Course guide  
240257 - 240EN39 - Electric Energy Conversion

Unit in charge:  Barcelona School of Industrial Engineering
Teaching unit:  709 - DEE - Department of Electrical Engineering.
Degree:  MASTER'S DEGREE IN ELECTRIC POWER SYSTEMS AND DRIVES (Syllabus 2021). (Compulsory subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: English

LECTURER

Coordinating lecturer: Montesinos Miracle, Daniel
Others:

PRIOR SKILLS

Basic knowledge on electricity, electronics and automation

REQUIREMENTS

None

TEACHING METHODOLOGY

Masterclasses for main concepts, but combining theoretical concepts, exercises and problems.

LEARNING OBJECTIVES OF THE SUBJECT

- Understand the working principles of power electronic systems
- Know the basic topologies and their relations
- Size and select the main components of a power converter

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>36.00</td>
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</tbody>
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Total learning time: 125 h
## CONTENTS

### Introduction to power electronics and its elements

**Description:**
Module 1 Introduction
Definition and Applications of power electronics. Commutation.
Module 2 Basic concepts
Module 3 Real switches
Diode. Thyristor. MOSFET. IGBT. Other types. Losses and drivers
Module 3 Auxiliary elements
Resistor, capacitors, inductors and transformers.

**Full-or-part-time:** 39h
Theory classes: 39h

### Power converters

**Description:**
Module 1 DC/DC converters
Module 2 AC/DC converters: current converters
Module 3 DC/AC converters: inverters
Introduction and applications of AC/DC converters. Synthesis of DC/AC converters. Single phase inverter. Three phase inverters. SVPWM.
Module 4 Applications of power electronics
Renewable Energy applications: wind, PV, microgrids
Motor control applications: industrial VFD, EV powertrain, railway, ships
Power supplies: Uninterruptible Power Supplies, power supplies
Transport and distribution of Energy: HVDC, FACTS, STATCOM, active filters and reactive power compensation
Other applications: induction heating, soldering, electrolysis, lighting

**Full-or-part-time:** 7h
Theory classes: 7h

### Converter control

**Description:**
Module 1 Auxiliary control elements
Voltage and current sensors. Analog and digital control. PWM modulation. Analog to digital conversion.
Module 2 Model and converter control

**Full-or-part-time:** 7h
Theory classes: 7h
GRADING SYSTEM

Final mark = 0,5 final exam + 0,4 lab report + 0,1 lab activities
Those who will not do the final exam or the lab report will be qualified with an NP
In case the reevaluation exam is necessary for you, the same methodology for computing the final mark will be used, but substituting the final exam mark by the mark in the reevaluation exam.

EXAMINATION RULES.

The final exam will be on the dates fixed by the school. The final exam and reevaluation exam consist of theoretical aspects, but also the aspects seen in the lab.

BIBLIOGRAPHY

Basic: