Course guide
295919 - ISM - Introduction to Sustainable Materials

Last modified: 02/10/2025

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

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: TOBIAS MARTIN ABT

Others: Primer quadrimestre:
TOBIAS MARTIN ABT - Grup: M1
NICOLAS CANDAU - Grup: M1
SEYED MAHMOOD FATEMI - Grup: M1
JAVIER GÓMEZ MONTERDE - Grup: M1
NOEL LEÓN ALBITER - Grup: M1
LEANDRO ISIDRO MARTÍNEZ OROZCO - Grup: M1
ROSE MARY RITA MICHELL URIBE - Grup: M1

PRIOR SKILLS

Scientific and technical education in materials science and engineering. Specifically, in the production, the transformation, the processing, the recycling and the storage of all type of materials which consider sustainability concepts.

TEACHING METHODOLOGY

MD.1 - Participative lecture: Traditional lecture with master classes (practical resources will be available on the UPC intranet Atenea)
MD.2 - Project-based learning: Active learning in small groups with real case projects.
MD.3 - Case studies:
MD.5 - Cooperative group work: Collaborative learning with teamwork and teamwork presentation

PM5: Skills evaluation: It should be noted that this course is mainly based on self-learning (project based learning methodology), with a close tutoring accorded by the professor.

LEARNING OBJECTIVES OF THE SUBJECT

- Raise student’s awareness of reduce, reuse and recycle materials
- Develop student knowledge of circular economy
- Enhancement of analytical and presentational skills
- Improvement of team working abilities and interpersonal communications
- Improvement of decision-making attitude and personal initiatives to resolve real-life scientific problems

STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	50.00
Hours large group	30,0	50.00

Total learning time: 60 h

CONTENTS

Introduction to Sustainability and Materials

Description:
• What is sustainability?
• The role of materials in global environmental issues.
• Key concepts: Renewable vs. non-renewable, lifecycle analysis, and eco-design.

Full-or-part-time: 13h
Theory classes: 12h
Self study : 1h

Biomaterials

Description:
• Types of biodegradable materials (e.g., bioplastics, organic composites).
• Advantages and limitations of biodegradable materials in different industries.
• Challenges in biodegradability and industrial composting.
• Recycled materials (e.g., recycled metals, glass, and plastics).
• Benefits and challenges of using renewable and recycled materials.

Full-or-part-time: 9h
Theory classes: 8h
Self study : 1h

Recycling of polymeric materials

Description:
• Recycling strategies of polymeric materials
• Benefits and challenges of using recycled polymeric materials.

Full-or-part-time: 17h
Theory classes: 8h
Laboratory classes: 8h
Self study : 1h

Recycling of precious metals and rare earths

Description:
• Recycling strategies of precious metals and rare earths
• Benefits and challenges of using recycled precious metals and rare earths

Full-or-part-time: 8h
Theory classes: 8h

Sustainable materials in automotive applications

Description:
• Sustainable materials in automotive applications
• Benefits and challenges of using sustainable materials in automotive applications

Full-or-part-time: 5h
Theory classes: 4h
Self study : 1h

Recycling of composite materials

Description:
• Recycling strategies of composite materials
• Benefits and challenges of using recycled composite materials and reinforcements

Full-or-part-time: 5h
Theory classes: 4h
Self study : 1h

GRADING SYSTEM

50 % End-of-course evaluation* and 50 % continuous assessment**
* End-of-course evaluation referred to as a written test
**Continuous assessment included collaborative work and oral presentations (25%), and delivery of project reports (25%).

BIBLIOGRAPHY

Basic:
- Ashby, M. F.; Ferrer Balas, Dídac; Segalàs, Jordi. Materials and sustainable development [on line]. Oxford: Waltham, MA, 2015 [Consultation: 14/07/2025]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780081001769/materials-and-sustainable-development. ISBN 9780081001769.