Universidad Rey Juan Carlos

TEACHING GUIDE

Circuit Theory

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	FORMACIÓN BÁSICA
Teaching period	2 course, 1Q semester
Nº of credits	6
Language in wich the subject is taught	English

II.-Presentation

Probability and Statistics form a fundamental basis for the construction of procedures, methodologies, designs, tools and algorithms, present in many of the specific subjects that a Biomedical Engineering undergraduate undertakes in its training process.

The main training objectives of the subject of Probability and Statistics are:

- Highlight the importance of probabilistic models (and their differences from deterministic models) very common in engineering and biomedicine, to describe systems that show unpredictable variations or randomness.
- Provide the student with the ability to define probabilistic models to solve engineering problems, with special attention to biomedical applications.

Prerequisites and recommendations: it is convenient for the student to have taken the Calculus, Algebra and Mathematical Methods of Bioengineering subjects so that you have knowledge about real functions of a variable and multiple variables, sequences and series of functions, multiple differentiation and integration, vector spaces, linear applications and linear systems.

In order to facilitate the passing of the subject and the achievement of the training objectives, students are recommended to read previously the contents of each session of the course, the complete the activities proposed in class and to solve the problems proposed in the recommended bibliography, as well as attending tutorials whenever necessary.

III.-Learning outcomes

CG02. Use computational and experimental tools for the analysis and quantification of biomedical engineering problems

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.

CE16. Understand the basic concepts of linear systems and related functions and transforms, theory of electrical circuits, electronic circuits, the physical principle of semiconductors and logic families, electronic devices, and their application to solve problems in biomedical engineering.

CE17. Designing instruments for medical applications

CE18 .Use sensors, controllers and biomedical signal acquisition systems for the evaluation and design of biomedical devices and systems

- 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

Topic 1. "Fundamentals of sequential logic. Bistable devices".
1.1- Concept of sequential circuit. Synchronous and asynchronous systems.
1.2- Asynchronous bistables.
1.3- Synchronous bistables.
1.4- Conversions between bistables.

Topic 2. Registers and counters. Registers and counters.
2.1- Concept of registers and types of registers.
2.2- Synchronous and asynchronous counters. Design and implementation.

Topic 3. Finite state automata. State machines (Mealy and Moore).
3.1- Concept of state machine or automaton. Classification: Moore machines and Mealy machines.
3.2- Design of Moore and Mealy machines.

Topic 4. Design of practical applications with Microcontrollers and FPGAs.
4.1- Introduction to Microprocessors and Microcontrollers. Architecture, core, input and output ports.
4.2- Introduction to FPGAs. Architecture, core, input and output ports.
4.3- Programming languages for programmable logic devices, Basic design of combinational and sequential circuits with Arduino and VHDL.
4.4- Design of basic electronic applications with Arduino, Sensors and FPGAs.

IV.B.-Training activities

Type	Title
Clínicos	Clinical practice
Other activities	Seminars

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V.-Student workload	
Theoretical sessions	0
Resolution of exercises, problems, case studies, etc.	0
Practical sessions in experimental, technological and clinical laboratories, fieldwork, etc.	230
Tests and/or exams	0
Academic tutorials	2
Related activities: conferences, seminars, etc.	0
Preparation of theoretical sessions and self-study	13
Preparation of practical tasks, exercises, case studies, projects, etc.	25
Preparation for tests and/or exams	0
Total student workload	270

VI.-Methodology and academic programme		
Type	**Period**	**Content**
Week 1 to Week 15	Seminarios de orientación de las rotaciones básicas	Week 1 to Week 15

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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

In the evaluation of Exteran Practices I (Clinical Practices), the following items will be considered:
- General aspects. Assiduity and punctuality in attending the service will be assessed, as well as the interest shown by the student during the internship.
- Interpersonal communication. Effective and clear communication with health professionals will be assessed.

- **Clinical/technical skills**. The acquisition of clinical and technical knowledge will be assessed. The evaluation will be made using the following system:
- Attendance to rotations in different medical areas/services: 5 %.
- Test with questions related to the concepts shown in the areas visited during the basic clinical practice: 30%.
- **Assessment of a report and a presentation of the work carried out in the specialized clinical practice**: 65%.

Attendance is mandatory. Up to a maximum of 20% absence will be accepted, provided that it is duly justified and as determined by the teacher in charge. If the number of absences exceeds 20%, they must be made up at another time of the year (evenings, weekends, holidays) after agreeing with those responsible for the subject and the clinical staff in charge of the clinical practice. If the rotation cannot be completed before the end of the course, due to good reasons (e.g., illness), if the teacher/tutor agrees, it can be rotated during the summer

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: No.

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
Yayo Herrero y Fernando Cembranos (2019) . Cambiar las gafas para mirar al mundo. Libros en acción. Kate Raworth (2018). Economía rosquilla. 7 maneras de pensar la economía del siglo XXI. Paidós. Jason Hickel (2023). Menos es Más. Cómo el decrecimiento salvará el mundo. Capitán Swing. McDonough, W., &Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things. Antonio Turiel (2024). El futuro de Europa: Cómo decrecer para una reindustrialización urgente. Destino. Prieto-Sandoval, V., Jaca, C., & Ormazabal, M. (2017). Economía circular: relación con la evolución del concepto de sostenibilidad y estrategias para su implementación. *Memoria Investigaciones en ingeniería*, (15). Juniper, T. (2021). *The Science of Our Changing Planet: From Global Warming to Sustainable Development*. Penguin Books.
Consultation bibliography
Joanna Macy y Chris Johnstone (2018). Esperanza activa: Cómo afrontar el desastre mundial sin volvernos locos. Ediciones La Llave. Miriam Lang, Breno Bringel y Mary Ann Manahan (eds.) (2023). Más allá del colonialismo verde: justicia global y geopolítica de las transiciones ecosociales. Clacso.

IX.-Professors	
Name and surname	IGNACIO PRIETO EGIDO
E-mail address	ignacio.prieto@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	2
Number of sexennia	2
No. of positive evaluations by Docentia	3
Name and surname	JOSÉ FRANCISCO TRAGANT ESPECHE
E-mail address	jose.tragant.espeche@urjc.es
Department	Economía de la Empresa (ADO), Economía Aplicada II y Fundamentos Análisis Económico
Campus	Fuenlabrada

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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
No. of positive evaluations by Docentia	0
Name and surname	JOSÉ MANUEL ÁLVAREZ MONTOYA
E-mail address	jose.alvarez.montoya@urjc.es
Department	Estudios Históricos y Sociales, Lengua Española, Literatura, Filosofía Moral y Didácticas Específicas.
Campus	Fuenlabrada
Category	Profesor Sustituto
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	MARÍA ÁNGELES CANO LINARES
E-mail address	angeles.cano.linares@urjc.es
Department	Derecho Público II
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	6
Number of sexennia	2

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No. of positive evaluations by Docentia	6
Name and surname	SIMONE GUARESCHI
E-mail address	simone.guareschi@urjc.es
Campus	Fuenlabrada
Category	Investigador
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

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