Universidad Rey Juan Carlos

TEACHING GUIDE

BIOMATERIALS

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

ACADEMIC YEAR 2026-27

Q2803011B UNIVERSIDAD REY JUAN CARLOS
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I.-Subject Identification	
Type	OBLIGATORIA
Teaching period	4 course, 2Q semester
Nº of credits	3
Language in wich the subject is taught	English

II.-Presentation

The main objective of the subject is to provide to the students the basic knowledge about the materials that could be implanted in order to repair, to replace or to regenerate alive tissues or organs and their functions. Macroscopic properties of materials and its relationship with microstructure will be introduce. Materials commonly used for implants manufacturing will be studied attending to the engineering classification: metals, ceramics, polymers, composites and natural material. In addition, they will be related with different applications in orthopaedic, odontology, ophthalmology, cardiovascular and dermatology. Materials surface properties and their relevance in the interaction with biological systems will be studied. Finally, fundamentals of biocompatibility and cytotoxicity will be stablished

III.-Learning outcomes

CB5 . That students have developed the learning skills needed to undertake further studies with a considerable degree of autonomy.
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
CE15. Solve physical problems in biomedical engineering using knowledge of: kinematics, dynamics, electromagnetism, waves, fluids, bioelectricity and biomechanics.
CE33. Understand the biological response to the use of materials and their application in biomedicine

- 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

1. Principles of materials science.
2. Introduction to biomaterials science. Definitions and application field.
3. Metallic biomaterials and their applications.
4. Ceramic biomaterials and their applications.
5. Polymeric biomaterials and their applications.
6. Composite biomaterials and their applications.
7. Biomaterials surface.
8. Biocompatibility.

IV.B.-Training activities

Type	Title
Theoretical sessions	On site master classes
Resolution of exercises, problems, case studies	Problem solving and indivudual tasks on Virtual Classroom
Experimental and/or technological laboratories	Laboratory practices
Group work	Scientific article analysis and material selection exercices with Granta Edupack
Test and/or exams	On site quizzes at the end of each chapter and exam

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V.-Student workload	
Theoretical sessions	19
Resolution of exercises, problems, case studies, etc.	2
Practical sessions in experimental, technological and clinical laboratories, fieldwork, etc.	7
Tests and/or exams	2
Academic tutorials	12
Related activities: conferences, seminars, etc.	12
Preparation of theoretical sessions and self-study	6
Preparation of practical tasks, exercises, case studies, projects, etc.	15
Preparation for tests and/or exams	15
Total student workload	90

VI.-Methodology and academic programme		
Type	**Period**	**Content**
Theoretical sessions	Week 1 to Week 15	On site master classes
Resolution of exercises, problems, case studies	Week 1 to Week 15	Laboratory and computing practices
Tests and/or exams	Week 14 to Week 15	The exam that will be taken on the day fixed by the university

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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

Continuous ordinary assessment:
The distribution and characteristics of the assessment tests are those described below. Only in exceptional cases and for special reasons, the teacher may add changes to the Guide. These changes will require the prior consultation with the Subject Head and the prior and explicit authorisation of the Degree Programme Coordinator, who will notify the Vice-Rector's office in charge of Academic Affairs of the modifications made. In any case, the changes proposed must take into account the stipulations of the verified report. For these changes to take effect, they must be duly communicated at the start of the course to the students using Aula Virtual.
The combination of activities that are not reassessable cannot exceed 50% of the subject grade and, in general, cannot have a minimum grade (except for the case of laboratory or clinical work placements, where duly justified), and tests which exceed 60% of the subject weighting cannot be added.
Extraordinary assessment: Students who do not manage to pass the ordinary assessment, or who did not attend, will be subject to completion of an extraordinary assessment to verify their acquisition of the skills established in the guide, only for activities that are reassessable.
Description of the tests for assessment and their weights.

- **Continuous assessments** of all contents with practical exercises and Wooclap quizzes. **30% of the final grade** (10% on site quizzes at the end of each chapter, 10% problems, 10% scientific article analysis and material selection exercices). Revaluation is not available.
- **Exam** of all contents. **60% of the final grade**. Minimum grade: 5. Can be revalued in June.
- **Laboratory Practices.10% of the final grade**.**Compulsory attendance**. Evaluate with examination or reports. Minimum grade: 5. Can be revalued in June.

The student who has requested the advanced call should contact the lecturer as soon as possible so that he/she can provide him/her with the necessary information and/or material for the evaluation, which will be similar to the one followed by the rest of the students enrolled in the subject.

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
B.D. Ratner, A. S. Hoffman, F. J. Schoen, J. Lemons. Biomaterials Science. An Introduction to Materials in Medicine. Academic Press 3ª ed. 2013. Park JB, Lakes RS. Biomaterials an Introduction. Springer 3ª ed. 2007
Consultation bibliography
Kendell Pawelec, Planell J.A. Bone repair biomaterials, 2nd ed. Woodhead Publishing, CRC Boca Raton, 2018.

IX.-Professors	
Name and surname	JUAN PABLO FERNÁNDEZ HERNÁN
E-mail address	juanpablo.fernandez@urjc.es
Department	Matemática Aplicada, Ciencia e Ingeniería de los Materiales y Tecnología Electrónica
Campus	Fuenlabrada
Category	Profesor/a Permanente Laboral
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	MARTA MARÍA MULTIGNER DOMÍNGUEZ
E-mail address	marta.multigner@urjc.es
Department	Matemática Aplicada, Ciencia e Ingeniería de los Materiales y Tecnología Electrónica
Campus	Fuenlabrada
Category	Titular de Universidad
Academic degree	Doctor
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

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Number of quinquennia	2
Number of sexennia	5
No. of positive evaluations by Docentia	3
Name and surname	SANDRA CAROLINA CIFUENTES CUÉLLAR
E-mail address	sandra.cifuentes@urjc.es
Department	Matemática Aplicada, Ciencia e Ingeniería de los Materiales y Tecnología Electrónica
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	2
No. of positive evaluations by Docentia	1

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