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230679 - PVS - Photovoltaic Systems

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 710 - EEL - Department of Electronic Engineering

Academic year: 2017

Degree: DEGREE IN ELECTRONIC ENGINEERING (Syllabus 1992). (Teaching unit Optional)
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2009). (Teaching unit Optional)
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: SANTIAGO SILVESTRE, LUIS CASTAÑER

Others: PABLO ORTEGA, SANDRA BERMEJO

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

- Lectures
- Application classes
- Laboratory practises
- Individual work (distance)
- Exercises
- Oral presentations
- Short answer test
- Extended answer tests (two in the semester and a Final Exam)

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.

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- Ability to understand a photovoltaic system and its components as long a the criteria used to size such systems.

Study load

Total learning time: 125h	Hours large group:	26h	20.80%
	Hours small group:	13h	10.40%
	Self study:	86h	68.80%

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Content

1. Introduction: Solar energy and PV systems

Learning time: 16h

Theory classes: 4h
Self study : 12h

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

2. Photovoltaic cells and modules

Learning time: 20h

Theory classes: 4h
Self study : 16h

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

3. Main components of a PV system

Learning time: 20h

Theory classes: 4h
Self study : 16h

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

4. Stand-alone and water pumping PV systems

Learning time: 24h

Theory classes: 5h
Laboratory classes: 7h
Self study : 12h

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

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5. Grid connected PV systems	Learning time: 26h Theory classes: 5h Laboratory classes: 6h Self study : 15h

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

6. PV Market analysis and legal incentives for PV expansion	Learning time: 19h Theory classes: 4h Self study : 15h

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

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Planning of activities

EXTENDED EXERCISES

Description:
Exercises to strengthen the theoretical knowledge and to work in depth in some subject

ORAL PRESENTATION

Description:
Presentation of a topic.

LABORATORY PRACTISES

Description:
Simulations of Stand-alone and Grid connected PV systems

EXTENDED ANSWER TEST (TOW DURING THE SEMESTER AND A FINAL EXAMINATION)

Description:
Final examination.

Qualification system

Final examination: 50%
Laboratoty practises:25%
Individual assessments: from 25%

Bibliography

Basic:

Castañer Muñoz, L.; Silvestre Berges, S. Modelling photovoltaic systems: using PSpice. Chichester: John Wiley & Sons, 2002. ISBN 0470845287.