RENEWABLE ENERGIES AND ALTERNATIVES

Code: 322039

Main Scientific Area: Automation, energy and cyber-physical systems

Lecturer: Ricardo Jorge Pires Cortinhas

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 45h Total Workload: 81h

ECTS: 5,0

Objectives

The objectives of this curricular unit are:

• Provide an overview of current energy consumption, evaluating the possible evolutions of the sources and energy networks in the future;

• Characterize the conversion, use and storage of energy, using renewable energy sources;

• Evaluate the energy efficiency level of buildings, seeking reduction and optimizing solutions;

• Interpret regulations concerning electric mobility within the electrical installations of type C and identify charging solutions for electric vehicle batteries in buildings.

Learning Outcomes

• Incorporate key concepts and make energy consumption calculations and energy conversion;

• Recognize the sun, the wind, the water and the earth as energy sources, being able to distinguish its main applications and perform calculations in terms of sizing systems;

• Know the main legislation related to energy efficiency, and recognize improvement solutions;

Course Contents

1. Introduction

1.1. Energy Fundamental Concepts

1.2. Current energy consumption

1.3. Climate change and energy use

1.4. National electric system

1.5. Electric grid of the future

2. Energy efficiency

2.1. Applicable Legislation

2.2. Reactive power

2.3. Energy in buildings and industry

3. Sun as energy source

3.1. Fundamentals and Applications

3.2. Solar photovoltaic systems

3.3. Solar modules

3.4. Systems design

4. Wind as an energy source

4.1. Fundamentals and Applications

4.2. Wind Power

4.3. Energy calculation

4.4. Technological Aspects

5. Earth as an energy source

5.1. Fundamentals and Applications

5.2. Geothermal 5.3. Biomass

Recommended Bibliography

Castro, Rui M.G., “Uma Introdução às Energias Renováveis - Eólica, Fotovoltaica e Mini-hídrica “, Instituto Superior Técnico, 2011

Wind Energy Basics: A Guide to Small and Micro Wind Systems - Paul Gipe.

Solar Economy: Renewable Energy for a Sustainable Global Future - H. Scheer.

PowerDown: Options And Actions For A Post-Carbon World - Richard Heinberg.

Curso técnico instalador de energia fotovoltaica - 2.ª edição, 2015 - Publindústria - Manual Oliveira e Filipe Pereira

Laboratórios de Energia Solar Fotovoltaica - 1.ª edição, 2012 - Publindústria - Manual Oliveira e Filipe Pereira

Guia de manutenção de instalações fotovoltaicas - 1.ª edição, 2013 - Publindústria - Filipe Pereira

Learning and Teaching Methods

The main goal of the CU "Renewable and Alternative Energies" is to draw an overview of energy consumption nationwide and worldwide, looking for viable alternatives for sustainable energy models that could be adopted.

By exploring the possibilities in renewable energy, the various strands solar, wind, water and terrestrial, the student will get a broad overview of the state of the art nowadays.

After that will be given some emphasis on rationalization of consumption, being made an analysis of energy efficiency, both residential buildings and services, and industry.

Assessment Methods

The approval in this Curricular Unit is obtained by achieving a grade equal or superior to 10 (ten) points, on a 0 to 20 scale, as a result of the theoretical-practical component evaluation, by doing one written test (70%) and a set of practical works to be done during the semester (30%). Attendance, punctuality and participation in class will be valued.