

Degree	Type	Year
Physics	OT	3

## Contact

Name: Alberto Quintana Puebla

Email: alberto.quintana@uab.cat

## Teachers

Marta Gonzalez Silveira

## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

They do not exist

## Objectives and Contextualisation

This course is about bringing students closer to the world of materials science. The physical properties are related to the applications and a brief incursion into the technological materials.

It is aimed at students who want to study materials science related to students interested in solid state physics and, in general, to students who want to relate the physical properties that they study in their career with their applications

## Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply fundamental principles to the qualitative and quantitative study of various specific areas in physics
- Be familiar with the bases of certain advanced topics, including current developments on the parameters of physics that one could subsequently develop more fully
- Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, and before both specialist and general publics

- Develop the capacity for analysis and synthesis that allows the acquisition of knowledge and skills in different fields of physics, and apply to these fields the skills inherent within the degree of physics, contributing innovative and competitive proposals.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Use mathematics to describe the physical world, selecting appropriate tools, building appropriate models, interpreting and comparing results critically with experimentation and observation
- Work independently, have personal initiative and self-organisational skills in achieving results, in planning and in executing a project

## Learning Outcomes

1. Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, in front of both specialist and general publics.
2. Describe the relationship between the structure, properties, processing and applications of materials.
3. Describe the various types of existing materials and their differences.
4. Distinguish the fields of application for different types of microscope (optical, electronic, tunneling or atomic force).
5. Establish the foundation for the study of nanomaterials and their application in society.
6. Explain the explicit or implicit code of practice of one's own area of knowledge.
7. Identify situations in which a change or improvement is needed.
8. Identify the social, economic and environmental implications of academic and professional activities within one's own area of knowledge.
9. Relate the properties of materials with their application to engineering.
10. Use calculation in the parameterization of material properties.
11. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
12. Work independently, take initiative itself, be able to organize to achieve results and to plan and execute a project.

## Content

1. Introduction: Importance of materials science and engineering. Types of materials.
2. Materials structure
3. Imperfections and mechanisms of diffusion in solids
4. Phase diagrams and phase transformations
5. Materials properties and characterization techniques
6. New materials

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
problems solved in the class	14	0.56	3, 2, 9, 10
theoretical classes	27	1.08	3, 2, 4, 5, 9

Type: Supervised

tutorials	2	0.08	5, 9
-----------	---	------	------

Type: Autonomous

personal work	33	1.32	3, 2, 4, 5, 9, 10
problems solved	21	0.84	2, 9, 10
thematic work	20	0.8	3, 2, 5, 9

### Lectures

Lectures will consist of a set of presentations in PowerPoint on the concepts and fundamentals of materials science. Students will have this content in sufficient time to prepare the classes and follow them properly.

### Problems class

The student will have a list of problems that will be facilitated throughout the course. The classes of problems will be coordinated with the theoretical classes, so that the students will be able to consider themselves and, in some cases, to solve the problems themselves. The list of problems is a set of exercises that illustrate the theory's content

### Tutorials

Throughout the course, the individualized discussion between the students and the teacher/s will be encouraged.

### Thematic work

The students, divided into groups, will have to present oral and publicly a work to choose from a list, suggested by the teachers, of topics related to the world of "new materials".

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Classroom problem solving	10%	0	0	3, 2, 4, 7, 11, 9, 12, 10
midterm exam* (2 partial tests)	80%	4	0.16	3, 2, 4, 5, 9, 10
resit exam	80%	3	0.12	3, 2, 4, 9, 10
thematic work (oral presentation)	10%	1	0.04	1, 3, 2, 4, 5, 6, 8, 11, 9

### Continuous Assessment

The assessment of the course will consist of:

- 2 midterm exams, accounting for 80% of the final grade (40% each).
- 1 thematic project on new materials, worth 10% of the grade.
- Problem-solving sessions in class under the supervision of the teaching staff, worth 10% of the grade.

If the overall grade obtained is below 5.0 (out of 10 points), the course will be considered not passed (fail). In this case, the student may take a resit exam, which will account for 80% of the total grade. The in-class problems and thematic project cannot be retaken and must be submitted in order to pass the assessment.

A student will be considered "Not Presented" if they do not take the second midterm exam or any resit exam.

---

## Single Assessment

Students who have opted for the single assessment mode will take a final test consisting of:

- A theory exam with short-answer questions.
- A problem-solving test with exercises similar to those practiced during class sessions.
- Upon completion, students must submit a written assignment (minimum of 5 pages) on one of the proposed seminar topics.

These assessments will take place on the same day, time, and location as the second midterm exam for the continuous assessment mode.

The student's grade will be the weighted average of the three components:

- Theory exam: 80%
- Problem-solving test: 10%
- Seminar paper: 10%

If the final grade is below 5, the student will have another opportunity to pass the course through a resit exam, which will be held on the date set by the program coordination. In this exam, up to 90% of the grade (theory and problems) can be recovered. The written paper component is not recoverable.

*student has another opportunity to pass the subject through the remedial exam that will be held on the date set by the degree coordinator. In this test you can recover 75% of the grade corresponding to the theory and the problems. The written part of the work is non-refundable.*

## Bibliography

Theory books and / or problems

- Class notes: Campus Virtual UAB.
- Ciència dels materials; M.Cruells et al.; Publicacions i edicions de la Universitat de Barcelona, 2007.
- Ciencia e Ingeniería de los materiales; D.R.Askeland, Ed. Paraninfo, Madrid, 2001.
- Ciencia e Ingeniería de los Materiales; W.D.Callister y D.G.Rethwisch, 2ªed Ed. Reverté 2016
- Fundamentals of materials science and engineering, an integrated approach; W.D.Callister 3ª ed. Ed. John Wiley, 2008.
- Introducción a la Ciencia de Materiales para Ingenieros; J.F.Shackelford, 6a ed., Prentice Hall, Madrid, 2005.
- Solid State Physics, An introduction; Hofmann, P. ; 2nd Edition, Wiley-VCH 2015
- Callister, William D., and David G. Rethwisch. [Ciencia e Ingeniería de Materiales](https://ebookcentral.proquest.com/lib/uab/detail.action?docID=6798944), Editorial Reverté, 2019. *ProQuest Ebook Central*, <https://ebookcentral.proquest.com/lib/uab/detail.action?docID=6798944>.

## Software

This subject does not use any particular software

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan	second semester	morning-mixed
(TE) Theory	1	Catalan	second semester	morning-mixed