Module Specification:

M08 Life Cycle Thinking and Sustainable Management

Within the Erasmus+ KA2 Capacity Building Project (CBHE)

WORK4CE – Cross-domain competences for healthy and safe work in the 21st century

619034-EPP-1-2020-1-UA-EPPKA2-CBHE-JP

Authors: Maider Iturrondobeitia (UPV/EHU), Erlantz Lizundia (UPV/EHU), Carolina Cruz Villazón (UPV/EHU)

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1 Summary

This module covers Life Cycle Thinking and Sustainable Management, emphasizing sustainability in product and process development. Key topics include the Triple Bottom Line, Life Cycle Analysis (LCA), and Ecodesign. Students will learn to assess environmental impacts, understand Ecodesign regulations, and explore circular economy practices such as reuse and recycling. The module fosters collaboration, critical evaluation, and innovation, preparing students to design sustainable products and processes and meet labour market demands.

Overall Learning Outcome: At the end of this module, the student will be able to recognize the importance of sustainability and the circular economy, apply tools like Ecodesign and Life Cycle Thinking (LCT), collaborate to design sustainable products and processes, and evaluate the integration of sustainability principles in design. This module emphasizes a holistic approach to sustainability, empowering students to innovate and drive sustainable practices in their fields.

Target Group Analysis:

- **Master Level Student:** Bachelor's degree holders in IT or engineering, currently pursuing a master's degree, needing structured learning support to prepare for advanced roles in engineering or design.
- **Lifelong Learning Student:** Professionals with a bachelor's degree in IT or engineering, requiring flexible learning schedules and motivation to balance education with work and personal commitments, aiming to advance in their current or new organizations.

Competences & Learning Outcomes:

	Knowledge	Skills	Competence
Level 7 (***) The learning outcomes relevant to Level 7 are	• Student become familiar with basic concept of Sustainability. • The student defines the concept of Ecodesign and become aware of the environmental economic and social and is aware of the environmental, economic and social implications of product design. • The student lists the advantages of integrating environmental criteria into the product development process. • The student knows and understands the different regulations and technical specifications for Ecodesign within an European framework. • The student understands the origin and need of Life Cycle thinking.	• Define or select proper a tool to assess the sustainability of a project. • Tailor or developing the Sustainability Assessment model. • Apply the Sustainability models to projects. • The student applies the Ecodesign methodology and manages the available tools for Ecodesign. • The student positions Ecodesign within the business organization in the framework of the product development process. • The student reports the current environmental problems associated with products and services. • The student defines the life cycle concept and identify the phases of the life cycle of a product. • The student describes the fundamentals and regulations of the Life Cycle Analysis. • The student applies evaluation methodologies and software tools for product life cycle analysis.	• The student evaluates the life cycle analysis developed by others.

Selection of Content: The course content is outlined as follows:

- What is Sustainability?
- How can we assess the impact of a product in more detail: LCA
- Minimizing the impact of a new product: Ecodesign
- Towards a circular economy.

Activities and Teaching/Learning Methods: The module is designed as a tutored online version and includes:

- Participation of students in online live stream lectures.
- Individual study of available materials.
- Development of individual and team assignments.

Teaching Materials/Literature/Media/Technical Requirements/Lab Equipment:

- Materials for student use will be available in the online supporting tool.
- Students are expected to have online connectivity to search for scientific literature.
- Additionally, students are required to have videoconferencing tools (webcam, audio).
- Recommended literature is in Annex I.

Tailoring & Educational Tracks (Practical, Entrepreneurial, Scientific):

- **Practical Focus:** Engineers and project managers need tools to address new challenges. Among them are LCA and Ecodesign, which will be studied and applied. In this module, both tools will be presented and embedded into the circular economy design-production-recovery process.
- **Scientific Focus:** Literature review and analysis. Deductive research based on the literature. Scientific reflection and discussion in teams.

Competence Assessment: Competence assessment is composed of:

- Individual assignment
- Team assignment
- Peer review
- Written exam

Curricula Integration: This module is targeted to be included in curriculum of Master in Project Management.

Quality Evaluation: The module will undergo pilot teaching and will be evaluated by students, professors, and IT/media specialists to gather feedback for improvement. This iteration will continue for 3 years across different universities, with a publishable release produced in each iteration.

Change History & Ownership:

Product Owner: Maider Iturrondobeitia (UPV/EHU)

Team Members: Dmytro Plynokos (NU-ZP), Jan Ivens (KU Leuven), Yevgenia Boiko (KNUCA), Khanlar Ganiyev (AzUAC), Maider Iturrondobeitia (UPV/EHU), Erlantz Lizundia (UPV/EHU), Carolina Cruz (UPV/EHU)

Revision	Reviewer	Date of Release	Remarks
1	Jose Ramon Otegi (UPV/EHU)	20 May 2021	• First Revision of document regarding developers of Open Cop prepared for review of project quality board. • This revision describes the basic parts and will be improved in further iterations.
2	Abouzar Daneshpajouh (UPV/EHU)	30 Mar 2023	
3	Maider Iturrondobeitia (UPV/EHU)	19 Sep 2023	
4	Carolina Cruz Villazón (UPV/EHU)	25 Jul 2024	• Put the content of Confluence in the established format. • Complete the missing sections. • Make the corrections suggested by the reviewer (Corinna). • Correct grammatical errors.

Table of Content

2 Introduction to the module

In 2015, the United Nations adopted the 2030 Agenda for Sustainable Development. It is a declaration and a plan of action for people, planet and prosperity. The agenda identifies 17 Sustainable Development Goals (SDGs) and 169 targets. It is a plan to improve life in the planet, and it is to be developed before 2030. This is an indicator of the importance that people and planet have for all of us.

For engineers and project managers, these SDGs serve as a guide for all projects. The consortium running the Work4ce project (Cross-domain Competences for Healthy and Safe Work in the 21st Century) has developed several educational modules addressing issues that impact workplace performance and health. This module provides a comprehensive perspective on the effects of sustainability on all stakeholders, including the environment.

The module begins with an introduction of the reasons for discussing sustainability. Climate change and material scarcity are some of the problems already affecting the economy and well-being. The design phase of new products and processes is affected by material scarcity - current and foreseen - and should also consider the impact that those products will have on climate change. Furthermore, the design phase should not be considered the starting phase of a lineal process, but as an entry point for a circular one. Cradle to Grave linear paradigm has already been converted to a circular Cradle to Cradle one. In March 2020 the European Union adopted the Circular Economy Action Plan; another institutional effort to create growth while reducing the pressure on resources.

Engineers and project managers need tools to tackle these new challenges. LCA and Ecodesign are particularly valuable in this context. This module will present and integrate these tools into the circular economy's design-production-recovery process.

The module is designed for autonomous students, who will develop knowledge collaboratively through online materials, teacher guidance, and peer collaboration.

3 Module Description

3.1 Overall Learning Outcomes

This chapter summarizes the main learning outcomes and learning goals of the module. Learning outcomes are defined as statements of what a learner knows, understands and is able to do upon completion of a learning process.

At the end of this module, the student will be able to:

- Recognize the importance of sustainability and the circular economy in the development of products and processes.
- Apply tools and techniques (Ecodesign, LCT) to design products and processes, considering the Triple Bottom Line.
- Combine their knowledge, skills, and competencies with those of others to design sustainable processes and products.
- Evaluate the work of others in incorporating sustainability principles into product and process design.

In the context of education and professional development, understanding the core concepts of knowledge, skills, and competence is essential. These elements form the foundation of the European Qualifications Framework (EQF), which standardizes qualifications across Europe, ensuring clarity and consistency. The following knowledge, skills, and competences are expected to be delivered to students:

Knowledge

- Students become familiar with the basic concepts of sustainability.
- Students define the concept of Ecodesign and understand its environmental, economic, and social implications.
- Students list the advantages of integrating environmental criteria into the product development process.
- Students know and understand the different regulations and technical specifications for Ecodesign within a European framework.
- Students understand the origin and need for LCT.

Skills

- Define or select appropriate tools to assess the sustainability of a project.
- Tailor or develop Sustainability Assessment models.
- Apply Sustainability models to projects.
- Apply the Ecodesign methodology and manage available tools for Ecodesign.

- Position Ecodesign within the business organization in the framework of the product development process.
- Report on current environmental problems associated with products and services.
- Define the life cycle concept and identify the phases of a product's life cycle.
- Describe the fundamentals and regulations of LCA.
- Apply evaluation methodologies and software tools for product LCA.

Competence: Evaluate life cycle analyses developed by others.

Learning outcomes and competencies for this module encompass several key competence domains. These domains ensure that students acquire a comprehensive set of skills and knowledge necessary for their professional and personal development in the field of sustainability. The competence domains are categorized into three primary areas:

Technical Competence:

- Apply LCA methodologies and tools.
- Integrate Ecodesign principles into product development.
- Adhere to sustainability regulations and technical specifications.
- Identify and implement sustainable practices throughout the product life cycle.
- Utilize software tools for LCA and Ecodesign.

Professional Competence:

- Manage and coordinate sustainability projects.
- Develop and present sustainability assessments and reports.
- Collaborate with cross-functional teams on sustainable designs.
- Critically evaluate peers' sustainability efforts.
- Apply critical thinking to solve sustainability problems.

Global Competence:

- Understand global sustainability challenges and initiatives.
- Consider cultural, political, and economic contexts in sustainability.
- Develop intercultural communication and language skills.
- Promote ethical considerations and social awareness.
- Address the social implications of design globally.

3.2 Target Group Analysis

This chapters lists the target groups with respect to the learners and the teachers addressed by the module.

Level	Prerequisite	Current position	Needs	Prospective Job Field
Master Level Student	Bachelor in technology domains (IT, Engineering)	Student	Monitoring and control of the learning process	Master level position in engineering or design sectors
Lifelong Learning Student	Bachelor in technology domains (IT, Engineering)	Professional	Flexible dedication to the learning process (daily and weekly); external motivation to keep learning (motivation may be hindered by factors such as work deadlines and family tasks)	Improvement of position in current or new organization

3.3 Competences & Learning Outcomes

This chapter contains a more detailed description of the competencies delivered by the module. This description forms a competence profile that students will gain by attending the module. It is broken down into competencies within a competence breakdown structure.

The concept of Overarching Learning Outcomes (OLO) integrates primarily professional and global competencies, along with select technical skills such as IT literacy, into a comprehensive competence portfolio. These competencies are developed and taught across multiple modules or through specific didactic formats, such as projects, presentations, and teamwork. In master's programs, these OLOs ensure a holistic and robust educational experience. The following is a description of the OLO for this module:

OLO 1 The student defines the concept of Ecodesign and becomes aware of the environmental, economic, and social implications of product design.

OLO 2 The student lists the advantages of integrating environmental criteria into the product development process.

OLO 3 The student knows and understands the different regulations and technical specifications for Ecodesign within a European framework.

OLO 4 The student applies the Ecodesign methodology and manages the available tools for Ecodesign.

OLO 5 The student positions Ecodesign within the business organization in the framework of the product development process.

OLO 6 The student understands the potential of Ecodesign as a new business model in the company.

OLO 7 The student understands the origin and need for LCT.

OLO 8 The student understands the current environmental problems associated with products and services.

OLO 9 The student defines the life cycle concept and identifies the phases of the life cycle of a product.

OLO 10 The student describes the fundamentals and regulations of LCA.

OLO 11 The student applies evaluation methodologies and software tools for LCA.

OLO 12 The student evaluates the LCA developed by others.

3.4 Content

Define the (thematic) content covered by the module.

1. **What is Sustainability?**
   - 1.1. Sustainability Definition.
   - 1.2. What are the drivers behind our increasing materials and energy consumption?
   - 1.3. The Triple Bottom Line, Sustainable Development Objectives, Circular Economy, Company Reporting Initiatives.
   - 1.4. The product life cycle: Global view.
2. **How can we assess the impact of a product in more detail: LCA**
   - **2.1. Product life cycle: Contextualization and Concept**
     - 2.1.1. Definitions and principles.
     - 2.1.2. Historical evolution and current situation: From consumerism to programmed obsolescence; the environmental problems associated with products.
     - 2.1.3. Points of attention: Input data, system boundaries, functional unit.
     - 2.1.4. Life cycle and extended responsibility of the producer.
     - 2.1.5. Introduction to the concept of Life Cycle Thinking: Implications for the product designer.
   - **2.2. Life Cycle Analysis: Methodology and Tools for Calculation**
     - 2.2.1. Life Cycle Analysis: Methodology for quantifying the environmental impact of products.
     - 2.2.2. Methodological principles of Life Cycle Analysis based on international standards UNE-EN ISO 14040 and UNE-EN ISO 14044.
     - 2.2.3. Introduction to software tools for developing Life Cycle Analysis: Open LCA.
3. **Minimizing Impact of a New Product: Ecodesign**
   - **3.1. Basic Principles and Implications of Ecodesign:** Introduction to the concept of design and Ecodesign - Basic principles and implications for the design of products and services, product life cycle, benefits of Ecodesign, energy saving/durability, product trends and implications.
   - **3.2. Ecodesign Regulations and Technical Specifications:** Regulations to be considered in Ecodesign - Global vision of the map of directives by sectors, European Directive 2009/125/CE, end of life vehicles (ELVs), waste electrical and electronic equipment (RAEEs), waste plastic food packaging, new measures such as M/543, patents.
   - **3.3. Ecodesign Methodology**

3.3.1. Ecodesign integration in business management systems: Application of the principles of the international standard ISO 14006: 2020 “Environmental management systems. Guidelines for the incorporation of Ecodesign”.

3.3.2. Introduction to Life Cycle Analysis (LCA), consumer communication mechanisms: Environmental Product Declarations (EPD), Product Environmental Footprint (PEF), Organization Environmental Footprint (OEF), monovector footprints (carbon, water, etc.), the Ecodesign process.

3.4. Ecodesign and Company: Servitization - Implementation of new business models based on product-service systems as a strategy to promote the Circular Economy, types of services, sustainability/environmental impact

4. **Towards a Circular Economy:** Goals and Definition of Circularity - Product sharing, product lifetime extension, reuse and refurbishing, recycling.

3.5 Teaching & Learning Activity Plan

A) Select Teaching/learning methods per competence

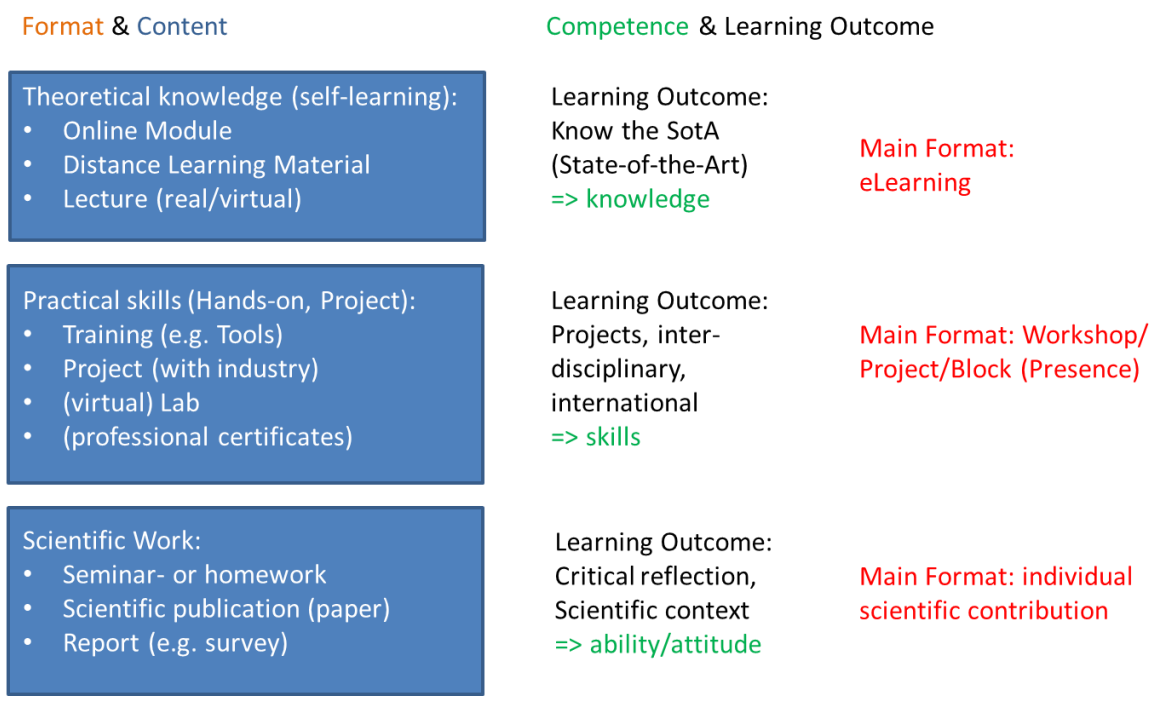

Figure 1: Mapping of Didactic Formats to Competence Areas [own source]

B) Define didactic concept: e.g. choose from:

The module is designed as a tutored online version where students will receive an introduction to the basic knowledge, which they will then apply to specific assignments. It will require:

- Participation of students in online live lectures
- Individual study of available materials
- Development of individual and team assignments

C) Define an Activity Plan

The module is organized around individual and team activities. The optimal group size is 30 students, divided into six teams of five people each.

As an introduction, the students will complete an online test to assess their knowledge of Circular Economy, Sustainability, and Life Cycle Thinking.

Activity Plan

Activity 1: In the first phase, the professor will lecture on the basic concepts of the module. These lectures will take place online. During this phase, the professors will also describe the assignments.

Activity 2: In the second phase, students will engage in individual knowledge acquisition tasks, focusing specifically on the assignments. This phase may occur simultaneously with phases three and four.

Activity 3: In this phase, students will begin developing their assignments. This phase will run in parallel with phase four.

Activity 4: During this phase, tutorials will be offered and organized. Students and teams are required to dedicate a minimum amount of time to these tutorials to ensure comprehensive understanding and progress.

Activity 5: In the final phase, teams will present their results both as a written report and an oral presentation. Students will also review and provide feedback on the work of their peers.

Activity 6: Finally, they will take an exam to assess their overall understanding and knowledge gained throughout the module.

Type of activity	Activities	Remarks	9 ECTS module		
			Hours Student	Hours Professor per Group/Team/ Student	Hours Professor Total
Group	Online Lecture	Students must attend (but it may be recorded).	15	15	15
Group	Recorded Lecture		6	15	15
Group	External video		10	0	0
Team	Team Tutorial		4	2	12
Team	Team Assignment Report	It may include the use of SW tools or other applications	70	1.5	9
Team	Team Assignment Oral Presentation		0.1	0.1	0.6

Individual	Individual Learning (reading, small exercises)		90	0	0
Individual	Individual Learning (Tutorial)		1	1	22
Individual	Individual Assignment Report	It may include the use of SW tools or other applications	20	0.5	15
Group	Exam	Different types of exams may be designed (test, essay…)	2.5	15	15
		TOTAL HOURS	**218.6**	**33.1**	**103.6**

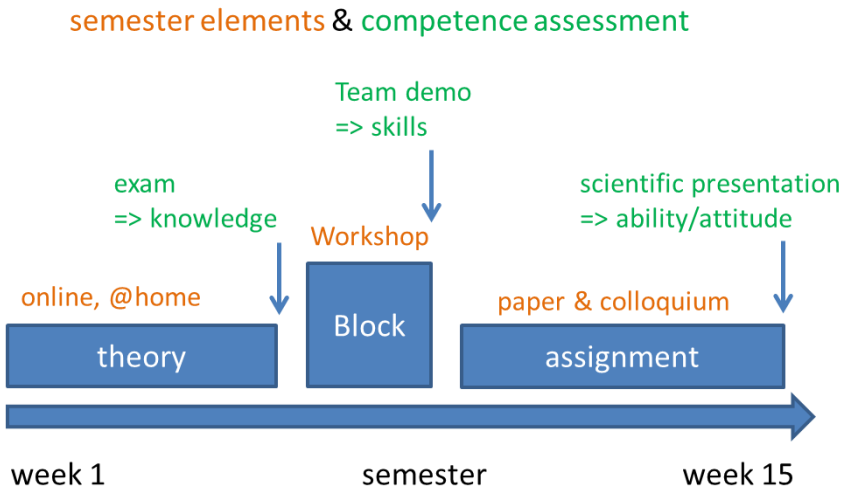

Figure 2: Scheduling Example of Didactic Formats during Semester [own source]

3.6 Teaching & Learning Resources

This section outlines the essential resources and tools needed for the module, including literature, media, technical requirements, lab equipment, and IT tools. A detailed list of the required core textbooks, articles, and supplementary readings is provided in Annex I.

Required Literature and Media

- Core Textbooks and Articles: Key textbooks and articles covering Circular Economy, Sustainability, and Life Cycle Thinking, available through the online supporting tool (see Annex I).
- Supplementary Readings: Additional readings, including recent research papers and industry reports, to enhance understanding and keep students updated (see Annex I).

Technical Requirements and Lab Equipment

- Computers and Software: Access to computers with software for Life Cycle Analysis (LCA) and Ecodesign, such as Open LCA.

- Online Connectivity: Reliable internet access for downloading materials, participating in discussions, and researching scientific literature.
- Videoconferencing Tools: Webcam and audio equipment for online lectures, virtual discussions, and tutorials.

Learning Management System (LMS)

- Moodle (Mandatory): Primary platform for course content, including lecture notes, readings, assignment guidelines, and submissions.
- Additional IT Tools: Tools for collaboration, project management and discussion forums.

3.7 Tailoring & Educational Tracks

The module is designed to provide flexibility and relevance to different learning goals and career paths.

Practical Focus: Engineers and project managers need tools to address new challenges. Among them are LCA and Ecodesign, which will be studied and applied. In this module, both tools will be presented and embedded into the circular economy design-production-recovery process.

Scientific Focus: Literature review and analysis. Deductive research based on the literature. Scientific reflection and discussion in teams.

3.8 Assessment Methods

FORM	%	REMARK
Written exam	20	Based on theory classes
Individual assignment	30	Based on report provided by Individual work of each student on a specified topic
Team assignment	40	Based on written report of teamwork of a group of students
Peer review	10	Based on peer review of other's team oral presentation or reports

3.9 Curricula Integration

This module will be implemented in a pilot version in the first semester of 2021-2022 for the University’s Master in Project Management. It will be taught by professors from Bilbao. Students are expected from the University of the Basque Country and FH Dortmund, and students from other partner universities are also welcome.

3.10 Quality Assurance - Evaluation

3.10.1 Quality assurance

The module will undergo pilot teaching and will be evaluated by students, professors, and IT/media specialists to gather feedback for improvement. This iteration will continue for 3 years across different universities, with a publishable release produced in each iteration.

3.10.2 Evaluation

By systematically evaluating and refining the learning and teaching processes, as well as the content and materials, the module will continually evolve to provide a high-quality educational experience that meets the needs of students.

Improving student learning:

- Interactive methods: Introduce peer teaching and collaborative projects to boost engagement.
- Frequent assessments: Use quizzes, polls, and short assignments for regular feedback and progress monitoring.

Improving the teaching process:

- Balanced learning: Optimize the mix of asynchronous (videos, clips) and synchronous sessions based on student feedback.
- Project assignments: Adjust the number and size of project-based assignments to manage workload and effectiveness.
- Feedback sessions: Provide regular general and personal feedback sessions to address queries and guide learning.

Improving content and materials:

- Multimedia resources: Use of high-quality multimedia resources like video clips and interactive e-learning modules.
- Physical materials: Supplement online resources with textbooks.

Implementation of Improvements:

- Regular review: Continuously review student feedback to identify improvement areas.
- Pilot programs: Test new teaching methods or content enhancements before full implementation.

4 Syllabus/Module Handbook

<table>
<tr><td colspan="7">M08 Life Cycle Thinking and Sustainable Management</td></tr>
<tr><td colspan="2">Module Owner
UPV/EHU</td><td>Workload
180 h</td><td>Credits
9 ECTS</td><td>Semester</td><td>Frequency</td><td>Duration
1 Semester</td></tr>
<tr><td>1</td><td colspan="2">Course Title
Life Cycle Thinking and Sustainable Management</td><td>Contact hours
30 h in total</td><td>Self-Study
150 h</td><td colspan="2">Planned Group Size
30 students</td></tr>
<tr><td>2</td><td colspan="6">Course Description

The module starts with an introduction to the reasons for discussing sustainability. Climate change and material scarcity are some of the problems already affecting the economy and well-being. The design phase of new products and processes is impacted by current and anticipated material scarcity and must also consider the effects of these products on climate change. Moreover, the design phase should not be viewed as the beginning of a linear process but as the entry point for a circular one. The Cradle to Grave linear paradigm has already evolved into a circular Cradle to Cradle model. In March 2020, the European Union adopted the Circular Economy Action Plan, another institutional effort to foster growth while reducing resource pressure. Engineers and project managers need tools to address these new challenges. Among them, Life Cycle Analysis (LCA) and Ecodesign stand out. In this module, both tools will be presented and integrated into the circular economy design-production-recovery process.</td></tr>
<tr><td>3</td><td colspan="6">Course Structure

1. What is Sustainability?
1.1. Sustainability Definition.
1.2. What are the drivers behind our increasing materials and energy consumption?
1.3. The Triple Bottom Line, Sustainable Development Objectives, Circular Economy, Company Reporting Initiatives.
1.4. The product life cycle: Global view.

2. How can we assess the impact of a product in more detail: LCA
2.1. Product life cycle: Contextualization and Concept
2.1.1. Definitions and principles.
2.1.2. Historical evolution and current situation: From consumerism to programmed obsolescence; the environmental problems associated with products.
2.1.3. Points of attention: Input data, system boundaries, functional unit.
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</table>

	3. Minimizing Impact of a New Product: Ecodesign 3.1. Basic Principles and Implications of Ecodesign: Introduction to the concept of design and Ecodesign - Basic principles and implications for the design of products and services, product life cycle, benefits of Ecodesign, energy saving/durability, product trends and implications. 3.2. Ecodesign Regulations and Technical Specifications: Regulations to be considered in Ecodesign - Global vision of the map of directives by sectors, European Directive 2009/125/CE, end of life vehicles (ELVs), waste electrical and electronic equipment (RAEEs), waste plastic food packaging, new measures such as M/543, patents. 3.3. Ecodesign Methodology 3.3.1. Ecodesign integration in business management systems: Application of the principles of the international standard ISO 14006: 2020 “Environmental management systems. Guidelines for the incorporation of Ecodesign”. 3.3.2. Introduction to Life Cycle Analysis (LCA), consumer communication mechanisms: Environmental Product Declarations (EPD), Product Environmental Footprint (PEF), Organization Environmental Footprint (OEF), monovector footprints (carbon, water, etc.), the Ecodesign process. 3.4. Ecodesign and Company: Servitization - Implementation of new business models based on product-service systems as a strategy to promote the Circular Economy, types of services, sustainability/environmental impact *4. Towards a Circular Economy:* Goals and Definition of Circularity - Product sharing, product lifetime extension, reuse and refurbishing, recycling.
4	**Application Focus** Engineers and project managers need tools to address new challenges. Among these tools are Life Cycle Analysis (LCA) and Ecodesign, which will be studied and applied in this module. Both tools will be presented and integrated into the circular economy design, production, and recovery process.
5	**Scientific Focus** Literature review and analysis. Deductive own research based on the literature. Scientific reflection and discussion in the teams.

6	**Parameters**
	
	• ECTS: 9
	• Hours of study in total: 180
	• Weekly hours per semester: It will depend on the calendar organization
	  – Contact hours: 30
	  – Self-Study hours: 150
	• Course characteristics: elective
	• Course frequency: every year - summer semester
	• Maximal capacity: 30 students
	• Course admittance prerequisites: Bachelor’s degree
	• Skills trained in this course: theoretical, practical and scientific skills and competences
	• Assessment of the course: continuous evaluation, including exam
	• Teaching staff: teachers from Open Community of Practice

7	**Learning outcomes** 6.1 Knowledge • The student defines the concept of Ecodesign and becomes aware of its environmental, economic, and social implications in product design. • The student lists the advantages of integrating environmental criteria into the product development process. • The student knows and understands the different regulations and technical specifications for Ecodesign within a European framework. • The student understands the origin and necessity of Life Cycle Thinking (LCT). 6.2 Skills • The student applies the Ecodesign methodology and manages the available tools for Ecodesign. • The student positions Ecodesign within the business organization in the framework of the product development process. • The student reports on the current environmental problems associated with products and services. • The student defines the life cycle concept and identifies the phases of a product's life cycle. • The student describes the fundamentals and regulations of LCA. • The student applies evaluation methodologies and software tools for product LCA. 6.3 Competence – ability & attitude • Students train to develop and discuss concepts in teams. • The student evaluates the life cycle analysis developed by others.
8	**Teaching and training methods** The module is organized around individual and team activities. The optimal group size is 30 students, divided into six teams of five people each. As an introduction, the students will complete an online test to assess their knowledge of Circular Economy, Sustainability, and Life Cycle Thinking. • **Activity 1:** In the first phase, the professor will lecture on the basic concepts of the module. These lectures will take place online. During this phase, the professors will also describe the assignments. • **Activity 2:** In the second phase, students will engage in individual knowledge acquisition tasks, focusing specifically on the assignments. This phase may occur simultaneously with phases three and four. • **Activity 3:** In this phase, students will begin developing their assignments. This phase will run in parallel with phase four. • **Activity 4:** During this phase, tutorials will be offered and organized. Students and teams are required to dedicate a minimum amount of time to these tutorials to ensure comprehensive understanding and progress. • **Activity 5:** In the final phase, teams will present their results both as a written report and an oral presentation. Students will also review and provide feedback on the work of their peers. • **Activity 6:** Finally, they will take an exam to assess their overall understanding and knowledge gained throughout the module.

9	**Curricula Integration** Integration into curricula of Project Management Master Course
10	**References** **Basic bibliography** European Commission. (2020, March 11). The European Green Deal: New Circular Economy Action Plan. Brussels. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_20_420 European Commission. (2014). Towards a circular economy: A zero waste programme for Europe (COM/2014/0398 final). Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014DC0398 Global Footprint Network. (2007). Ecological Footprint Accounting: Building a Winning Hand. Retrieved from https://www.footprintnetwork.org/ International Organization for Standardization. (2020). ISO 14006:2020 Environmental management systems — Guidelines for incorporating eco-design. Retrieved from https://www.iso.org/standard/72644.html UNEP SETAC. (2015). Guidance on Organizational Life Cycle Assessment. Life Cycle Initiative. Retrieved from https://www.lifecycleinitiative.org/publications/guidance-on-organizational-life-cycle-assessment **In-depth bibliography** Braungart, M., & McDonough, W. (2002). Cradle to Cradle: Remaking the Way We Make Things. Farrar, Straus and Giroux. European Commission. (2001). Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development (COM/2001/0068 final). Retrieved from https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52001DC0068 Goedkoop, M., & Spriensma, R. (2001). The Eco-indicator 99: A damage oriented method for Life Cycle Impact Assessment - Methodology Annex (3rd ed.). PRé Consultants B.V. Ihobe. (n.d.). Climate Circularity Calculator User Manual. Retrieved from https://www.ihobe.eus/publications/climate-circularity-calculator-user-manual Rodrigo, J., & Castells, F. (2003). Electrical and electronic practical ecodesing guide. The International Journal of Life Cycle Assessment, 8(2), 114. **Journals** ACS Sustainable Chemistry and Engineering International Journal of Sustainable Design Journal of Cleaner Production Journal of Industrial Ecology Journal of Life Cycle Assessment Journal of Management and Sustainability Nature Sustainability Resources, Conservation and Recycling

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