Course guide
295025 - SE - Selection and Ecodesign

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: JOSE ANTONIO BENITO PARAMO

Others: Primer quadrimestre:
JOSE ANTONIO BENITO PARAMO - Grup: M11

PRIOR SKILLS

Knowledge of the main characteristics of the different materials families, as well as their classification. Knowledge of the main mechanical properties, thermal properties, etc... important in mechanical design.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEI-16. Understand the basic applications of environmental technologies and sustainability principles.
CEMT-22. Knowledge and application of materials technology in the production, transformation, processing, selection, control, maintenance, recycling and storage of all types of materials.

Transversal:
02 SCS N1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world¿s situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.

TEACHING METHODOLOGY

The course will be based on lectures, resolution of problems and sessions in the computer room to work with the software CES EduPack

LEARNING OBJECTIVES OF THE SUBJECT

The student will learn how to translate the constraints of an engineering component to mathematical relationships of the properties (mechanical, thermal, optical, etc...) of the material. Moreover, the student will get familiar with the Ashby methodology for materials seleccion and the use of the program CES EduPack. Ecodesign criteria will be introduced.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	30.00
Hours small group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Introduction

Description:
In the introductory session the importance of materials in the dessign processes will be explained and some examples of the influence of materials developments on the progress of society will be analyzed.

Full-or-part-time: 1h 30m
Theory classes: 1h 30m

The design process

Description:
The design process. Types of design. Design tools and materials data. Case study.

Full-or-part-time: 2h
Theory classes: 1h
Self study : 1h

Engineering materials and their properties

Description:
The classification of the materials will be reviewed and related to the classification applied in the software CES EduPack, with special attention to the differences between materials of different families or within a specific family. The important properties (mechanical, thermal, electrical, optical and durability) which appear in the datasheet of each material in the Level 2 of CES EduPack will also be checked.

Full-or-part-time: 4h 30m
Theory classes: 3h
Practical classes: 1h 30m

Materials properties charts

Description:
Materials properties charts. Exploring the relationship between different properties.

Full-or-part-time: 12h 30m
Theory classes: 1h 30m
Practical classes: 1h 30m
Laboratory classes: 2h
Self study : 7h 30m

Materials Selection

Description:
Definition of the problem. Selection process. Material indices. Attribute limits.

Full-or-part-time: 41h 30m
Theory classes: 6h
Practical classes: 4h 30m
Laboratory classes: 6h
Self study : 25h

Shape factor

Description:
Efficient shapes. Introducing the concept of efficient shapes in the materials selection process. Examples.

Full-or-part-time: 13h 30m
Theory classes: 1h 30m
Practical classes: 2h
Laboratory classes: 2h
Self study : 8h

Ecodessing

Description:
Life cycle assessment and EcoAudit. Eco-informed materials selection. Examples.

Full-or-part-time: 29h
Theory classes: 6h
Practical classes: 3h
Laboratory classes: 4h
Self study : 16h

Monographic work

Description:
The students will have to select an engineering component and propose the best materials for the given application, following the methology explained during the course.

Full-or-part-time: 31h
Practical classes: 11h
Self study : 20h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

30% final exam + 30% midterm exam + 20 % Practical Work + 20% Monographic work

THERE IS NOT A RE-EVALUATION EXAM

BIBLIOGRAPHY

Basic:
- Ashby, M. F. Materials selection in mechanical design. 4th ed. Amsterdam [etc.]: Elsevier : Butterworth-Heinemann, 2005. ISBN 9781856176637.
- Ashby, M. F. Materials and the environment : eco-informed material choice. 2nd ed. Amsterdam [etc.]: Elsevier/Butterworth-Heinemann, cop. 2013. ISBN 9780123859716.
- Ashby, M. F.; Shercliff, Hugh; Cebon, David. Materials : engineering, science, processing and design. 3rd ed. Oxford: Butterworth-Heinemann, 2014. ISBN 9780080977737.