

# CIRCULAR DESIGN WITH PLASTICS

20 SEP-8 OCT.2021



+INFO:

[www.run-eu.eu](http://www.run-eu.eu)

Organized by IPCA, NHL Stenden, AIT, LIT

## PROGRAMME DESCRIPTION/OBJECTIVE

**Circular Economy is a hot topic and a trendy term. However, what does it really imply for industry, for society, and for development? What are the existing and the emerging challenges?**

Every drop of water on the planet has been here for millennia, in a constant cycle of renewal. The aim of circular plastics is to take this approach to plastics and earth's finite resources. The broad picture of the circular economy is defined by (Murray et al., 2017) as "an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximise ecosystem functioning and human well-being". The revised Waste Framework Directive (WFD), adopted on 30 May 2018, sets out a greater ambition for prevention, preparation for reuse and recycling than ever before, acknowledging that a more Circular Economy could significantly reduce greenhouse gas emissions associated with resource extraction and production as well as creating many new jobs. The Environmental, social and economic benefits of circular based process and output operation are significant: Firstly, these activities keep goods within the economy and thereby reduce waste production, leading to a reduction in raw material extraction, manufacturing and transport. Secondly, these activities avoid the creation of recalcitrant wastes and the need for elaborate waste management. Thirdly, the EU acknowledges that circular economic implementation has the potential to positively impact social and economic benefits including jobs and growth, the investment agenda, the social agenda and industrial innovation.

**But how to explore and apply strategies of Circular Plastics for Product Design, in the scope of EU Circular Economy Policies, in order to improve sustainability of both product life cycles and companies? And how to take advantage of the resulting opportunities for new products and material life cycles, as well as new circular business models?**

This short programme aims to present insights into these topics and examine some existing tools that can help designers, engineers, managers, and entrepreneurs. The underlying principles, concepts and tools are quite relevant in the current global economy in a plethora of thematic areas, and applicable to any industrial sector, although this program will have a particular focus on sectors related to Plastic products.

**DATE** September 20 – October 8 2021 (Overall)  
September 27 – October 1 (Lecturing/contact week)

## LANGUAGE OF INSTRUCTION

English

## PROPOSED LEARNING OUTCOMES

This is an introductory course aimed at those interested in becoming familiar with Circular Design (specifically with Plastics), Circular Economy, and Circularity. Participants will be introduced to the topic of Circular Design, starting from a variety of concepts, passing through several important approaches and methodologies, and finally covering some specific tools (in terms of their purpose and how they are employed, and not learning to use them in detail).

At the end of this programme, students will be able to:

- Appreciate current driving features for sustainability in a multidisciplinary and international context
- Understand the concepts of circular design, circular economy, circularity, and ecodesign (among others)
- Recognize the key challenges and opportunities for improving circularity in plastics, and how to quantify it
- Understand the different perspectives of ecodesign / design for X
- Understand circular supply chains and sustainable business modelling

## HOW TO APPLY

Fill in the Application Form [here](#).

## DEADLINE FOR APPLICATIONS

8 September 2021

## ECTS CREDITS 2

## MODE OF DELIVERY

 Blended

Simultaneously co-located with a live audience room at the 4 partner institutions (all sessions are simultaneous and transmitted through Zoom/Colibri). However, all participants in the programme can attend sessions remotely through the Zoom/Colibri and Teams platforms.

## EQF/LEVEL

 Masters/2nd cycle (EQF 7).

Students from Bachelor/1st cycle (EQF 6) and PhD/3rd cycle (EQF 8) are also welcome.

## ACADEMIC RECOGNITION

To be defined by each Home Institution. In general terms, most students will have this RUN-EU SAP certified in the Diploma Supplement, as a minimal condition.

## ELIGIBLE PARTICIPANTS

RUN-EU students from all cycles of studies, with particular emphasis on students from Engineering, Design and Management.

## CONTACT DETAILS

[run-eu@ipca.pt](mailto:run-eu@ipca.pt) and [SAPcirculardesign@ipca.pt](mailto:SAPcirculardesign@ipca.pt)



SHORT  
ADVANCED  
PROGRAMME

RUN  
REGIONAL  
UNIVERSITY  
NETWORK

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## SELECTION CRITERIA

A maximum of 40 students will be selected for this programme. A minimum of 5 places are reserved for each of the 4 host institutions. After that, the remaining 20 places will be distributed by all applicants. Selection will always be based on order of submission (first come, first served), although priority will be given to RUN-EU partner students. Only after all RUN-EU partner students are placed will external applicants be selected. The selection team will also take steps towards ensuring diversity and representativity.

## COURSE LEADERS | LECTURERS

### Course leaders

Ricardo Simões (IPCA)  
Marcel Crul (NHL-Stenden)  
Adam de Eyto (LIT)  
Declan Devine (AIT)

### Lecturers

João Sampaio (IPCA)  
Judith Ogink (NHL-Stenden)  
Romina Pezzoli (AIT)  
Peter Joore (NHL-Stenden)  
Dennis Vegter (NHL-Stenden)

## LEARNING AND TEACHING STRATEGY

- Immersive Learning
- Active Learning
- Peer Learning

## MEANS AND CRITERIA FOR ASSESSMENT

**Individual participation (attendance):** 20%

**Group project:** 80% (20% interim presentation + 60% final presentation).

Active participation from all students of each group is mandatory in both group presentations.

A Learning Report must be elaborated at the end of this RUN-EU SAP.

## CERTIFICATION

The participants who successfully complete this RUN-EU SAP, will receive a Certificate of Participation and a Transcript of Records jointly issued by the organising institutions.

Certificates will only be issued to students who attend at least 75% of the lectures and who actively participate in the final group presentation.



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**20 SEP  
to 8 OCT  
2021**

## PROGRAMME AT A GLANCE

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	CET 10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
	GMT 09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
<b>SEPTEMBER 20-26</b>	PRE-READING									
<b>MONDAY 27/09</b>	Welcome & Opening Session	What is circular design + Ecodesign	Sustainability/ global aspects	Lunch Break	Team-building activity	Group setup + Planning	Cultural Session			
<b>TUESDAY 28/09</b>	Challenges + opportunities for impr. circul. for plastics	Circular entrepreneurship/ regional+local chains	Design for X	Lunch Break	Group work (unsupervised)					
<b>WEDNESDAY 29/09</b>	Materials and processing	Circular economy principles	Economics of circular design / green logistics	Lunch Break	Group work (with local mentors)					
<b>THURSDAY 30/09</b>	Multilevel Design Perspective	MDP(30m) + EI&CI(30m)	Environmental Impact & Circularity Indicators	Lunch Break	Group work (unsupervised)					
<b>FRIDAY 01/10</b>	Sustainable Business Modelling	SBM(30m) + ST(30m)	System Thinking [+tool]	Lunch Break	Group work (with local mentors)	Interim presentations (~5m)				
<b>OCTOBER 02-07</b>	Group work (unsupervised)									
<b>FRIDAY 08/10</b>							FINAL GROUP PRESENTATIONS	Learning Assessment		

DESIGN

ENVIRONMENT

BUSINESS



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Grant Agreement Number: 101004068

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SEPTEMBER 27<sup>TH</sup>

MONDAY 09:00 - 17:00 GMT

	CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00
<b>MONDAY 27/09</b>		Welcome & Opening Session	What is circular design + Ecodesign	Sustainability/ global aspects	Lunch Break	Team-building activity	Group setup + Planning	Cultural Session			

## Welcome & Opening Session

- 🕒 09h00 - 10h00
- 👥 Group Work
- 👤 SAP Course Leaders and Lecturers

## What is Circular Design/ Ecodesign?

- 🕒 10:00 - 11:00
- 👤 Individual Work
- 👤 Adam de Eyto, Limerick Institute of Technology (LIT)

📄 An overview of the development of Design for Sustainability from the early stages of 'Eco design', Design for circular economy/ 'Cradle to Cradle' Design, Life Cycle Analysis (LCA) and 'Regenerative design'. The module will cover the basic principles, limitations, key terms, opportunities and approaches and will give students a basic understanding of how to apply these through short case study and project work.

## Sustainability/ global aspects

- 🕒 11h00 - 12h00
- 👤 Individual Work
- 👤 Marcel Crul, NHL-Stenden University of Applied Sciences (NHL-Stenden)

📄 We are living in a world where products are created to be replaced as frequently as possible instead of lasting long. The linear take-make-waste system that humanity has been living in for a long time is evolving at an even more critical state with fast consumption. The appliances we use, our furniture or our clothes, everything is produced in a way that ensures that we need to buy a new one in a rather short amount of time. Circularity focuses on the resources aspect of sustainability and is a holistic and futuristic way of thinking that considers the entire product lifespan as a whole and aims for a product to complete its purpose in a waste-free way. It is currently considered to be the most promising approach to ensure sustainable development for the society with minimal damage to our planet.

## Team-building activity

- 🕒 13h00 - 15h00
- 👥 Group Work
- 👤 SAP Course Leaders and Lecturers

## Group Setup and Planning

- 🕒 15h00 - 16h00
- 👥 Group Work
- 👤 SAP Course Leaders and Lecturers

📄 Select the topics of the group projects. Form the teams and planning group activities and dynamics.

## Cultural Session

- 🕒 16h00 - 17h00
- 👥 Group Work
- 👤 All participants

📄 Coming soon

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**SEPTEMBER 28<sup>TH</sup>**

**TUESDAY 09:00 - 16:00 GMT**

	CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00
<b>TUESDAY 28/09</b>		Challenges + opportunities for impr. circul. for plastics	Circular entrepreneurship/ regional+local chains	Design for X	Lunch Break	Group work (unsupervised)					

## Challenges and opportunities of improving circularity of plastics

🕒 09h00 - 10h00

👤 Individual Work

👤 Declan Devine, Athlone Institute of Technology (AIT)

📄 Recent years have seen heightened interest in the potential of circular technologies to break, or at least mitigate, the adverse effects of the make-use-dispose model. Yet few government initiatives, business models or collective efforts to date have been adequately extended or reached their full intended scale and impact. This is due to multiple factors including the complexities of the plastics value chain which spans raw materials extraction to final disposal, collection and recycling and includes regulation, standards, technologies, investment and trade. The Challenges and opportunities for improving circularity for plastics module will provide an overview of core challenges to meeting a plastics circular economy before providing attendees an opportunity to discuss opportunities arising from these challenges as well as highlighting best practice solutions to these challenges.

## Circular entrepreneurship/ regional and local chains

🕒 10h00 - 11h00

👤 Individual Work

👤 Coming soon

## Design for X

🕒 11h00 - 12h00

👤 Individual Work

👤 João Sampaio, Polytechnic of Cávado and Ave (IPCA)

📄 Overview of this main concept as well and some relevant Xs that relate it to Design for the Circular Economy such as Df Maintenance; Df Reuse/redistribute; Df Refurbish; Df Service; Df Disposability, that will be addressed through examples that demonstrate the potential of these strategies and their impact notably on EOL approaches.

## Group work (unsupervised)

🕒 13h00 - 16h00

👤 Group Work

👤 Groups

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SEPTEMBER 29<sup>TH</sup>

WEDNESDAY 09:00 - 16:00 GMT

	CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00
WEDNESDAY 29/09		Materials and processing	Circular economy principles	Economics of circular design / green logistics	Lunch Break	Group work (with local mentors)					

## Materials and processing

🕒 09h00 - 10h00

👤 Individual Work

👤 Romina Pezzoli, Athlone Institute of Technology (AIT)

📄 From medical devices to packaging, polymeric materials are an essential part of modern life thanks to their remarkable versatility. The choice of polymers available in the market is wide, ranging from thermoplastics to thermosets, rigid to flexible, commodities to engineering, polyolefin-based to biobased, the design possibilities are endless. As a result, plastic production ramped during the last six decades and we now produce 300 million tons of plastic each year worldwide, however half of it is for single-use items and only 90% is being recycled. This linear economy model has resulted on a serious environmental crisis due to plastic accumulation of 80% of the 7 billion tons of plastic ever produced, endangering our marine and terrestrial ecosystems. Migrating from a linear to a circular economy is imperative to mitigate the environmental impact of plastic materials as well as to maximise the use of resources. However, achievement of a circular economic system

will depend on the synergetic combination of a mindful product design process, appropriated operations and post-consumer management. In that context, understanding of the principles about plastic materials and processing techniques is essential for the design for circularity. This topic will introduce the chemical and physical properties of polymeric materials and their processing techniques to understand their implications on the waste management routes of the final products. Through the analysis of the state of the art of plastic reconversion routes, we will look to answer what are the requirements for the reconversion of a plastic product and to explore the innovations on materials and recycling technologies.

## Circular economy principles

🕒 10h00 - 11h00

👤 Individual Work

👤 Adam de Eyto, Limerick Institute of Technology (LIT)

📄 Awareness about the basic principles connected to the development of Circular Economies; Product and Materials Lifecycles, Value Chain, User Behaviours, CE Business models, Policy, Legislative drivers and Barriers for implementation. Students will be given an opportunity to work on real world

‘wicked problems’ connected to Circular Economies and to propose sustainable product and product service system design solutions to address these.

## Economics of circular design/green logistics

🕒 11h00 - 12h00

👤 Individual Work

👤 Dennis Vegter, NHL-Stenden University of Applied Sciences (NHL-Stenden)

📄 We will discuss the processes and performance objectives of the circular supply chain. In particular, we focus on how product design decisions affects the configuration of a circular supply chain. In turn, this configuration determines the performance of the circular supply chain. After this session you will be able to understand the implications of design decisions on the performance of the circular supply chain.

## Group work (with local mentors)

🕒 13h00 - 16h00

👤 Group Work

👤 SAP Course Leaders and Lecturers

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**SEPTEMBER 30<sup>TH</sup>**

**THURSDAY 09:00 - 16:00 GMT**

CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00

THURSDAY 30/09	Multilevel Design Perspective	MDP(30m) + EI&CI(30m)	Environmental Impact & Circularity Indicators	Lunch Break	Group work (unsupervised)					
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## Multilevel Design Perspective (MDP)

🕒 09h00 - 10h30

👤 Individual Work

👤 Peter Joore, NHL-Stenden University of Applied Sciences (NHL-Stenden)

📄 In order to create truly circular solutions, it is necessary to design both products made from materials that may be reused, as well as the service and business model surrounding these products, as well as the infrastructure, policy, regulations and other relevant aspects related to the circular system. After all, a circular product will only be truly circular, if the disposed product is indeed collected, processed and made into another product again. This requires a redesign of for instance new infrastructure or business models related to the disposed product collection system, or new regulations requiring a deposit on empty cans or plastic bottles. Each of these solution elements requires a conscious design process.

This module introduces a specific way of conceptualising the complete system, in the form of the Multilevel Design Model (MDM). The MDM supports designers in their role as facilitator of societal change towards a circular economy. It does this by

providing insight into the relationships between processes on different system levels, distinguishing between the Product-Technology level, the Product-Service level, the Socio-Technical level and the Societal level.

In the module, a general outline of the MDM is presented and the systems thinking approach is introduced. It is being explained how to use the MDM, and an operational problem is introduced as an example case to work on during the module. Based on the preferred future - a completely circular society - students design new solutions for both a circular product or technology, a related circular product-service system as well as a circular socio-technical system and society.

## Environmental Impact (EI) & Circularity Indicators (CI)

🕒 10h30 - 12h00

👤 Individual Work

👤 Ricardo Simões, Polytechnic of Cávado and Ave (IPCA)

📄 In order to improve the circularity of products and systems, it is important to have methods to assess the relevant parameters. To complement other more qualitative modules, this module focuses on quantitative tools, both for circularity (circularity indicators,

which are more intuitive for industry and for which it is easier to collect the require information) and environmental impact (life cycle assessment, which while being very robust and well established, require considerable technical expertise to understand and is often very difficult to collect the required input data). Being able to quantitatively assess the performance is the first step towards a more sustainable future.

## Group work (unsupervised)

🕒 13h00 - 16h00

👤 Group Work

👤 Groups

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OCTOBER 1<sup>ST</sup>

FRIDAY 09:00 - 16:00 GMT

	CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00
<b>FRIDAY 01/10</b>		Sustainable Business Modelling	SBM (30m) + ST (30m)	System Thinking [+tool]	Lunch Break	Group work (with local mentors)	Interim presentations (~5m)				

## Sustainable Business Modelling (SBM)

🕒 09h00 - 10h30

👤 Individual Work

👤 Judith Ogink, NHL-Stenden University of Applied Sciences (NHL-Stenden)

📄 Business modelling is a way to describe the rationale of how a company or organization creates, delivers and captures value. 'Value' can be defined in economic, social, cultural or another context. The most common use of business modelling is when it encompasses one organization, often a commercial company, and is focused on creation of economic value for that company and its customers. Value creation is mostly seen in terms of turnover, profit and earning money. In this lecture the process of designing a business model is introduced. After this module you will understand the different business strategies in relation to value creation and value loss (Value Hill Model), the value creation through including everyone involved in the product life-cycle, the different design strategies in relation to the different business models, the main circular business model archetype, and see the difference between a linear and a circular business model.

## System Thinking (ST)

🕒 10h30 - 12h00

👤 Individual Work

👤 João Sampaio, Polytechnic of Cávado and Ave (IPCA)

📄 Relates products and services in a holistic design approach. By applying service design tools such as CE Journey, we propose a learning by doing approach by running an assignment that identifies a challenge and the stakeholders where in-group um must try to generate a solution that will analyze (up hill, top hill and down hill) and optimize (in a conceptual framework), which allows you to consider new strategies or minimize possible negative impacts and enhance circularity.

## Group work (with local mentors)

🕒 13h00 - 15h00

👤 Group Work

👤 SAP Course Leaders and Lecturers

## Interim presentations

🕒 15h00 - 16h00

👤 Group Work

👤 SAP Course Leaders and Lecturers

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**OCTOBER 2<sup>TH</sup> - 7<sup>TH</sup>**

**SATURDAY TO THURSDAY**

CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00

**OCTOBER  
02-07**

Group work  
(unsupervised)

## Group work (unsupervised)

- 🕒 At your pace
- 👥 Group Work
- 👤 Live Practical Work

📄 Approximately 15 hours of group work effort.

**OCTOBER 8<sup>TH</sup>**

**FRIDAY 14:00 - 17:00 GMT**

CET	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00

**FRIDAY  
08/10**

FINAL GROUP PRESENTATIONS

Learning  
Assessment

## Final Group Presentations

- 🕒 13h00 - 16h00
- 👥 Group Work
- 👤 SAP Course Leaders, Lecturers and RUN-EU Project Leaders

## Learning Assessment

- 🕒 16h00 - 17h00
- 👤 Individual and group work
- 👤 SAP Course Leaders, Lecturers and RUN-EU Project Leaders