# Syllabus

## Course description

<table>
<thead>
<tr>
<th>Course title</th>
<th>Functional Mechanical Design for Energy Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code</td>
<td>47509</td>
</tr>
<tr>
<td>Scientific sector</td>
<td>ING-IND/13</td>
</tr>
<tr>
<td>Degree</td>
<td>Master Industrial Mechanical Engineering</td>
</tr>
<tr>
<td>Semester</td>
<td>I</td>
</tr>
<tr>
<td>Year</td>
<td>II</td>
</tr>
<tr>
<td>Academic year</td>
<td>2019/2020</td>
</tr>
<tr>
<td>Credits</td>
<td>5</td>
</tr>
<tr>
<td>Modular</td>
<td>no</td>
</tr>
<tr>
<td>Total lecturing hours</td>
<td>28</td>
</tr>
<tr>
<td>Total lab hours</td>
<td></td>
</tr>
<tr>
<td>Total exercise hours</td>
<td>18</td>
</tr>
<tr>
<td>Attendance</td>
<td></td>
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<tr>
<td>Prerequisites</td>
<td>Some knowledge of electrical machines is preferred.</td>
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### Specific educational objectives

The course aims at giving the guidelines for the functional design of automatic machines, in particular taking into account mechanical and energetic efficiency. Criteria and methods to analyze and choose mechanical devices and to evaluate the best system to minimize the energy consumption in electromechanical systems will be addressed.

### Lecturer

Roberto Belotti

### Scientific sector of the lecturer

ING-IND/13

### Teaching language

English

### Office hours

By appointment

### Teaching assistant (if any)

- **List of topics covered**
  - Introduction: The functional design. Introduction to functional design, classification of the mechanisms and motion systems.
  - Mechanical components for transfer and transformation of energy. Classification based on function, working principle and performance/efficiency.
• Optimization aimed at improving the quality of motion and efficiency.

**Teaching format**
Frontal lectures, exercises.

**Learning outcomes**

1. **Knowledge and Understanding**
   • Identify the main components and sources of inefficiency in motor-transmission-load systems

2. **Applying knowledge and understanding**
   • Evaluate and select, from the mechanical and energy efficiency point of view, the proper transmission system;

3. **Making judgments**
   • Choose suitable and proper mechanical components for energy transformation and transfer

4. **Communication skills**
   • Ability to structure and prepare scientific and technical documentation

5. **Learning skills**
   • Ability to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation.

**Assessment**

**Formative assessment**
In class exercises and activities (2,3,4,5)

**Summative assessment**

The assessment of the course is:

- **Written exam.**

  Written exam with exercises and questions to test the ability to use and transfer the acquired knowledge as well as to make judgement and use a proper technical language (1,2,3,4).

- **Project work.**

  Short essay on a topic of interest, to be agreed upon with the lecturer (4,5).

**Assessment language**
English

**Evaluation criteria and criteria for awarding marks**
The final grade is the written exam grade, augmented or diminished by at most 1 point, according to the project work evaluation. N.B. The written exam grade must be $\geq 18$ anyway.

**Required readings**
There is no single textbook that covers the entire course. A collection of suggested readings from various sources will be announced during the course.

**Supplementary readings**