COURSE GUIDE

Course Data	
Name	Circular economy and eco-industry
Code	DOI-OPT-439
Degree	Grado en Ingeniería Electromecánica, Grado en Ingeniería Telemática
Year	4
Semester	2º
ECTS Credits	3 ECTS
Type	Optative
Department	Industrial Engineering
Area	Economics and Business Administration
Coordinator	Adela Conchado

Information of Professors	
Professor	
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SPECIFIC INFORMATION OF THE COURSE

Course context

Contribution to the professional profile of the degree

This course introduces the student to the basic concepts of the circular economy and eco-industry, and provides an opportunity for hands-on learning on these topics. Classes will combine theoretical pills, case studies, tools and techniques for idea generation and business model design, and team work on a project.

The team project will indeed be the cornerstone of the course: students will work on innovative solutions for the circular economy taking into account technical consideration and business model design.

During the course students will learn how to apply the principles of the circular economy to real cases and develop skills such as creativity, systems thinking and teamwork.

Pre-requirements

There are no particular prerequisites to take this course.

CONTENTS

Topics

1. Exploring the challenge: current models of production-consumption and global socio-environmental pressures
2. Frameworks for grasping the circular economy -butterfly model- and examples
3. Biomimicry -nature as inspiration for solutions
4. Circular strategies
5. Circular lifecycle assessment
6. Ecodesign

Project work

The contents of the course will be explored at a practical level in class, working progressively in teams to develop a business model that can contribute to the circular economy. Hands-on learning, and learning from project-related discussions and interactions, thus becomes an essential part of the course.

Methodologies

Project work will take us to introduce and apply tools from methodologies such as:

- design thinking
- lean startup

Competences – Learning Results

Competences

Basic Competences

CG3.	Knowledge of basic and technological subjects, which enables students to learn new methods and theories, and gives them versatility to adapt to new environments.
CG4.	Ability to solve problems with initiative, decision, creativity, and critical reasoning; and to communicate and transfer knowledge, abilities and skills, understanding the ethical and professional responsibility.
CG7.	Ability to analyze and assess the social and environmental impact of technical solutions.
CG9.	Management and planning ability in business environments, or in other institutions or

organizations.
CG10. Ability to work in a multilingual, multidisciplinary environment.
CFB6. Appropriate knowledge of the concept of the firm, its institutional and legal setting. Business management.
Specific Competences
CRI9. Basic knowledge on production and manufacturing systems. CRI10. Basic knowledge and application of environmental and sustainability technologies. CRI11. Business management applied knowledge.
Learning Results
At the end of the course the student must have achieved the following outcomes: RA1. Understand the context, the challenges and the opportunities of the circular economy RA2. Get insights and inspiration from real examples of the circular economy RA3. Propose a business model for the circular economy considering technical, economic and environmental aspects RA4. Apply tools for business model design RA5. Engage in collaborative dynamics for team work

TEACHING METHODOLOGY

Classroom Methodology: Activities
1. **Theoretical pills**: the instructor will introduce some background and relevant frameworks to understand the topic. 2. **Real cases**: key concepts will be illustrated using real-life examples and case studies, which can will also become a source of inspiration for students' projects. 3. **Tools & techniques**: the instructor will introduce some key tools and techniques from design thinking and entrepreneurship that can be useful for developing the projects: brainstorming, idea selection, business model design, etc. 4. **Hands-on learning:** we will have some guided dynamics in class to encourage students participation and engagement, and time for team work on the projects applying the tools and techniques explained in class.
Non-Classroom Methodology: Activities
5. **Individual research**: students will be encouraged to do research on their own, both to deepen the understanding of the concepts and methods discussed in class and to discover new resources, related concepts and inspiration for their projects. 6. **Team project**: students will have to work on their projects out of classroom. Team project is the cornerstone of this course: it is here where students should demonstrate their understanding of concepts and their ability to propose innovative solutions, in a process of co-creation and co-learning. The instructor will guide this process and be available for addressing the questions of students.

EVALUATION ACTIVITIES AND CRITERIA

Evaluation activities	Evaluation Criteria	Weight Percentage
Active participation in class	- Quizzes to check understanding of key concepts - Questions and comments in class, and active engagement in the proposed activities - Activities' outcomes	40%
Project-related assignments	- Meeting the assignment - Original and critical analysis - Evolution of ideas	30%
Final project	- Degree to which students apply what they have learned to the analysis of a real situation - Degree of innovation of the proposed solution - Degree of technical & economic feasibility of the proposed solution - Ability to present and communicate the solution	30%

Qualification Criteria

Grading will be based on:

- [40%] Active participation in class
- [30%] Project-related assignments
- [30%] Final project

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade in each graded area (active participation in class, project-related assignments, and final project) of 5 over 10.

Extraordinary session

- [50%] Extraordinary exam
- [50%] Revised final project

WORK PLAN AND SCHEDULE

SUMMARY OF WORKING HOURS OF THE STUDENT			
CLASSROOM HOURS			
Lectures	**Problem solving**		
10	20		
NON-CLASSROOM HOURS			
Autonomous work – research	**Team work - project**		
20	40		
		ECTS CRÉDITS:	**3 (90 hours)**

BIBLIOGRAPHY AND RESOURCES

Basic References

Reference books, articles & videos

Stahel, W. R. (2016). *The circular economy*. Nature, vol. 531, nr. 7595, comment.
[Available from http://www.nature.com/news/the-circular-economy-1.19594]

Ellen MacArthur Foundation (2011). *Re-thinking progress: The Circular economy.*
[Available from https://www.youtube.com/watch?v=zCRKvDyyHml]

Ellen MacArthur Foundation (2013).*Towards The Circular Economy Vol. 1: An Economic And Business Rationale For An Accelerated Transition*.
[Available from https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf]

Koppius, O., Ö.r Özdemir-Akyildirim, and E. van der Laan (2014), *Business Value from Closed-Loop Supply Chains*. Int. J Sup. Chain. Mgt, vol. 3, nr. 4, p 107-120.
[Available from http://ojs.excelingtech.co.uk/index.php/IJSCM/article/view/1006]

Nasr, N. and M. Thurston (2006). *Remanufacturing: A Key Enabler to Sustainable Product Systems*. Proceedings of the 13th CIRP International Conference on Life Cycle Engineering, p 15-18.
[Available from http://www.mech.kuleuven.be/lce2006/key4.pdf]

Ellen MacArthur Foundation, World Economic Forum and McKinsey & Company (2016). *The New Plastics Economy: Rethinking the Future of Plastics*.
[Available from https://www.weforum.org/reports/the-new-plastics-economy-rethinking-the-future-of-plastics/]

Graedel, T.E., E.M. Harper, N.T. Nassar, and B. Reck (2013). *On the materials basis of modern society*. PNAS, pp.1–6.
[Available from http://www.pnas.org/content/112/20/6295.full.pdf]

RSA (2016). *Designing for a circular economy: Lessons from The Great Recovery 2012 – 2016.*
[Available from https://www.thersa.org/globalassets/pdfs/reports/the-great-recovery---designing-for-a-circular-economy.pdf]

SwitchMed (2014) *Create your Green Business! The Handbook for Green Entrepreneurs in the Mediterranean*
[Available from https://www.switchmed.eu/en/corners/start-up/training-materials]

Additional References

Online resources

Ellen MacArthur Foundation: https://www.ellenmacarthurfoundation.org/

Circular Design Guide: https://www.circulardesignguide.com/

Ask Nature: https://asknature.org/

DIY toolkit: http://diytoolkit.org/

Strategyzer: https://strategyzer.com/