Learning objectives of the subject

The aim of this course is to train students in methods of design, dimensioning and evaluation of power electronic systems.

Learning results of the subject:

- Ability to develop models and design nonlinear control schemes of power electronic systems.
- Ability to analyze and design power electronic systems in single-phase and three-phase applications.
- Ability to evaluate the performance of power electronic systems by simulation tools.
- Ability to program digital signal processors (DSP) for control purposes.
- Ability to develop techniques for the design, analysis and evaluation of electronic systems in applications such as automation, aerospace, energy distribution and generation, consumer electronics, biomedicine, etc.
- Ability to synthesize and solve problems related to the electronic engineering discipline, to apply learning techniques in
complex and multiple contexts, to apply previous knowledge to new situations and contexts, as well as the ability to coordinate and work in a team.

- Ability to analyze, design and evaluate electronic systems for power control and energy conversion.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
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</thead>
<tbody>
<tr>
<td>Hours large group:</td>
</tr>
<tr>
<td>26h</td>
</tr>
<tr>
<td>20.80%</td>
</tr>
<tr>
<td>Hours medium group:</td>
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<tr>
<td>0h</td>
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<tr>
<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
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<tr>
<td>13h</td>
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<tr>
<td>10.40%</td>
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<tr>
<td>Guided activities:</td>
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<tr>
<td>0h</td>
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<tr>
<td>0.00%</td>
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<tr>
<td>Self study:</td>
</tr>
<tr>
<td>86h</td>
</tr>
<tr>
<td>68.80%</td>
</tr>
</tbody>
</table>
## Modeling and control of three-phase power converters

**Learning time:** 35h  
Theory classes: 8h  
Laboratory classes: 4h  
Guided activities: 10h  
Self study: 13h

**Description:**  
- Space-phasor representation and frames  
- Modeling of three-phase power converters  
- Control of three-phase power converters

## Simulation of three-phase power converters

**Learning time:** 40h  
Theory classes: 8h  
Laboratory classes: 4h  
Guided activities: 8h  
Self study: 20h

**Description:**  
- Unity-power-factor rectifiers  
- Uninterruptible power supplies  
- Active power filters

## Modeling, simulation and control of electrical micro-grids

**Learning time:** 50h  
Theory classes: 10h  
Laboratory classes: 5h  
Guided activities: 8h  
Self study: 27h

**Description:**  
- Basic concepts of electrical micro-grids  
- Hierarchical control  
- Energy management in micro-grids
Qualification system

The course is evaluated according to the following items:
* Individual written exams (EXAM).
* Individual or in group exercises (EXER).
* Laboratory classes (LABO).
* Achievement of general and specific skills (SKIL).

The final mark (FM) is obtained using the following equation:
FM = 0.3*EXAM + 0.3*EXER + 0.25*LABO + 0.15*SKIL

Bibliography

Basic:

Complementary: