MSc in Sustainability Management

# Cradle to Cradle and Circular Economy

Professor: Ilija Sazdovski

Office hours: 24

Course Type: Selective

Credits: 3 ECTS

Term: Second

# 1.COURSE PRESENTATION

## Course Description

Alarming reports published by United Nations warned of the massive increase in resource extraction that tripled since 1970, and according to their projections, resource usage will increase by 70% more by 2050. This increase in resource consumption is resulting in tremendous environmental impacts, a consequence of the present linear economic model.

The circular economy is a relatively new concept introduced to overcome the limitations of the traditional linear economic model that has proved to be inefficient in terms of material use and environmental protection.

A growing body of scientific literature aims at providing adequate metrics to improve the comparison between the two economic paradigms or systems serving the same function. One of the key limitations of the circular economy concept is the lack of a unique definition and commonly accepted indicators for circularity. Moreover, there are a plethora of different approaches utilizing or introducing new variables that are not defined in previously developed conceptual frameworks of the circular economy. Some authors even predict a collapse of the approach because of such wide interpretations of circularity as a concept.

The main aim of the course is the understanding of the urgency of changing the present linear economic model, as well as the key principle and philosophical approaches for the circular future.

## The course in the study plan

This **elective** course belongs to the subject of **Environmental Dimension of Sustainability** of the study plan. It takes place in the **second quarter**.

## Learning Objectives (resultados de aprendizaje) and competences

The main objective for the students participating in this course is to differentiate the linear from the circular economic model. They will understand the main policy package in the European Union toward transforming the economy using the circularity paradigm.

The students will obtain the basic skills for circularity assessments and learn how to identify the non-linear flow of the materials in the technosphere in multiple utilization circles.

## Related SDGs

Circular Economy plays a crucial role in contributing to the achievement of Sustainable Development Goals (SDGs). Circular Economy and Cradle to Cradle methodology contributes to several key SDGs:

- **SDG 12: Responsible Consumption and Production**: Circular Economy promotes more responsible consumption and production patterns. It emphasizes reducing waste, reusing products, and recycling materials. By doing so, it reduces the environmental impact associated with resource extraction, manufacturing, and disposal, helping to achieve more sustainable patterns of production and consumption.
- **SDG 8: Decent Work and Economic Growth**: The Circular Economy creates job opportunities in various sectors, including recycling, repair, remanufacturing, and sustainable product design. These jobs often have a positive impact on local economies, leading to inclusive and sustainable economic growth.
- **SDG 9: Industry, Innovation, and Infrastructure**: Circular business models require innovative approaches to product design, supply chain management, and waste reduction. These innovations contribute to the development of sustainable infrastructure and technologies, which are essential for achieving SDG 9.
- **SDG 11: Sustainable Cities and Communities**: The Circular Economy can lead to more sustainable urban development by reducing waste generation and promoting the sharing of resources. Circular practices can also make cities more resilient and efficient in their use of resources and infrastructure.
- **SDG 13: Climate Action**: The Circular Economy can help mitigate climate change by reducing greenhouse gas emissions associated with resource extraction, production, and disposal. For example, recycling and reusing materials require less energy than producing them from virgin resources.
- **SDG 14: Life Below Water** and **SDG 15: Life on Land**: By reducing resource consumption and minimizing waste, the Circular Economy helps protect ecosystems and biodiversity, contributing to goals aimed at preserving life both in oceans and on land.
- **SDG 1: No Poverty** and **SDG 2: Zero Hunger**: Circular Economy initiatives can address poverty and hunger by creating jobs, reducing resource scarcity, and minimizing food waste through practices like food recovery and redistribution.
- **SDG 6: Clean Water and Sanitation**: Circular practices can reduce pollution of water bodies by minimizing the release of harmful substances from waste and promoting responsible water use in production processes.
- **SDG 7: Affordable and Clean Energy**: The Circular Economy encourages energy efficiency and the use of renewable energy sources, aligning with the goal of affordable and clean energy.
- **SDG 17: Partnerships for the Goals**: Collaboration between governments, businesses, NGOs, and communities is essential to achieve the SDGs. Circular Economy initiatives often involve multi-stakeholder partnerships, fostering cooperation to address sustainability challenges.

In summary, the Circular Economy and Cradle to Cradle methods contributes to several Sustainable Development Goals by promoting responsible consumption and production, reducing waste, creating jobs, fostering innovation, and mitigating environmental impacts. It offers a holistic approach to sustainability that aligns with the global agenda set by the United Nations.

# COURSE LEARNING PLAN

## Methodology

The course comprises eight 3-hour sessions, which combine theory lecturing and student active participation in the classes.

They will be introduced to the historical development of the concept of circular economy, its main principles, and different definitions based on the scope of assessment. Also, they will get the basic knowledge of new philosophical approaches for the future such as the “Cradle to Cradle” concept, through theoretical approach and practical examples.

During the study visit, they will recognize the size of linearity of our system, and the urgent need for an efficient circular system for our economy and the materials we use.

## Calendar and contents

To achieve the course objectives that will equip the students with necessary future skills, the following work plan will be conducted:

**Week 1: January 15th, 2023**

**Topics:** Introduction of the course;

Introduction of principles of circularity, limits of the linear economic model, key steps towards a circular economy, and practical examples. Assessing global resource use, understanding the global waste management problem.

*Presentation of the Homework 1: Circular aspects of the proposed master topics or literature review of the European policies on circularity.*

**Week 2: January 22nd, 2023**

**Topics:** Theoretical basis

Circularity matrix based on robustness: micro-scale (product, company), mezzo-scale (industrial systems), and macro-scale (city, regional, national, or beyond);

Comparison of different circularity definitions and circularity indicators.

Material Circularity Indicator vs. other circularity indicators used. Practical aspects of calculations.

*Presentation of the Homework 2: Student's group work*:

The students will have to design a packaging product, with the maximal potential of circularity. Free accessible tools for the assessment of circularity will be used.

**Week 3: January 29th, 2023**

**Topics:** Circular properties of the materials, the difference between the fossil and bio-based materials, circular losses in open-loop multiple recycling processes. Material flows in real circumstances. Combination of lifecycle variables with circularity principles.

Guest lecture on Degrowth paradigm: historical perspective of the degrowth as economic model, philosophical aspects of the difference between degrowth and linear economic model, relative and absolute decupling, separating economic growth from recourse usage. Practical examples of degrowth and alternative economic models. Recent scientific aspects of degrowth paradigm.

**Week 4: February 5th, 2023**

**Topics:** European Policy towards circular economy transformation.

*Homework for the students:* The students will be divided into groups to perform a literature review of the European policies to identify possible replications and unique approaches toward the transformation of the linear economic system. An alternative will be a presentation of the circular aspects of the topics accepted for students master theses.

**Week 5: February 26th, 2023**

**Topics:** Understanding of the scope and size of the linear economic model that we use.

Study visit to the Ecoparc Del Mediterrani S.A. and TERSA (Tractament i Selecció de Residus, S.A.)" Barcelona, Spain

**Week 6: February 29th, 2023**

**Topics:** Cradle to Cradle, a new philosophical concept of the future.

**Week 7: February 27th, 2023**

**Topics:** Practical implementation of the Cradle-to-Cradle concept, certification, and best examples.

*Guest lecture from the recycling industry: Gremi de Recicladores de Cataluña.*

**Week 8: March 6th, 2023**

**Topics:** Group work presentations: Designing a circular product.

Preparatory activities for the test.

**Exam: March 11th, 2023**

Multiple choice question test.

## 2. COURSE LEARNING PLAN

### Methodology

The course comprises eight 3-hour sessions, which combine theory lectures and student active participation in the classes.

During the course, the students will be assigned to a group work exercise and different homework assignments where the practical application of learned concepts will be applied. Activities will require both individual and group work.

A study visit will be organized to one of the biggest incinerator facilities in Spain.

**Hours devoted by the student** (according to ECTS): **75**

### Evaluation criteria

Three elements concur in the final mark:

- **Final exam (50%).** The final exam is used to assess the individual level of knowledge and understanding of each student. It will include questions covering topics from all the classes. This item counts for 50% of the final mark. To pass the exam the minimum grade is 5.

- **Group work and homework presentation (30%).** Students will apply their knowledge to real-life situations during the development of the homework and the group work exercise. They are expected to use the topics they learned during the classes.

- **Class attendance and active participation (20%).** Attendance in every session is expected and recorded using an attendance sheet. It is your responsibility to comply with this measure. Class attendance is compulsory and will be considered in your final grades; punctuality is a must. Note that unexcused absences reduce your score on the "attendance and participation" element of your final grade. Two or more unexcused absences will result in an automatic score of zero and, i~~n all likelihood~~likely, a failure mark for the course asa whole.

| | |
|---|---|
| Attended all the sessions + actively and consistently participated in the class discussions during the entire course period | **20** |
| Attended all the sessions + actively and consistently participated in most of the class discussions | **15-19** |
| No more than one unexpected absence + often participated in the class discussions | **10-14** |
| No more than one unexpected absence + participated in some class discussions | **5-10** |
| No more than one unexpected absence + limited or no participation in class discussions | **1-5** |
| Otherwise | **0** |

Other evaluation criteria to take into consideration:

- **Retake**

Students who fail the course during the regular evaluation will be allowed ONE re-take of the examination/evaluation. Students that pass any Retake exam should get a 5 by default as a final grade for the course. If the course is again failed after the retake, students will have to register again for the course the following year.

- **No-show**

In case of a justified no-show to an exam, the student must inform the corresponding faculty member and the director(s) of the program so that they study the possibility of rescheduling the exam (one possibility being during the "Retake" period). In the meantime, the student will get an "incomplete", which will be replaced by the actual grade after the final exam is taken. The "incomplete" will not be reflected on the student's Academic Transcript.

- **Plagiarism**

Plagiarism is to use another's work and present it as one's own without acknowledging the sources in the correct way. All essays, reports, or projects handed in by a student must be original work completed by the student. By enrolling at any UPF BSM Master of Science and signing the "Honor Code," students acknowledge that they understand the schools' policy on plagiarism and certify that all course

assignments will be their own work, except where indicated by correct referencing. Failing to do so may result in an automatic expulsion from the program.

## Bio of Professor

Ilija Sazdovski is finalizing his Ph.D. thesis in the field of circular aspects of materials, directed by Dr. Pere Fullana-i-Palmer at the UNESCO Chair in Life Cycle and Climate Change ESCI-UPF. His thesis aims to propose methodological improvements to the life cycle assessment methodology by involving the principles of the circular economy. He developed theoretical aspects of two circularity indicators, which can be utilized in fast-moving products such as packaging, through involving time in the life cycle principles. He is skilled in laboratory testing of fossil-based and bio-based plastic materials in multiple recycling processes aiming to identify circular qualitative properties.

Between 2012 and 2018, he was part of the Scientific Advisory Board of the Conference for Sustainable Development of Energy, Water and Environmental Systems. He holds a B.Sc. in mathematics and physics and M.Sc. in ecological economics.

He is an experienced researcher, and he is authoring numerous technical reports, strategies, and conference and scientific papers.

## Reading Materials/ Bibliography/Resources

No textbook is required for this course. All the required materials will be provided. Any readings, notes, handouts, datasets, or additional course material will be available through the course website.