BACHELOR'S DEGREE IN INDUSTRIAL DESIGN ENGINEERING

SYLLABUS
MATERIALS TECHNOLOGY

ACADEMIC YEAR: 2026-27
YEAR: 2nd
CHARACTER: Basic Training
SEMESTER: 4th
ECTS: 6
TEACHING HOURS: 49
HOURS OF SELF-EMPLOYMENT: 101
TOTAL HOURS: 150
LANGUAGE/S: Spanish/Catalan
CODE: 17033

TEACHING TEAM: Francesc Mestres fmestres@elisava.net / Juan Crespo jcrespo@elisava.net

PRESENTATION SUBJECT / OBJECTIVES
In the subject Materials Technology, three fundamental areas of applied physics will be studied: optics, heat transfer and fluid mechanics.
First, the concept of light and its main properties will be addressed, paying special attention to its interaction with matter. Optical phenomena relevant to the formation of images will be studied, both in artificial devices (LCD, LED, OLED screens) and in biological systems. From this base, the concept of light will be extended to the entire electromagnetic spectrum, establishing its relationship with the temperature of bodies and with the mechanisms of emission, absorption and transport of energy.
Secondly, the principles of heat transfer between systems at different temperatures will be introduced, analysing the mechanisms of conduction, convection and radiation. These concepts will be applied to the study of thermal processes and the operation of thermal machines, connecting the physical foundations with technological and everyday examples.
Finally, the equations that describe statics and fluid dynamics will be studied, both under ideal and real conditions, including the effects of viscosity. Practical applications in industrial, technological and biological contexts will be analysed, with the aim of understanding how physical principles allow modelling and solving real problems.

SUSTAINABLE DEVELOPMENT GOALS (SDGS)
This subject does not specifically incorporate any SDGs.

CONTENTS
Block I: Light
1.1. Electromagnetic waves. Visible spectrum and colour.
1.2. Light propagation: reflection, refraction, scattering and absorption.
1.3. Geometric optics: imaging by thin lenses
1.4. The human eye.

Block II: Heat
2.1. Thermodynamic variables. Ideal gases and the first principle of thermodynamics.
2.2. Thermal engines.
2.3. Heat transfer and transport: conduction, convection and radiation.
2.4. Thermal expansion.

Block III: Fluids
3.1. Fluid statics: pressure and fundamental equation.
3.2. Ideal fluid dynamics: continuity and Bernoulli equation.
3.3. Real fluid dynamics: viscosity.

TEACHING METHODOLOGIES
- Work sessions with the whole group, class with the teacher. (PA)

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COMPETENCIES

- G1 - Develop a creative attitude of experimentation, under scientific and humanistic criteria, which favours the exploration of relevant and innovative contributions.
- CB1 - Students must have demonstrated that they possess and understand knowledge in an area of study that is based on general secondary education, and is usually at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study
- CB3 - Students must have the ability to gather and interpret relevant data (usually within their area of study) in order to make judgments that include reflection on relevant social, scientific or ethical issues
- T1 - Act 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.
- T7 - To become 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 living together in a context that respects linguistic diversity, with diverse social, cultural, gender and economic realities.
- E1 - Integrate the fundamentals of materials science and technology for the proper characterization, selection and application of the properties, mechanical structures and manufacturing systems of materials.
- E9 - Recognize scientific methods to integrate research sources into decision-making.

LEARNING OUTCOMES

- Acquire and demonstrate advanced knowledge of the theoretical and practical aspects and work methodology in the field of materials science and engineering.
- Collects and interprets data and information on which to base their conclusions, including reflections on social, scientific or ethical issues in the field of materials science and engineering.
- Learn the general basics of materials science and engineering.
- Apply knowledge of optical, conduction, convection, or heat radiation phenomena appropriately in the design process.

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.

EVALUATION

EVALUATION 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
P1-Observation of participation	10
P2-Follow-up of the work done	10
P4-Specific assessment tests: exams	40
P5-Completion of required work or projects	40

EVALUATION 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	RETRIEVABLE (up to 50%)	EVALUATION SYSTEM
Activity-1 Contribution in class and follow-up	20%	NO	P1/P2
Activity-2 Laboratory Practices	15%	NO	Q5
Activity-3 Research Project	25%	NO	Q5
Activity-4 Final Exam	40%	YES*	P4**

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.

* If 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 (P4 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 someone else'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 of other people (What is considered plagiarism?) as well as the improper or undeclared use of Artificial Intelligence in an activity, automatically translates into a failure 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

- Hecht, E. 1999. *Óptica*. 3a ed. Madrid: Addison-Wesley Iberoamericana.
- Moran & Shapiro. 2004. *Fundamentos de termodinámica técnica,* Ed. Reverté.
- Tipler. 1997. Física, Volumen 2. Ed. Reverté.

The teaching staff will provide a specific bibliography at the beginning of the subject, if applicable.

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