

1S_FB_Introduction to materials sciences

Qualification: Degree in Higher Artistic Education in Design in the specialties of graphic design, interior design, fashion design and product design.

Subject: Science applied to design

Type: Training Basic

Credits: 4 ECTS

Total hours: 100h

Course: 1

Hours/week: 6.3 hours

Semester: 1r

Face-to-face hours/week: 3h

Language in which it is taught: Catalan / Spanish

Self-employed hours/week: 3.3h

Prerequisites: Cap

1. Presentation of the subject

The Introduction to Materials Science subject focuses on the knowledge and analysis of the different materials in the four specialties. The objective of this subject is to understand materials as elements and determinants of design.

The introduction of this scientific knowledge will allow:

- Understanding what, how and why designs are made will provide tools to choose the most appropriate materials for each project.
- Know the importance of materials in the design process and their influence on the aesthetics of what is designed, taking into account their life cycle and the energy resources used in their production, with the aim of achieving a more sustainable and energy-efficient world.
- Seek answers to questions about what they are like, what environmental cost they have, how they behave, how much energy they consume, what applications they have, how they age, what they transmit to us, how they are transformed, how they interact with light, how they are recycled.
- Experiment with materials to get to know them more deeply, by touching them, manipulating them and working with them.

Materials are living, dynamic elements that are constantly changing, which is why it is necessary to stay up to date with new materials and the latest trends that have appeared, which is why contact with companies is essential.

At the end of the subject, students will have a global view of all materials and will understand the responsibility they have as a designer in the use of resources that are often not unlimited.

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2. Course contents

Design responsibility in optimizing energy resources. Sustainability.

Types, characteristics and applications of materials.

Properties of materials: physical, mechanical, electrical, optical, thermal and chemical.

Behavior of materials.

Classification.

Presentation of the work and its packaging. Experimentation with materials such as plastics, paper, cardboard.

3. Skills worked on in the subject(Real Decret 633/2010)

Transversal skills		Subject	Subject
CT-02	Collect significant information, analyze it, synthesize it and manage it appropriately.	X	X
CT-08	Develop ideas and arguments in a reasoned and critical manner.	X	X

General skills		Subject	Subject
CG-04	Have a scientific view on the perception and behavior of form, matter, space, movement and color.	X	X
CG-18	Optimize the use of the resources necessary to achieve the planned objectives.	X	X

4. Learning outcomes

RA	Description of the learning outcome	Skills
RA1	Select significant cases based on certain requirements (sustainability, ergonomics, materials, etc.).	CT-02 CT-08
RA2	Demonstrates through samples knowledge of the properties of materials, as well as their relationship with the environment and the user.	CT-02 CG-04
RA3	Solve problems by applying a new way of understanding the form-function relationship, the application of materials, structures, the geometry of nature and systems.	CG-04 CG-18
RA4	Select materials based on their characteristics and purpose.	CG-04 CG-18
RA5	Experiment and verify the properties and behavior of materials.	CG-04

5. Teaching methodologies of the subject

Code	Typology	Description	Apply
MD1	Conference and/or master class	The teacher presents and transmits knowledge to the entire group of students, the student has a passive role, that of a receiver.	AF1, AF3
MD4	Tests and/or exams	Formal and structured activity to collect evidence on the degree of achievement of knowledge, skills or	AF1

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		competencies by students. This can be written, oral or practical and includes a variety of formats: questionnaires, problems, open questions, practical exercises, etc.	
MD5	Workshops and/or internships	Carrying out practical activities applied in a controlled environment, oriented towards learning through experience and/or the transfer of theoretical knowledge to real or simulated situations.	AF2
MD6	Presentations and/or defenses	Publicly presenting the results of a work, project or research in front of an audience.	AF2, AF3
MD7	Case study	Analysis of situations or problems within the specialty with the aim of reflecting, analyzing and discussing different intervention or solution proposals through examples or references.	AF2
MD8	Project work	Project or problem based on the real or professional world that needs to be solved independently or in a group.	AF2
MD9	Guided practice	The teacher presents and transmits theoretical knowledge applied to practical activities that take place in the classroom. The teacher guides, supervises and gives active feedback during the practice.	AF3
MD10	Flipped classroom	Transfer part of the theoretical learning outside the classroom, through online materials or resources prepared by the teacher, to dedicate face-to-face time to practical, participatory activities and knowledge application.	AF1, AF3
MD11	Collaborative work	Joint construction of knowledge through interaction and collaboration between students. The teacher has a guiding and dynamizing role.	AF2, AF3
MD12	Agile methodologies	Type of teamwork in which work is carried out in several short periods of time.	AF3

6. Training activities of the subject

Code	Description	Duration	Percentage
AF1	Tests or exams	Specific activities scheduled throughout the semester. The last test or exam will be no later than week 16.	40-50%
AF2	Jobs theoretical or practical	Completion scheduled throughout the semester. The final assignment will be due no later than week 14.	40-60%
AF3	Practical activities	Specific activities that will be carried out when necessary during the semester.	0-10%

7. Evaluation systems

Due to their typology and educational program, all subjects in the ESDAPC undergraduate design studies include continuous assessment as a procedure to regulate and qualify the learning achieved by students during the semester.

In the event of not achieving the level of sufficiency in the evaluation activities within the closing milestones

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set out in the subject's schedule, the activities not passed may be corrected and/or completed within the recovery procedure defined by the teaching staff in their schedule.

7.1. Continuous evaluation

General evaluation criteria

The ESDAPC sets some **general evaluation criteria** which are common to all teaching guides, without prejudice to the specific evaluation and grading criteria of each subject:

- Subject grading: A weighted average of the grades obtained in each of the training activities will be made in accordance with the percentages described in the teaching guide and classroom schedule. The subject will be passed with a grade of 5.0 (Pass). All assessment activities can be corrected and/or completed within the recovery procedure within the continuous assessment that the teaching staff defines in their classroom schedule.
- Class attendance is essential in order to guarantee that learning is progressive, flexible and allows feedback and adjustments in its achievement within the continuous assessment. For this reason, class attendance is mandatory. The teaching staff establishes the mechanisms to control it. The student who does not attend a minimum of 80% of the face-to-face hours of the subject loses the right to continuous assessment and may present for remediation outside of the continuous assessment defined in the teaching guide and classroom schedule for the subject. In cases of serious absenteeism, with attendance of less than 60% of the face-to-face hours of the subject, the student will lose the right to be evaluated and will have a grade of "Not Presented".
- The ability to organize and plan tasks is part of the learning outcomes that the student must achieve within the training process, therefore the deliverables of the evaluation activities must conform to the deadlines, the format and contents defined in the activity statement in order to be qualified. Activities submitted after the deadline, format and/or minimum content will be considered outside the continuous assessment process, will not be evaluated within it and may be resubmitted as a retake.
- In the event of a submission or exam coinciding with a force majeure situation, the student may request to submit an activity after the deadline or repeat an exam, without being considered out of continuous assessment. This submission or exam will be carried out according to the conditions and calendar determined by the teaching staff.
 - Force majeure is understood to mean: serious illness or temporary incapacity (hospitalization) of the student or a first-degree relative, coincidence with an official language level or driving license exam, inexcusable duties before the administration or death of a first- or second-degree relative. It must be requested in an argued and justified manner in the form of [generic application](#), addressed to the campus management, and must necessarily include the original with a stamp of the document proving the major cause alleged.
- The evaluation process is based on the student's personal work and presupposes the authenticity of

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the authorship and originality of the exercises carried out. Any act of copying and/or plagiarism or irregular use of Artificial Intelligence (AI) will result in the immediate and irrevocable suspension of the assessable activity, without the right to recovery.

However, and without contradicting these general criteria, each teacher may define other specific complementary conditions, which are included in this teaching guide.

These complementary conditions cannot in any case result in a penalty or limitation of the qualification of an activity, nor the loss of the right to recover an activity.

Specific evaluation criteria within continuous evaluation

According to the criteria described in the activities:

1. Counting theoretical tools(30%):

- Assimilation of theoretical content
- Recognition of theoretical issues

2. Manipulation - Strategic Application(30%):

- Identification of material samples (RA2)
- Ability to make strategic use of the application of acquired knowledge in complex tasks and decisions (RA3)
- Selection of significant cases (RA1)
- Ability to apply theory to specific examples (RA3)

3. Practical application(20%):

- Diversity of alternative proposals (RA3)
- Identification of relevant solutions (RA3)
- Ability to modify a product so that it is made of certain materials, more sustainable and/or ergonomic (RA5)

4. Argumentation and discourse(20%)

- Synthesis capacity
- Critical reasoning
- Coherent structuring of the discourse
- Use of appropriate vocabulary.
- Level of in-depth analysis
- Ability to draw conclusions

Evaluation instruments within continuous evaluation

Written/practical tests

Questionnaires

Checklists

Rubrics

Co-evaluation

Individual and/or group feedback: written or oral

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7.2. Recovery

General recovery criteria

The ESDAPC sets general recovery criteria that are common to all teaching guides, without prejudice to the specific evaluation and grading criteria of each subject:

- The ESDAPC provides for a single recovery per activity. The recovery of suspended activities will be done within the deadlines defined by the teachers in their classroom schedule within the same semester. In the event that the teachers have not established a recovery calendar, students may submit the recovery activities during the last school week of the semester.

Specific recovery criteria within continuous assessment

The same specific evaluation criteria are maintained as in continuous evaluation.

Specific recovery criteria outside of continuous assessment

- Students who do not meet the general evaluation criteria, described in point 7.1, will have to make up the activities outside of continuous evaluation.
- To opt for retake, the pending activities must be submitted during the retake period indicated by the teacher or, if not established, the retake can be done during the retake week. In addition to submitting all of the course activities, to retake the subject, the teacher may request a supplementary test and/or exercise to demonstrate that the skills and contents of the subject have been achieved. This supplementary test and/or exercise will have a weight of 30% with respect to the final grade for the course.
- This test may include the contents and skills of the three activities of the subject (AF1, AF2, AF3).
- Specific evaluation criteria for the practical test: the same specific evaluation criteria are maintained as in the continuous evaluation.

Subject recovery instruments outside of continuous assessment

Written/practical tests

Questionnaires.

Complementary exercises / extension activities.

8. Educational care within the framework of an inclusive education system

This Teaching Guide takes into account educational care within the framework of an inclusive educational system that includes two reference frames that support it:

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- MISU: Universal Measures and Supports to promote personal and social development in equity and equality.
- DUA: Universal Learning Design, which allows flexible learning situations to be created based on a design that detects and minimizes the barriers of the context, from the beginning, and that considers variability.

However, to ensure freedom of thought and opportunities in relation to the gender perspective, a co-educational dynamic is carried out that avoids the predisposition of differential treatment, role attributions or assumptions of abilities determined by gender.

The MISU and DUA will be applied to all ESDAPC students. Those students in need of additional measures and support will be included through an Individualized Support Plan.

9. Copying, plagiarism, and academic honesty

From a legal point of view, plagiarism is an infringement of copyright.

The ESDAPC NOFC describes in section 5.4 irregular conduct in the evaluation procedure, which includes copying or plagiarism in any academic activity.

10. Use of Artificial Intelligence (AI)

The ESDAPC recognizes the value of Artificial Intelligence (AI) in the educational field, while highlighting the risks it entails if it is not used ethically, critically and responsibly. The use of AI in the teaching and evaluation context is governed by the principles, criteria and recommendations established in the ESDAPC Guide to the Ethical and Responsible Use of Artificial Intelligence, which constitutes the institutional reference document in this matter.

In this sense, in each assessment activity, students will be informed about the AI tools and resources that can be used and under what conditions, recommending their use as an assistance tool during the research, analysis or conceptual exploration process, but not as a replacement for their own work or professional judgment.

For their part, students undertake to follow the instructions of the ESDAPC when carrying out the assessment activities, as well as the criteria included in the Guide for the Ethical and Responsible Use of AI. Within this framework, students must transparently cite the AI tools used and explicitly identify texts, images or other content generated with AI systems, which may not be presented as their own production.

Misuse of Artificial Intelligence can seriously affect the evaluation of assessment activities. In case of doubt, it is recommended that students consult the teacher responsible for the subject before submitting.

The specifics of the use of Artificial Intelligence in each subject—including the authorized tools, conditions of use and associated evaluation criteria— will be defined in the classroom programming, where teachers will contextualize the Teaching Guide and the Guide for the Ethical and Responsible Use of AI based on the objectives, skills and methodologies of the subject.

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In all cases, students are responsible for any possible errors, omissions or biases that may be generated by the Artificial Intelligence used in the work process.

11. Sources of information and teaching resources

Basic bibliography

Peña, J. (2009). Material Selection in the Design Process. Barcelona: CPG Editions
Shackelford, James F. (2010). Introduction to Materials Science. Madrid: Pearson Editions. Sastre, Ramon (2004). Properties of Materials and Construction Elements. Barcelona: UPC Editions

Reference bibliography and other resources

Bonet, Vicenç (1995). Introduction to materials science. Barcelona: Edicions UPC
Viñolas, Joaquim (2005). Ecological Design. Barcelona: Ed. Blume Campi, Isabel (2007). The idea and the matter. Barcelona: Ed. Gustavo Gili
Brown, Rachael and Farrelly, Lorraine (2012). Materials in Interior Design. Barcelona: Blume. Inmes, Malcolm (2012). Lighting in Interior Design. Barcelona: Blume.
Deplazes, Andrea (2015). Building Architecture: From Raw Material to Building. Barcelona: Ed. Gustavo Gili.
Kula, Daniel, et al. (2009). Materiology. Basel: Ed. Frame i Birkhäuser
Wilhide, Elizabeth (2005). Materials. A guide to interior design. Barcelona: Blume. Abellan, Miquel (2014). Ephemeral. Exhibitions, advertisements. Barcelona: Monsa. Asunción, Josep (2002). Paper. Badalona: Parramón.
Baugh, Gail (2016). Tissue Manual. A Guide to Properties. Badalona: Parramón Publishing

Audiovisuals

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12. Training activity sheets

ACTIVITY 1	Duration: Activities are one-time (one-class duration) that will be carried out in a scheduled manner during the semester. The last test or exam will be no later than week 16.	Weighting: 40 - 50%
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Description of the activity

This activity can be divided into several **sub-activities** (it is recommended that there are at least 2), taking into account that the sum of the weighting of the sub-activities must coincide with the overall weighting of this activity.

Realization of **proves** the **exams** (short answer or test type) to test the student's knowledge of the **typologies**, **THE properties** and of the **production and transformation systems** of the materials studied in the subject, as well as for the correct **sample identification** of these materials.

Contents

Properties of materials: physical, mechanical, electrical, optical, thermal and chemical.

Behavior of materials.

Types, characteristics and applications of materials.

Classification.

Skills

CT-02 Collect significant information, analyze it, synthesize it and manage it appropriately.

CG-04 Have a scientific view on the perception and behavior of form, matter, space, movement and color.

Applied teaching methodologies

MD1 **Conference and/or master class:** The teacher presents and transmits knowledge to the entire group of students, the student has a passive role, that of a receiver.

MD4 **Tests and/or exams:** Formal and structured activity to collect evidence on the degree of achievement of knowledge, skills or competencies by students. This can be written, oral or practical and includes a variety of formats: questionnaires, problems, open questions, practical exercises, etc.

MD10 **Flipped classroom:** To skip part of the theoretical learning outside the classroom, through online materials or resources prepared by the teacher, to dedicate face-to-face time to practical, participatory activities and knowledge application.

Learning outcomes

RA2 Demonstrates through samples knowledge of the properties of materials, as well as their relationship with the environment and the user.

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Continuous evaluation

Specific evaluation criteria within continuous evaluation

- Assimilation of content
 - Strategic application of knowledge
- Identification of material samples.

Evaluation instruments within continuous evaluation

Written/practical tests
Questionnaires

Specific recovery criteria within continuous assessment

According to the specific recovery criteria within the continuous assessment described in the subject's teaching guide.

Recovery outside of continuous assessment

Specific recovery criteria outside of continuous assessment

According to the specific recovery criteria outside of continuous assessment described in the subject teaching guide.

Recovery instruments outside of continuous assessment

Written/practical tests
Questionnaires.

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ACTIVITY 2	Duration: Scheduled completion throughout the semester. The last assignment is due no later than week 14.	Weighting: 40/60% (variable, at the teacher's discretion)
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Description of the activity

This activity can be divided into several **sub-activities**, taking into account that the sum of the weighting of the sub-activities must coincide with the overall weighting of this activity.

Carrying out one or more **theoretical or practical work** where the student will exercise the knowledge learned, such as:

- Work of **analysis of one or more objects**, studying some of the properties of the material it is made of (e.g. density) and the production and transformation systems that have been used in its manufacture (work preferably in groups of 2 or 3 people).
- Work of **experimentation with materials**: creation of an object based on certain requirements based on materials, processes and use, interrelating formal and symbolic languages with specific functionality.
- Work of **sample collection** and information and/or classification of materials based on visits to industrialists or companies, the collection and manipulation of samples and experimentation.

Contents

Design responsibility in optimizing energy resources. Sustainability.

Types, characteristics and applications of materials.

Properties of materials: physical, mechanical, electrical, optical, thermal and chemical.

Presentation of the work and its packaging. Experimentation with materials such as plastics, paper, cardboard.

Skills

CT-02	Collect significant information, analyze it, synthesize it and manage it appropriately.
CT-08	Develop ideas and arguments in a reasoned and critical manner.
CG-18	Optimize the use of the resources necessary to achieve the planned objectives.

Applied teaching methodologies

MD5	Workshops and/or practices: Carrying out practical activities applied in a controlled environment, oriented towards learning through experience and/or the transfer of theoretical knowledge to real or simulated situations.
MD6	Presentations and/or defenses: Publicly presenting the results of a work, project or research in front of an audience.
MD7	Case study: Analysis of situations or problems within the specialty with the aim of reflecting, analyzing and discussing different intervention or solution proposals through examples or references.
MD8	Project work: Project or problem based on the real or professional world that needs to be solved independently or in a group.
MD11	Collaborative work: Joint construction of knowledge through interaction and collaboration between students.

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The teacher has a guiding and dynamizing role.

Learning outcomes

RA1	Select significant cases based on certain requirements (sustainability, ergonomics, materials, etc.).
RA2	Demonstrates through samples knowledge of the properties of materials, as well as their relationship with the environment and the user.
RA3	Solve problems by applying a new way of understanding the form-function relationship, the application of materials, structures, the geometry of nature and systems.
RA4	Select materials based on their characteristics and purpose.
RA5	Experiment and verify the properties and behavior of materials.

Continuous evaluation

Specific evaluation criteria within continuous evaluation

1. Theo Contents rics (30%):

- Assimilation of theoretical content
- Recognition of theoretical issues

2. Manipulation - Strategic Application (30%):

- Identification of material samples (RA2)
- Ability to make strategic use of the application of acquired knowledge in complex tasks and decisions (RA3)
- Selection of significant cases (RA1)
- Ability to apply theory to specific examples (RA3)

3. Practical application (20%):

- Diversity of alternative proposals (RA3)
- Identification of relevant solutions (RA3)
- Ability to modify a product so that it is made of certain materials, more sustainable and/or ergonomic (RA5)

4. Argumentation and discourse (20%)

- Synthesis capacity
- Critical reasoning
- Coherent structuring of the discourse
- Use of appropriate vocabulary.
- Level of in-depth analysis
- Ability to draw conclusions

Evaluation instruments within continuous evaluation

Checklists, Rubrics, Peer Assessment, Individual and/or Group Feedback: Written or Oral

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Specific recovery criteria within continuous assessment

According to the specific recovery criteria within the continuous assessment described in the subject's teaching guide.

Recovery outside of continuous assessment

Specific recovery criteria outside of continuous assessment

According to the specific recovery criteria outside of continuous assessment described in the subject teaching guide.

Recovery instruments outside of continuous assessment

Checklists
Rubrics
Written/practical tests
Questionnaires

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ACTIVITY 3	Duration: One-time activities (one or two classes long) that will be carried out when necessary during the semester.	Weighting: 0-10% (variable, at the teacher's discretion)
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Description of the activity

This activity can be divided into several **sub-activities**, taking into account that the sum of the weighting of the sub-activities must coincide with the overall weighting of this activity.

Making of **practical activities** punctual with **reinforcement** of the content received, such as:

- Materials recognition session.
- Experimental practice of the properties of a specific material.
- Analytical practice of the properties of materials or design products.
- Visits to materials companies, material libraries, laboratories, exhibitions...

Contents

Design responsibility in optimizing energy resources. Sustainability.

Types, characteristics and applications of materials.

Properties of materials: physical, mechanical, electrical, optical, thermal and chemical.

Behavior of materials.

Skills

CT-02	Collect significant information, analyze it, synthesize it and manage it appropriately.
CG-04	Have a scientific view on the perception and behavior of form, matter, space, movement and color.

Applied teaching methodologies

MD1	Conference and/or master class: The teacher presents and transmits knowledge to the entire group of students, the student has a passive role, that of a receiver.
MD6	Presentations and/or defenses: Publicly presenting the results of a work, project or research in front of an audience.
MD9	Guided practice: The teacher presents and transmits theoretical knowledge applied to practical activities that take place in the classroom. The teacher guides, supervises and gives active feedback during the practice.
MD10	Flipped classroom: Transfer part of the theoretical learning outside the classroom, through online materials or resources prepared by the teacher, to dedicate face-to-face time to practical, participatory activities and knowledge application.
MD11	Collaborative work: Joint construction of knowledge through interaction and collaboration between students. The teacher has a guiding and dynamizing role.
MD12	Agile methodologies: Type of teamwork in which work is carried out in several short periods of time.

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Learning outcomes

RA2	Demonstrates through samples knowledge of the properties of materials, as well as their relationship with the environment and the user.
RA4	Select materials based on their characteristics and purpose.
RA5	Experiment and verify the properties and behavior of materials.

Continuous evaluation

Specific evaluation criteria within continuous evaluation

- Selection of significant cases
- Ability to gather appropriate information
- Level of in-depth analysis
- Ability to draw conclusions
- Participation and interest in the activity.

Evaluation instruments within continuous evaluation

Verification of participation in the practice by demonstrating interest in the activity by following the instructions given.

Specific recovery criteria within continuous assessment

According to the specific recovery criteria within the continuous assessment described in the subject's teaching guide.

Recovery outside of continuous assessment

Specific recovery criteria outside of continuous assessment

- Assimilation of content
- Problem solving
- Identification of material samples.

Recovery instruments outside of continuous assessment

Checklists
Rubrics
Written/practical tests
Questionnaires.