Course guides

230679 - PVS - Photovoltaic Systems

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).

Academic year: 2020  ECTS Credits: 5.0  Languages: English

LECTURER

Coordinating lecturer: Santiago Silvestre Berges

Others: Pablo Ortega Villasclaras
Bahareh Moradi

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

2. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

Learning objectives of the subject:

The aim of this course is to train students in photovoltaic systems. First, we consider the building blocks and describe them taking into account state of the art solar cells and PV modules and the characteristics dependence with irradiance and temperature. Then, using this knowledge, sizing criteria will be described as well as the operating yields. Power electronics components will also be described.

Learning results of the subject:

- Ability to specify and design PV systems for stand alone, grid connected and water pumping applications.
- Ability to calculate the energy performance analysis, return of investment and system reliability.
- Ability to understand operation of state of the art solar cells in flat panel or concentrating systems.
- 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 analyze, design and evaluate electronic systems for power control and energy conversion.
- Ability to understand a photovoltaic system and its components as long as the criteria used to size such systems.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>26.0</td>
<td>20.80</td>
</tr>
<tr>
<td>Hours small group</td>
<td>13.0</td>
<td>10.40</td>
</tr>
<tr>
<td>Self study</td>
<td>86.0</td>
<td>68.80</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

1. Introduction: Solar energy and PV systems

Description:
- Solar energy and renewable sources
- Solar energy availability
- Building blocks of a PV system

Full-or-part-time: 16h
Theory classes: 4h
Self study : 12h

2. Photovoltaic cells and modules

Description:
- Solar cell operation and main characteristics
- PV modules and PV plants
- Available technologies

Full-or-part-time: 20h
Theory classes: 4h
Self study : 16h

3. Main components of a PV system

Description:
- Modules, batteries, DC/DC converters and DC/AC converters
- Safety and monitoring components and measuring systems
- Simulation models

Full-or-part-time: 20h
Theory classes: 4h
Self study : 16h
4. Stand-alone and water pumping PV systems

**Description:**
- Sizing, best practice recommendations
- Applications
- Available technologies

**Full-or-part-time:** 24h
Theory classes: 5h
Laboratory classes: 7h
Self study: 12h

5. Grid connected PV systems

**Description:**
- Inverters characteristics and guidelines for sizing and design
- Long term simulations
- Operation and performance parameters

**Full-or-part-time:** 26h
Theory classes: 5h
Laboratory classes: 6h
Self study: 15h

6. PV Market analysis and legal incentives for PV expansion

**Description:**
- Grid parity and feed-in tariff
- Global market analysis and worldwide trends

**Full-or-part-time:** 19h
Theory classes: 4h
Self study: 15h

**GRADING SYSTEM**

35 % Personal work & Oral presentation
30 % Tasks & Exercises
35 % Laboratory Practices

**BIBLIOGRAPHY**

**Basic:**