1. BASIC INFORMATION

Course	Electronic Physics
Degree program	Degree in Physics
School	School of Science, Engineering and Design
Year	2023/2024
ECTS	6
Credit type	Mandatory
Language(s)	English
Delivery mode	Campus based mode
Semester	S6
Academic year	3
Coordinating professor	Ezequiel Valero Lafuente
Professor	Ezequiel Valero Lafuente

2. PRESENTATION

Electronic Physics belongs to the "Structure of Matter" block formed by the following subjects:
- Solid State Physics.
- Electronic Physics.
- Nuclear and Particle Physics.

This subject of 6 ECTS is compulsory and is taught in the second semester of the third year of the Physics degree.

The course of electronic physics will deepen the aspects of physics related to crystal lattices and solid state physics, with particular emphasis on semiconductors, fundamental materials with diverse applications nowadays.

The main objective of the course is to provide the necessary tools for students to learn the fundamentals of semiconductor transport, as well as to show the properties of some microelectronic and nanoelectronic devices.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CG1 - To know the most important concepts, methods and results of the different branches of Physics, together with some historical perspective of their development.
- CB3 - That students could gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.
- CB4 - That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences. specialized and non-specialized audiences.

- CB5 - That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Cross-curricular competencies:

- CT4 - Written communication / Oral communication: Ability to transmit and receive data, ideas, opinions and attitudes to achieve understanding and action, being oral communication through words and gestures and written communication through writing and/or graphic supports.
- CT5 - Analysis and problem solving being able to critically evaluate information, decompose complex situations into their constituent parts, recognize patterns and consider other alternatives, approaches and perspectives to find optimal solutions and efficient negotiations.

Specific competencies:

- CE01 - To understand the processes of obtaining, physical fundamentals and applications of materials.
- C02 - Describe and analyze physical systems, identifying the fundamental concepts and principles in order to make the necessary approximations to build a simplified model.
- CE04 - Understand and explain the laws and principles of Physics, identify their logical and mathematical structure, their experimental support and the phenomena described through them.
- CE09 - Understand the processes of obtaining, the physical foundations and the applications of materials.

Learning outcomes:

- RA1 - Describe the band structure of semiconductors and their electronic properties.
- RA2 - Explain the physical structure of electronic devices and how it affects their properties.
- RA3 - Identify the electronic devices used in micro- and nanoelectronics.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB4, CB5, CT5, CT4, CE01, CE02, CE04	RA1- Describe the band structure of semiconductors and their electronic properties.
CB4, CB5, CT5, CE01,CT4, CE02, CE04	RA2 - Explain the physical structure of electronic devices and how it affects their properties.
CB4, CB5, CT5, CE04,CT4, CE09	RA3 - Identify the electronic devices used in micro- and nanoelectronics.

4. CONTENT

1. Basic concepts of the band structure.

2. Physics of semiconductors.
3. Electronic transport properties.
4. Heterojunctions and nanostructures.
5. Introduction to micro/nanoelectronics.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Cooperative learning: students learn to collaborate with other people (classmates and teachers) to solve in a creative, integrative and constructive way the questions and problems identified from the cases posed, using the knowledge and material resources available.
- Problem-based learning: Problems will be posed with the objective that students solve them working in teams or individually.
- Master Class: presentations made by the teacher with the necessary technological tools for the maximum understanding of the concepts taught.
- Directed academic activities: more autonomous, individual and group work, with information search, written synthesis and debates and public defense of work.

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Master class	22
Oral presentations of work and debates	13
Preparation of reports	10
Formative evaluation	5
Practical activities	20
Tutoring	6
Self learning	74
TOTAL	**150**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Individual knowledge tests, theoretical and/or practical.	50
Submission of reports/ papers/ projects, group and/or individual exercises.	30
Final project	10
performance monitoring	10

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

To be eligible to take the first period evaluation exam, attendance at in-person classes must be 50% or higher. Attendance must be in person. Synchronous virtual attendance via HyFlex is only counted in cases that are approved and justified by the university.

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Exercise 1,2	Week 1-4
Exercise 3	Week 4-6
Final test simulation	Week 7-9
Exercise 4,5	Week 10-13

Final test	First exam period

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. REFERENCES

The main reference work for this subject is:

- Donald A. McQuarrie, Statistical Mechanics, Harper's Chemistry Series (1976).

The recommended Bibliography is:

- E. Kubo, Statistical Mechanics: An Advanced Course with Problems and solutions (2nd edition), North-Holland (1999).
- J.J.Brey Abalo et al, Mecánica Estadística, UNED, Madrid (2001).

10. EDUCATIONAL GUIDANCE DIVERSITY AND INCLUSION UNIT

From the Educational Guidance, Diversity and Inclusion Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students' inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunity for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa.uev@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the "surveys" section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.