

Développement Durable

Introduction to eco-design and life cycle assessment of materials

IDENTIFICATION

CODE : SGM-3-S2-ECOACV
ECTS : 2.0

HOURS

Lectures : 10.0 h
Seminars : 12.0 h
Laboratory : 0.0 h
Project : 0.0 h
Teacher-student
contact : 22.0 h
Personal work : 12.0 h
Total : 34.0 h

ASSESSMENT METHOD

Individual assessment by MCQ (2
MCQs of 15 min)
Collective assessment of the case
study / LCA: production of a
summary sheet or poster and oral
presentation

TEACHING AIDS

Syllabus (lecture slides)
Possible thematic documents for in-
depth studies
Softwares [CES Edupack, Simapro]

TEACHING LANGUAGE

French

CONTACT

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AIMS

The objectives at the end of the course are :

- to understand the challenges of eco-design in the field of materials: regulatory, economic, industrial and societal.
- to provide an initial understanding of the methods and tools involved, by teaching how to take environmental aspects into account in specifications
- to learn how to quantify the impacts of the choices made using LCA
- to develop a critical approach in the analysis of LCA results

This EC SGM-3-S2-ECOACV comes under the Teaching Unit SGM-3-UE-SDI-S2 and contributes to :

School skills in engineering sciences :

- A1-Analyze a real or virtual system [or problem] Level 2
- A2-Exploit a model of a real or virtual system Level 2
- A4-Design a system to meet specifications Level 2
- A6-Communicate a scientific analysis or approach, using situations adapted to their specificity Level 2

Specialty-specific school skills

- C1-CKnow and be able to establish the relationships between structures and properties of materials Level 1
- C2-Identify and apply methods of materials processing Level 2
- C3-Put materials into practice Level 1
- C5-Innovate and research materials Level 1

By mobilizing the following skills:

- B2-Work, learn and develop independently
- B3-Interact with others, work as part of a team
- B4-Create, innovate, undertake
- B5-Act responsibly in a complex world

CONTENT

- Issues of eco-design of materials [6h CM]:
General context and industrial vision.
Notion of specifications and consideration of environmental issues.
Scientific approach focused on materials.
- In-depth study of specific topics [6h TD] :
Regulations, REACH directives
Choice of materials [CES Edupack]: multi-criteria approach
- LCA of materials [4h CM]:
Introduction to the manufacture of materials
Introduction to the Eco Invent database
Principles of LCA applied to materials
- Case study [6h TD]
Carrying out an LCA using professional software

BIBLIOGRAPHY

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[1] ISO, I. [2006]. 14040. Environmental management, Life Cycle Assessment, Principles And Framework.

[2] ISO, I. [2006]. 14044: Environmental Management, Life Cycle Assessment, Requirements and Guidelines.

[3] Role and responsibilities of analysts in communicating Life Cycle Assessment results to decision makers: a case study in building sector. Proceedings of the SETAC Europe Annual Meeting 2014, Basel, Marion Sie, Jérôme Payet, 2014

[4] ¿Recyclable and bio-based materials open up new prospects for polymers : Scientific and social aspects¿ dans le livre « Environmental impact of polymers ». Valérie Massardier, Ed. Th Hamaide, R. Deterre, JF Feller, Wiley, DOI: 10.1002/9781118827116.ch12 Lavoisier-Hermès, 2014.

[5] A review to guide eco-design of reactive polymer based materials, Emma Delamarche, Valérie Massardier, Remy Bayard, and Edson Dos, dans Reactive and Functional Polymers Volume Three, Advanced materials, Editors: Gutierrez, Tomy [Ed.], Octobre 2020. <https://www.springer.com/gp/book/9783030504564#aboutBook>

PRE-REQUISITE

Basic knowledge in materials
Basic knowledge in design

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