Universidad Rey Juan Carlos

TEACHING GUIDE

BIOMEDICAL INFORMATION TRANSMISSION AND CODING SYSTEMS

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

ACADEMIC YEAR 2026-27

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

Publication date: 02-07-2026

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

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

II.-Presentation

Goals

The goal of this course is to introduce the basic concepts about programming methods and techniques. The course will focus on the Python programming language, with a special emphasis on its applications for *scientific programming*, as well as on *reproducible research* methods. Python is a versatile, intuitive and accessible programming language. For some years now, it has become the reference programming language for scientific applications, and it is widely used in engineering and data science. In this way, students are expected to learn and apply the foundations for the development of software programs in Biomedical Engineering. Practical exercises in this course will address the resolution of problems in bioengineering using Python programming.

Previous requirements

Basic knolwedge about logic and mathematics.

Suggestions

It would be desirable that students had some basic knowledge about computers.

ATTENTION: INSTRUCTIONS ON HOW THE COURSE WORKS FOR STUDENTS TAKING THIS COURSE AT THE CAMPUS OF ALCORCÓN: Meetings will be set up during the theoretical and practical sessions to which you will be able to connect.

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
CB5 . That students have developed the learning skills needed to undertake further studies with a considerable degree of autonomy.
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.

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

IV.-Contents

IV.A.-Syllabus

1. Introduction to scientific programming with Python
2. Basics of the programming language
3. Functions
4. Execution flow control
5. List and tuples
6. Files
7. Dictionaries and sets
8. Exceptions

IV.B.-Training activities

Type	Title
Resolution of exercises, problems, case studies	Solving practical exercises synchronized with the contents of the course.
Practical sessions	Conducting lab sessions in computer science/bioengineering
Test and/or exams	In-person exams to assess knowledge acquisition
Academic tutorials	Academic tutoring for addressing students' questions
Theoretical sessions	In-class presentations of the course concepts. The instructor provides students with the necessary materials to follow the classes.

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

V.-Student workload	
Theoretical sessions	15
Resolution of exercises, problems, case studies, etc.	0
Practical sessions in experimental, technological and clinical laboratories, fieldwork, etc.	30
Tests and/or exams	15
Academic tutorials	9
Related activities: conferences, seminars, etc.	9
Preparation of theoretical sessions and self-study	40
Preparation of practical tasks, exercises, case studies, projects, etc.	40
Preparation for tests and/or exams	22
Total student workload	180

VI.-Methodology and academic programme

Type	Period	Content
Theoretical sessions	Week 1 to Week 14	Theoretical classes
Week 1 to Week 14	Practice classes of scientific programming in Python	Academic tutorials
Week 1 to Week 14	Tutorial sessions requested by students to check the progress of their practices and question solving. Collaborating in the resolution of questions and doubts from other students. Participation in debates and Q&A threads proposed in the course forums.	Practical sessions
Week 2 to Week 14	Practical classes for solving problems, corresponding to chapters 2 to 8	- to -
Pequeños proyectos a programar	- to -	Resolución de casos reales

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

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

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

Ordinary call

The evaluation for the regular exam session will consist of:

1. Periodic submissions of scientific programming assignments in Python applied to bioengineering.
2. Theoretical/practical exams on scientific programming in Python.

The weighting of each test and task is detailed in the following table:

Item	Weight	Minimum Score	Date	Type	Content
Practical exercises	40%	4 out of 10	Along the course	Reassessable (in the extraordinary call)	Content taught until the delivery of the exercise
Mid-term exam	20%	2 out of 10	Not defined yet (mid-course)	Reassessable (in the extraordinary call)	Content taught until the mid-term exam
Final exam	40%	4 out of 10	Official exam date	Reassessable (in the extraordinary call)	All content

Each of the aforementioned activities will be graded on a scale from 0 to 10 points. The final grade will be the weighted average of the different activities, according to the weighting factor specified for each. To pass the course in the regular exam session, students must achieve a final grade equal to or greater than 5 points, and also obtain at least the minimum required grade in those activities that specify one. The grades obtained in each activity will be retained for the resit (extraordinary) session. All activities are subject to reevaluation in the resit session.

Extraordinary call

Evaluation in the resit session will be based on a single individual assessment, consisting of:

1. **Practical Assessment** (this part reevaluates the “Lab Assignments” activity from the ordinary call):

•Completion of a program of similar complexity to the lab assignments proposed during the course.
•Minimum grade: 4 out of 10.
•Weight: 40% of the final grade.

2. **Assessment Test on Practical Exercises** (this part jointly reevaluates the “Midterm Exam” and “Final Exam” activities from the ordinary call):

•Completion and submission of programs similar to the practical exercises solved in class.
•Minimum grade: 4 out of 10.
•Weight: 60% of the final grade.

Early Exam Session

The same conditions as those for the resit session apply.

Academic Exemption

The same conditions as those for the resit session apply.

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.

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

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.

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

VIII.-Teaching resources and materials
Basic bibliography
Learn More Python 3 the Hard Way: The Next Step for New Python Programmers. Zed Shaw. 1st edition. ; Addison-Wesley Professional ; 2017
"Introducing Python: Modern Computing in Simple Packages". Bill Lubanovic. O'Reilly Media, 2014.
Think Python. Allen B. Downey. 2nd ed. update for Python 3. ; Sebastopol etc : O'Reilly ; cop. 2016
Consultation bibliography
The Quick Python Book, 3rd ed. Naomi Ceder. Manning Publications. 2018
Bioinformatics with Python Cookbook. Tiago Antao. Packt Publishing, 2015.
Python Data Science Handbook: Essential Tools for Working with Data. Jake VanderPlas. O'Reilly Media, 2016

IX.-Professors	
Name and surname	DAVID ROLDÁN ÁLVAREZ
E-mail address	david.roldan@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	2
No. of positive evaluations by Docentia	2
Name and surname	JESÚS FERNÁNDEZ CONDE
E-mail address	jesus.fernandez@urjc.es
Department	Teoría de la Señal y Comunicaciones y Sistemas Telemáticos y Computación
Campus	Fuenlabrada
Category	Titular de Universidad
Academic degree	Doctor

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.

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	3
Number of sexennia	1
No. of positive evaluations by Docentia	2

Q2803011B UNIVERSIDAD REY JUAN CARLOS
Fecha firma: 20/11/2026 16:15 | Hash: dc74ae8782162ff5e5290ac58b039d4b.