

## **DEGREE IN INDUSTRIAL DESIGN ENGINEERING**

### **TEACHING PLAN OF SUBJECT DESIGN AND BIOMATERIALS**

ACADEMIC YEAR: 2025-26

YEAR: 3RD

CHARACTER: Optional

SEMESTER: 6th

ECTS: 6

TEACHING HOURS: 45

HOURS OF SELF-EMPLOYMENT: 105

TOTAL HOURS: 150

LANGUAGE/S: English

ID: 17064

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#### **PRESENTATION SUBJECT / OBJECTIVES**

The subject will explore biomimetics, and the natural meso-, micro- and nanostructures involved in nature. We will study nature's self-organization, engineering and architecture to later apply such knowledge into industrial design methodology. For that purpose, we will learn parametric software, like Grasshopper and different characterization procedures, like microscopy and micro-assays. The general aim of the subject is to study natural design and biomaterials, and deepen their understanding for future applications in the engineering field.

#### **SUSTAINABLE DEVELOPMENT GOALS (SDGS)**

This subject does not specifically incorporate any SDG.

#### **CONTENTS**

##### **Block-I: Biomimicry & nature**

- 1.1. Biomimicry: nature & architecture
- 1.2. Fractals & nature
- 1.3. Natural structures I
- 1.4. Additive manufacturing & Microfabrication
- 1.5. Natural structures II
- 1.6. Biolab experimentation

##### **Block-II: Algorithm-Aided Design (AAD)**

- 2.1. Intro to Grasshopper
- 2.2. Data management
- 2.3. Transformations
- 2.4. Skins
- 2.5. Form finding
- 2.6. Digital fab

- 2.A. Case Study 1
- 2.B. Case Study 2
- 2.C. Case Study 3

##### **Block-III**

- 3.1. Final Project

#### **TEACHING METHODOLOGIES**

- Work sessions with the whole class group with the teacher (PA)
- Work sessions in small groups with the teacher (PB)
- Autonomous group work sessions (FP)

#### **COMPETENCES**

- G2 - Configure new realities to interpret the historical, social, cultural, economic and technological context.
- CB2 - The student knows how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

- T2 - Project the values of entrepreneurship and innovation in the exercise of the academic and professional personal trajectory through contact with different realities of practice and motivation towards professional development.
- T4 - Show 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 ICT.
- T6 - Use different forms of communication, both oral and written or audiovisual, in one's own language and in foreign languages, with a high degree of correctness in use, form and content.
- 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.
- E6 - Use different methodologies and work tools to correctly design any product, system or service.
- E10 - Understand the present industrial reality to function in the professional environment.
- E11 - Identify emerging technologies that can add value to the project.

### LEARNING OUTCOMES

- Applies their knowledge to solve problems in complex or professional and specialized work environments that require the use of creative and innovative ideas.
- Solves problems and situations of professional performance with entrepreneurial and innovative attitudes
- It uses different methodologies, and technological combinations with materials in the context of product, system or service design to offer an innovative and competent solution to a given problem.

### 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 a continuous monitoring of the student's academic work throughout the course.

EVALUATION SYSTEM	FINAL WEIGHTING
P2-Follow-up of the work done	35
P3-Reports from the students themselves, external tutors, court	15
P5-Realization of required works or projects	50

#### EVALUATION CRITERIA

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

EVALUABLE ACTIVITY	WEIGHT	RECOVERABLE (up to 50%)	EVALUATION SYSTEM
Activity-1 Case studies	20%	NO	P-2
Activity-2 Conducting exercises and participating in class	15%	NO	P-2
Activity-3 Laboratory/ADL projects	15%	NO	P-3
Activity-4 Final project. Concept + memory + prototype	40%	YES*	P-5
Activity-5 Final presentation	10%	NO	P-5

Students will have the option of re-examining themselves for recoverable tests. The recovery tests will be carried out in the period of the semester destined to this function, not being able to recover more than 50% of the subject.

\* In the event that the Recoverable Evaluable Activities exceed 50%, the student may choose, up to a limit of 50%.

The unjustified non-presentation of any evaluable activity implies a grade of 0, even if the activity has been qualified as Recoverable.

The Recoverable Activities can only be subject to recovery when they have been delivered by the student on the indicated date and with a grade equal to or greater than 3.

If you renounce access to the recovery test, the grade achieved in the first instance will be maintained.

In case of presenting to recovery, the note obtained will be the last, even if it is less than the first.

Plagiarism or copying someone else's work is penalized 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 offenses. That is why during the course of this subject any indication of plagiarism or misappropriation of

other people's texts or ideas ([What is considered plagiarism?](#)) as well as the improper or undeclared use of Artificial Intelligence in an activity, will result automatically in failure of the subject and/or other disciplinary measures ([Norms of Coexistence of the University of Vic-Central University of Catalonia](#)). For any questions or queries, see the ([Academic Regulations for the Degree of the Elisava Faculty of Design and Engineering UVic-UCC](#)).

#### **BIBLIOGRAPHY AND TEACHING RESOURCES**

- Benyus, J. M., 2002. *Biomimicry: Innovation inspired by nature*. William Morrow & Co.
- Finsterwalder, R. 2015. *Form follows nature*. Springer Wien New York.
- Kapsali, V. 2016. *Biomimetics for designers*. Thames & Hudson.
- Tedeschi A., 2014. *Aided Algorithm Design*. England: Le Penseur.

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