# Course Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Circular economy and eco-industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>DOI-OPT-439</td>
</tr>
<tr>
<td>Degree</td>
<td>Grado en Ingeniería Electromecánica, Grado en Ingeniería Telemática</td>
</tr>
<tr>
<td>Year</td>
<td>4</td>
</tr>
<tr>
<td>Semester</td>
<td>2º</td>
</tr>
<tr>
<td>ECTS Credits</td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Type</td>
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</tr>
<tr>
<td>Department</td>
<td>Industrial Engineering</td>
</tr>
<tr>
<td>Area</td>
<td>Economics and Business Administration</td>
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## Information of Professors

<table>
<thead>
<tr>
<th>Name</th>
<th>Adela Conchado</th>
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<tbody>
<tr>
<td>Department</td>
<td>Instituto de Investigación Tecnológica (IIT)</td>
</tr>
<tr>
<td>Area</td>
<td></td>
</tr>
<tr>
<td>e-mail</td>
<td><a href="mailto:adelaconchado@comillas.edu">adelaconchado@comillas.edu</a></td>
</tr>
<tr>
<td>Tutoring hours</td>
<td>Previous appointment by e-mail</td>
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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 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-requisites

There are no particular prerequisites to take this course.
## 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. Cradle to cradle  
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  

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### 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.

### 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

<table>
<thead>
<tr>
<th>Evaluation activities</th>
<th>Evaluation Criteria</th>
<th>Weight Percentage</th>
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<tbody>
<tr>
<td>Quizzes on key concepts</td>
<td>- Understanding of concepts</td>
<td>10%</td>
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</table>
| 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                                      | 50%               |
|                             | - Degree of technical & economic feasibility of the proposed solution                |                   |
|                             | - Ability to present and communicate the solution                                     |                   |

## 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

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Problem solving</th>
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<tbody>
<tr>
<td>10</td>
<td>20</td>
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#### NON-CLASSROOM HOURS

<table>
<thead>
<tr>
<th>Autonomous work – research</th>
<th>Team work - project</th>
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<tbody>
<tr>
<td>20</td>
<td>40</td>
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ECTS CREDITS: 3 (90 hours)

### BIBLIOGRAPHY AND RESOURCES

#### Basic References

**Reference books, articles & videos**


<table>
<thead>
<tr>
<th>Online resources</th>
</tr>
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<tbody>
<tr>
<td>Ellen MacArthur Foundation <a href="https://www.ellenmacarthurfoundation.org/">https://www.ellenmacarthurfoundation.org/</a></td>
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<table>
<thead>
<tr>
<th>Additional References</th>
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<tbody>
<tr>
<td>Online resources</td>
</tr>
<tr>
<td>A list of online resources will be provided at the beginning of the course as the basis for students own research.</td>
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