COURSE GUIDE
2016-17

COURSE GUIDE

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

Information of Professors	
Professor	
Name	Adela Conchado
Department	Instituto de Investigación Tecnológica (IIT)
Area	
e-mail	adela.conchado@comillas.edu
Tutoring hours	Previous appointment by e-mail

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 considerations, business model design, and supply chain 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 team-work.

Pre-requirements

There are no particular prerequisites to take this course.

CONTENTS

Contents
THEORETICAL BACKGROUND
1: Facts and trends
1.1. Resources & environmental challenges 1.2. Global trends 1.3. Business value in “closing the loops”?
2. Influencing schools of thought
2.1. Craddle to craddle 2.2. Biomimicry 2.3. Industrial ecology
3. Framework for analysis
3.1. The butterfly diagram 3.2. Four design models
CASE STUDIES
▪ Interface inc. ▪ Black bear carbon ▪ Precious plastic… & many more
TOOLS & TECHNIQUES
▪ Design thinking ▪ Idea generation and selection ▪ Business model canvas ▪ Eco-design

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 of the activity.
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 briefly introduce the background and the challenges to be dealt with. 2. **Case studies**: key concepts will be illustrated using real-life examples and case studies. Case studies will also be used as 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
Quizzes on key concepts	- Understanding of concepts	10%
Active participation in class	- Questions and comments in class - Active engagement in the proposed activities	20%
Project-related assignments	- Meeting the assignment - Original and critical analysis	20%
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	50%

Qualification Criteria

Grading will be based on:

- [10%] Quizzes on key concepts
- [20%] Participation in class
- [20%] Project-related assignments
- [50%] 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 the final project of 5 over 10.

Extraordinary session

- [50%] Extraordinary exam
- [50%] 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]

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]

Online resources

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

Additional References

Online resources

A list of online resources will be provided at the beginning of the course as the basis for students own research.