

Course guide

480USE011 - 480USE011 - Tools for Sustainability in Production Processes

Last modified: 17/06/2026

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 724 - MMT - Department of Heat Engines.
 713 - EQ - Department of Chemical Engineering.
 729 - MF - Department of Fluid Mechanics.

Degree: MASTER'S DEGREE IN SUSTAINABILITY AND STRATEGIES FOR A JUST GLOBAL TRANSITION (Syllabus 2026). (Optional subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: Garrido Soriano, Nuria

Others: Segalas Coral, Jordi
 Álvarez Del Castillo, María Dolores
 Molins Duran, Gemma
 Cervantes Torre-Marin, Gemma
 Dawid, Sacha

PRIOR SKILLS

Students are recommended to have basic knowledge of sustainability, industrial production processes and data analysis. No specific prior knowledge of Life Cycle Assessment is required

TEACHING METHODOLOGY

MD.1.- Active expository teaching (participatory lecture).
 MD.2.- Flipped Classroom.
 MD.4.- Case studies.
 MD.7.- Project-based learning.

LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of the course, students will be able to:

1. Recognize the impacts of economic and productive activities on the environment and society, considering sustainability approaches (K01.2).
2. Implement methodologies for the analysis and sustainable management of natural resources (S06.1).
3. Evaluate the environmental and social impacts of productive processes and business models through quantitative and qualitative tools (RAT_UPC_1.1).

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	63.95
Hours medium group	11,4	9.11
Hours large group	22,7	18.15

Type	Hours	Percentage
Hours small group	11,0	8.79

Total learning time: 125.1 h

CONTENTS

Topic 1. Conceptual Framework and Sustainability Indicators

Description:

Introduction to the fundamental concepts of sustainability measurement. Distinction between flow indicators (resource management) and impact indicators (environmental consequences). Development of Circular Economy and Sustainability indicator systems, including functions, aspects, criteria, objectives, themes, indicators, units of measurement and formulas.

Particular emphasis is placed on initial data collection for industrial projects.

- * Sustainability metrics: from physical units to impact categories.
- * Uncertainty management: use of secondary data sources and proxy data for preliminary assessments.

Specific objectives:

1. Identify the fundamental concepts of sustainability and circular economy applicable to production processes.
2. Design an indicator system to assess the environmental and sustainability performance of a product or process.

Related activities:

AV1.1. Project – Phase 1: Selection of the study object (product or process) and definition of the assessment scope. Data collection.

AV1.2. Development of an indicator system for the selected study object

Full-or-part-time: 16h

Theory classes: 6h

Self study : 10h

Topic 2. Environmental Life Cycle Assessment (LCA)

Description:

In-depth study of Life Cycle Assessment (LCA) according to ISO 14040/44 standards. Quantification of environmental impacts using professional software tools and interpretation of results.

- * LCA phases: goal and scope definition, and functional unit.
- * Life Cycle Inventory (LCI) and Life Cycle Impact Assessment (LCIA).
- * Use of OpenLCA and open databases.
- * Interpretation of results.

Specific objectives:

1. Apply the Life Cycle Assessment methodology according to ISO 14040/44 standards.
2. Interpret LCA results to identify major environmental impacts and improvement hotspots.

Related activities:

AV2.1 (Laboratory): Practical OpenLCA session to model the project's baseline scenario.

AV2.2. Project – Phase 2: Modelling of the current state of the selected product or service using the LCA methodology and OpenLCA software, including identification of environmental hotspots. Presentation and defence of the project report

Full-or-part-time: 37h

Theory classes: 12h

Self study : 25h

Topic 3. Social Life Cycle Assessment (S-LCA)

Description:

Assessment of the social aspects of products throughout the supply chain.

- * Social Life Cycle Assessment (sLCA) methodology.
- * Stakeholder-based impact categories.
- * Identification of social hotspots.

Specific objectives:

1. Recognize the social impacts associated with the different stages of a product life cycle.
2. Assess social risks and identify critical hotspots within supply chains.

Related activities:

AV3.1. Project – Phase 3: Identification of social risks associated with the product under study using risk matrices. Presentation and defence of the project report

Full-or-part-time: 18h

Theory classes: 6h

Self study : 12h

Topic 4. Life Cycle Costing (LCC)

Description:

Life Cycle Costing (LCC) methodology and integration of environmental and economic costs into decision-making.

- * Difference between traditional accounting and LCC.
- * Acquisition, operation, maintenance and end-of-life costs.
- * Internalization of environmental costs.

Specific objectives:

1. Analyse the costs associated with all stages of a product or service life cycle.
2. Integrate economic and environmental criteria into decision-making through Life Cycle Costing.

Related activities:

AV4.1. Project – Phase 4: Identification of the life cycle costs of the product under study. Presentation and defence of the project report.

Full-or-part-time: 18h

Theory classes: 6h

Self study : 12h

Topic 5. Ecodesign Tools and Environmental Communication

Description:

Application of qualitative and semi-quantitative eco design tools and environmental product communication.

- * Ecodesign wheel.
- * Ecodesign checklist and MET matrix.
- * Ecodesign strategies.
- * Environmental labelling and Environmental Product Declarations (EPD)

Specific objectives:

1. Apply eco design tools to develop environmentally improved product and service alternatives.
2. Select appropriate environmental communication strategies to communicate product environmental performance

Related activities:

AV5.1 (Classroom): Workshop on generating redesign alternatives for the project.

Full-or-part-time: 18h

Theory classes: 6h

Self study : 12h

Topic 6. Tools for Developing Sustainable Business Models

Description:

Design of sustainable value propositions using the Triple Layered Business Model Canvas and introduction to the functional economy and servitization.

- Design of sustainable value propositions
- The Triple Layered Business Model Canvas (TLBMC): economic, environmental and social layers
- Functional Economy: from Ownership to Service Provision

Specific objectives:

1. Develop sustainable value propositions using business model innovation tools.
2. Analyse servitization and functional economy opportunities to enhance business sustainability

Related activities:

AV6.1 (Classroom): Product servitization workshop

Full-or-part-time: 18h

Theory classes: 6h

Self study : 12h

GRADING SYSTEM

Activities (AV1.1, AV1.2, AV2.1, AV5.1 and AV6.1) (AA): 20%

Project Report (Phase 1, 2, 3) (MP): 50%

Final presentation and defense (PDF): 30%

Final grade: $0.20 \cdot AA + 0.50 \cdot MP + 0.30 \cdot PF$

BIBLIOGRAPHY

Basic:

- § Hauschild, M. Z., Rosenbaum, R. K., & Olsen, S. I. Life Cycle Assessment: Theory and Practice. Springer, 2018.
- § Vezzoli, C., & Manzini, E. Design for Environmental Sustainability. Springer Science & Business Media., 2008.
- § Osterwalder, A., & Pigneur, Y.. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. Wiley, 2010.



Complementary:

- Verbeek, P. P. Moralizing Technology: Understanding and Designing the Morality of Things. University of Chicago Press, 2011.
- Artificial Intelligence and the Circular Economy: Accelerating the transition. Ellen MacArthur Foundation, 2019.

RESOURCES

Other resources:

Training material in ATENEA