healthcare.
The purpose of this course is to provide students with the necessary theoretical foundations in the field of remote diagnostic and treatment systems, including the concepts of telemedicine, telecare, and technology-based home healthcare. In addition, the course will address the knowledge of the devices, platforms, and systems used in these environments.
In a complementary manner, the course has a strong practical orientation, focused on the development and implementation of telematic health monitoring and control systems, enabling students to acquire applied skills in the design, integration, and evaluation of technological solutions in real or simulated contexts.
By the end of the course, students will be able to understand, design, and use remote diagnostic and treatment systems, contributing to the development of innovative solutions in the field of biomedical engineering.

III.-Learning outcomes

CG01 . Analyze and synthesize problems related to biomedical engineering, solve them and communicate them efficiently.
CG02. Use computational and experimental tools for the analysis and quantification of biomedical engineering problems
CB3 . That students have the ability to gather and interpret relevant data (usually within their field of study) to express judgments that include a reflection on relevant topics related to social, scientific or ethical areas.
CB4 . That students are able to transmit information, ideas, problems and solutions to both specialized and non-specialized audience.
CE01 . Understand or acquire the principles of bioelectrical fundamentals, anatomy, physiology or pathophysiology needed to identify the most appropriate processing technologies for a given problem in biomedical engineering
CE11. Identify, use and adapt telecommunication technologies that offer reasonable solutions to biomedical engineering problems

- 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

Block 1. Introduction to telemedicine and home healthcare systems
• Fundamental concepts of telemedicine, telecare, and technology-based home healthcare (AAL)
• Classification of systems according to the type of service and medical specialty
• Application domains, services, and technologies involved
Block 2. Technical, clinical, and regulatory aspects
• Architecture of remote diagnostic and treatment systems
• Biomedical devices and sensors
• Clinical considerations in remote systems
• Legal, ethical, and regulatory aspects of telemedicine
Block 3. Platforms and technologies in telemedicine
• Technological platforms in the field of telemedicine
• Remote patient monitoring systems
• Integration with healthcare information systems
• Introduction to mHealth and mobile health applications
Block 4. Development of mHealth solutions
• Fundamentals of mobile device programming
• Design of applications for health monitoring and control
• Interaction with sensors and external devices
Block 5. Evaluation of telemedicine systems and projects
• Project evaluation methodologies
• Quality, reliability, and usability indicators
• Analysis of results and system validation
Block 6. Laboratory practice
• Development of experimental laboratory activities related to the previous blocks
• Design and implementation of remote monitoring systems
• Analysis of practical cases and resolution of real-world problems

IV.B.-Training activities

Type	Title
Theoretical sessions	Expository sessions in which the teaching staff introduce and develop the conceptual foundations of the course, including the principles of telemedicine, telecare, the architectures of remote diagnostic and treatment systems, technological platforms, as well as the associated technical, clinical, and regulatory aspects. Active student participation will be encouraged through questions, case analysis, and discussion of real-world applications in the field of biomedical engineering.
Practical sessions	Sessions carried out in the laboratory in which students apply theoretical knowledge through experimental practice related to remote diagnostic and treatment systems. These include the use of biomedical devices, telemedicine platforms, and development tools, as well as the design, implementation, and evaluation of remote health monitoring solutions. Teamwork, problem solving, and critical interpretation of the results obtained will be encouraged.

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Academic tutorials	Individual or group guidance and follow-up sessions in which the teaching staff address and resolve questions related to the theoretical and practical contents of the course. These tutorials are aimed at supporting the students¿ learning process, facilitating the understanding of concepts, guiding the development of laboratory practice and projects, and providing personalized feedback.
Test and/or exams	Assessment activities carried out throughout the course, both theoretical and practical in nature, aimed at verifying the degree of acquisition of the knowledge and competences of the course. These tests may include written examinations, quizzes, practical laboratory assessments, and/or assessable assignments, and will be designed to evaluate both conceptual understanding and the ability to apply knowledge in the field of remote diagnostic and treatment systems.
Other activities	Complementary activities aimed at reinforcing the contents of the course, such as attendance at seminars, workshops, conferences, or technical events, as well as the viewing and analysis of audiovisual materials or demonstrations of real telemedicine systems. These activities will enable students to broaden their knowledge of current applications and trends in the field of remote diagnostic and treatment systems.

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V.-Student workload	
Theoretical sessions	13
Resolution of exercises, problems, case studies, etc.	0
Practical sessions in experimental, technological and clinical laboratories, fieldwork, etc.	15
Tests and/or exams	2
Academic tutorials	18
Related activities: conferences, seminars, etc.	6
Preparation of theoretical sessions and self-study	9
Preparation of practical tasks, exercises, case studies, projects, etc.	18
Preparation for tests and/or exams	9
Total student workload	90

VI.-Methodology and academic programme

Type	Period	Content
Theoretical sessions	Week 1 to Week 2	Lectures Blocks 1 and 2
Practical sessions	Week 3 to Week 3	Introduction to laboratory class development
Theoretical sessions	Week 4 to Week 6	Lectures Blocks 3, 4 and 5
Practical sessions	Week 7 to Week 15	Laboratory sessions Block 6

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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

In order to pass the course, students must obtain a minimum grade of 5 out of 10 in both the theoretical component and the practical component.
Theoretical-practical examination (50%): Individual test in which the theoretical and practical concepts developed throughout the course will be assessed. A minimum grade of 5 out of 10 is required in order for this mark to be averaged with the practical component. Reassessable activity.
Laboratory practice (50%): Throughout the course, eight laboratory practice sessions will be carried out in groups of two students. The laboratory practice sessions will focus on the design, implementation, and evaluation of telemedicine, telecare, remote monitoring, and mHealth application systems. The assessment of this component will be carried out jointly through:
- *Final laboratory practice report (30%)*, prepared by each group, covering the activities carried out during the eight sessions, the methodology used, the results obtained, and their critical analysis.
- *Oral defence and/or individual practical test (20%)*, aimed at verifying the individual acquisition of the competences and knowledge addressed during the laboratory sessions.

Extraordinary assessment

In order to pass the course, students must obtain a minimum grade of 5 out of 10 in both the theoretical component and the practical component.
Theoretical-practical examination (50%): Individual test in which the theoretical and practical concepts developed during the course will be assessed.
Recovery of the practical component (50%): Assessment through the submission of a final laboratory practice report, the completion of complementary activities proposed by the teaching staff, and/or an oral defence or individual practical test on the contents developed during the eight laboratory sessions.
The grades of the components passed in the ordinary examination period, with a mark equal to or higher than 5 out of 10, will be retained for the extraordinary examination period.

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.

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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

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
Telemedicine. Biomedical Engineering, A. Carrión Pérez, 2009. The Development Framework for e-Health in Spain, J. L. Monteagudo, 2012.
Consultation bibliography

IX.-Professors	
Name and surname	EVA MILARA HERNANDO
E-mail address	eva.milara@urjc.es
Department	Teoría de la Señal y Comunicaciones y Sistemas Telemáticos y Computación
Campus	Fuenlabrada
Category	Profesor/a Ayudante Doctor/a
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	0
Number of sexennia	0
No. of positive evaluations by Docentia	0
Name and surname	ROBERTO BRAVO CABAÑAS
E-mail address	roberto.bravo@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	No
Tutorial timetable	Para consultar las tutorias póngase en contacto con el/la profesor/a a través de correo electrónico
Number of quinquennia	0
Number of sexennia	0

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No. of positive evaluations by Docentia	0

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