BACHELOR'S DEGREE IN INDUSTRIAL DESIGN ENGINEERING

SYLLABUS
MATERIALS

ACADEMIC YEAR: 2026-27
COURSE: 1st
TYPE: Compulsory
SEMESTER: 1st
ECTS: 6
TEACHING HOURS: 49
AUTONOMOUS WORKING HOURS: 101
TOTAL HOURS: 150
LANGUAGE/S: Spanish/Catalan
CODE: 17043

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PRESENTATION OF SUBJECT / OBJECTIVES

The subject of Materials has a first general objective in the whole area: to acquire the scientific and theoretical basis of materials in engineering. It introduces students to the science and engineering of materials as a basis of knowledge to understand what, how and why the objects (and living beings) that surround us are made in this way.

In design and engineering we are used to working on a human scale (we are talking about mm, cm or meters). However, there is a large portion of the information that is on a smaller scale. In this subject we will understand the microscopic world and the characteristics that this scale confers on the subject.

Through experimentation, theoretical knowledge will be generated. In the internship block, students will carry out 5 laboratory practices in which they will learn to identify polymers, to perform elastomer shore hardness tests, foam resilience and to work empirically on metal corrosion and heat treatments of steels.

Understanding the importance of the material in social development and as inspiration will lead us to conclude the subject with 3 important concepts: biomimicry, bioengineering and sustainability. This subject shows students what materials are and how they got to where they are.

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

This subject does not specifically incorporate any SDGs.

CONTENTS

Block I: Origin and evolution of materials

1.1. Origin and evolution of materials
1.2. The importance of the material

Block II: Element, matter and material
2.1. Atomic structure and bonding
2.2. Structure of crystalline solids
2.3. Imperfections in solids
2.4. Atomic diffusion
2.5. Hardening mechanisms

Block III: Phase diagrams
3.1. Equilibrium phase diagrams
3.2. The Iron-Carbon System
3.3. Heat treatment of steels

Block IV: Description of materials
4.1. Types of metallic materials: ferrous and non-ferrous alloys. Metal corrosion.
4.2. Types of polymeric materials: thermoplastics, thermosets and elastomers.
4.3. Foams
4.4. Ceramic materials
4.5. Composite materials (fibres, fabrics and composites)
4.6. Natural materials and biomaterials

TEACHING METHODOLOGIES
– PA-Work sessions with the whole group class with the teacher
– PF-Autonomous group work sessions
– Laboratory Practices

COMPETENCIES
– Developing a creative attitude of experimentation, under scientific and humanistic criteria, which favours the exploration of relevant and innovative contributions. (G1)
– Configuring new realities based on the interpretation of the historical, social, cultural, economic and technological context. (G2)
– Students must have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues. (CB3)
– Students must have developed those learning skills necessary to undertake further studies with a high degree of autonomy. (CB5)
– Acting with a spirit and critical reflection in the face of knowledge in all its dimensions, showing intellectual, cultural and scientific concern and commitment to rigour and quality in professional demand. (T1)
– Exercising active citizenship and individual responsibility with a commitment to democratic values, sustainability and universal design, based on practices based on learning, service and social inclusion. (T5)
– Becoming the main actor in the training process itself with a view to personal and professional improvement and the acquisition of a comprehensive training that allows learning and coexist in a context that respects linguistic diversity, with diverse social, cultural, gender and economic realities. (T7)
– Integrating the fundamentals of materials science and technology for the proper characterisation, selection, and application of the properties, mechanical structures, and manufacturing systems of materials. (E1)

– Recognising scientific methods to integrate research sources into decision-making. (E9)

LEARNING OUTCOMES

– Collecting and interpreting data and information on which to base their conclusions, including reflections on social, scientific or ethical issues in the field of materials.
– Communicating knowledge, methodology, ideas, problems and solutions to all types of audiences (specialized or not) in a clear and precise way.
– Integrating research sources into decision-making
– Arguing for the importance of materials in social and technological development

TRAINING ACTIVITIES

Each subject will present at the beginning of the course its WORK PLAN where the didactic activities per week / session / autonomous work are recorded.

EXAMINATION

EXAMINATION SYSTEMS

The evaluation of the subject will be based on continuous monitoring of the student's academic work throughout the course.

EVALUATION SYSTEM	FINAL WEIGHTING
P2-Follow-up of the work done	10%
P4-Specific assessment tests: exams	50%
P5-Completion of required work or projects	40%

EXAMINATION CRITERIA

The final grade of the subject will be the weighted average of the grades of the assessable activities according to the following table:

ASSESSABLE ACTIVITY	WEIGHT	RECOVERABLE (up to 50%)	EVALUATION SYSTEM
Class participation	5%	NO	P-2
Midterm Exam	25%	YES*	P-4**
Final exam	25%	YES*	P-4**
Proyecto_1 Finding Materials	10%	NO	P-2/P-5
Proyecto_2 Materials experimentation	20%	NO	P-2/P-5
Proyecto_3 Material Analysis	15%	NO	P-2/P-5

Students will have the option of retaking the retake tests. The retake tests will be carried out in the period of the semester allocated to this function, not being able to recover more than 50% of the subject.

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* In the event that the Recoverable Assessable Activities exceed 50%, the student body may choose, up to a limit of 50%.
The unjustified non-submission of any assessable activity implies a grade of 0, even if the activity has been classified as Recoverable.
Recoverable Activities can only be recovered when they have been submitted by the student body on the indicated date and with a grade equal to or greater than 3.
** In order to calculate the final grade of the subject, it will be necessary to obtain a minimum grade of 4 in the weighted average of the exams (P-4 evaluation system).
If access to the retake test is waived, the grade achieved in the first instance will be maintained. In case of taking the recovery, the grade obtained will be the last, even if it is lower than the first.
Plagiarism or copying of other people's work is penalised in all universities and, according to the Rules of Coexistence of the University of Vic-Central University of Catalonia, they constitute serious or very serious offences. That is why in the course of this subject any indication of plagiarism or misappropriation of texts or ideas other people (What is considered plagiarism?) as well as the improper or undeclared use of Artificial Intelligence in an activity, automatically translates into a suspension and/or other disciplinary measures (Normes de Convivencia de la Universitat de Vic-Universitat Central de Catalunya).
For any questions or queries, see the (Academic Regulations of the Bachelor's Degree of the Faculty of Design and Engineering Elisava UVic-UCC).

BIBLIOGRAPHY AND TEACHING RESOURCES

– Ashby, M.F. 2009. *Engineering Materials 1 and 2.* Ed. Reverté.
– Callister, W.D. 2012. *Introduction to Materials Science and Engineering*. Barcelona: Reverté.
– Kula, D., Ternaux, E. 2013. *Materiology*. Ed. matériO.
– Peña, J. 2010. *Selection of materials in the design process.* 2nd Edition, Barcelona: CPG.
– Smith, W.F., Hashemi, J. 2014. *Fundamentals of materials science and engineering*. Mc Graw Hill.
– Thompson, R., Thompson, M. 2017. *The Materials Sourcebook for Design Professionals*. Ed. Thames & Hudson.

TEACHING RESOURCES AND TEACHING MATERIAL

The teaching staff will deliver the teaching material to the students as needed. This material will consist of scientific articles, problem collections, practice scripts, and academic paper scripts.

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