BACHELOR'S DEGREE IN INDUSTRIAL DESIGN ENGINEERING

SYLLABUS
ELECTRICAL AND ELECTRONIC TECHNOLOGY

ACADEMIC YEAR: 2026-27
COURSE: 1st
CHARACTER: Compulsory Training
SEMESTER: 2nd
ECTS: 6
TEACHING HOURS: 49
AUTONOMOUS WORKING HOURS: 101
TOTAL HOURS: 150
LANGUAGE/S: Spanish/Catalan
CODE: 17040

TEACHING TEAM: Xavier Riudor xriudor@elisava.net / Carles Araguz caraguz@elisava.net

PRESENTATION OF SUBJECT / OBJECTIVES
The subject deals with the basic principles that govern electricity and electromagnetism, as well as the technologies and processes that allow new electronic products and systems to be conceived. The focus of the subject is divided, firstly, into a theoretical part, in which the fundamental magnitudes and methods of analysis of circuits, low-power devices and applications, energy storage systems and electrical machines will be introduced. The practical part of the subject focuses on electrical measurement tools and the processes of design and integration of industrial prototypes based on microcontrollers, sensors and actuators.

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

CONTENTS
Block 1: Fundamentals of Electricity and Circuit Analysis Methods
- Electrical potential, current, power and resistivity.
- Ohm's law and the Joule effect.
- Impedances: resistance and ballasts
- Association of resistances
- Kirchhoff's laws, circuit resolution

Block 2: Semiconductor Devices and Low-Power Applications
- Semiconductor materials.
- PN Union. Diode, LED, Zener diode.
- Diode circuit analysis.
- MOSFET and BJT transistor. Types, characteristics and methods of analysis.
- Circuits and applications with semiconductor devices.

Block 3: Electromagnetism and Energy Storage Systems
- Capacitance and inductance. Reactances.
- Batteries and electrical energy storage devices.
- Magnetism and induction.
- Electromagnetism. Faraday's Law of Induction and Lorenz's forces.
- Direct current motors.
- Alternating current and transformers.

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TEACHING METHODOLOGIES

- Lecture sessions with the whole class group with the teacher.
- Workshop sessions with the whole group, class with the teacher.
- One-on-one tutoring sessions.

COMPETENCIES

- For the students to demonstrate that they are able 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 (B3)
- Students shall have developed those learning skills necessary to undertake further studies with a high degree of autonomy (B5)
- 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)
- 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)
- Showing skills for professional practice in multidisciplinary and complex environments, in coordination with networking teams, either in face-to-face or virtual environments, through the computer and informational use of ICTs. (T4)
- Using computer science and programming for application in different phases of industrial design engineering. (E3)
- Solving technical problems creatively in the fields of Industrial Design Engineering to respond to new situations. (E8)
- 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 ICT.
- Identifying their own training needs and organising their own learning with a high degree of autonomy in all types of contexts (structured or not).
- Showing skills for critical reflection in the processes linked to the exercise of the profession.
- Correctly developing in the general use of ICT and especially in the technological environments of the professional field.
- Applying data in different phases of industrial design engineering.
- Creatively solving technical problems posed in new industrial design situations Integrates research sources into decision-making

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
P2-Follow-up of the work done	10

EVALUATION SYSTEM	FINAL WEIGHTING
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
Activity-1 Midterm Exam	15%	YES*	P-4**
Activity-2 Final Exam	35%	YES*	P-4**
Activity-3 Continuous evaluation (exercises, practices, and attendance)	10%	NO	P-2
Activity-4 Project	40%	NO	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.
* 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

- Alexander, C. K., & Sadiku, M. N. O. (2020). Fundamentals of Electric Circuits (7th ed.). McGrawHill.
- Malvino, A. P., Bates, D. J., & Hoppe, P. E. (2021). Principles of Electronics (9th ed.). McGrawHill Education.
- Neamen, D. A. (2009). Microelectronics: Circuit Analysis and Design (4th ed.). McGrawHill Education.
- Horowitz, P., & Hill, W. (2015). The Art of Electronics (3rd ed.). Cambridge University Press.

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

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