

Sustainable Energy Systems Studies at the University of Lisbon

J. Maia Alves^{1*}, João M. Serra¹, Miguel C. Brito¹, Guilherme Carrilho da Graça¹, Pierre Hollmuller¹, Killian Lobato¹, António Vallêra¹, António Joyce², Isabel Cabrita³

¹ University of Lisbon, Faculty of Sciences, Department of Geographical Engineering, Geophysics and Energy

² INETI, Department of Renewable Energies, Lisbon, Portugal

³ INETI, Department of Energy Engineering and Environmental Control, Lisbon, Portugal

* Corresponding Author, jma@fc.ul.pt

Abstract

Since the academic year of 2006/07 the University of Lisbon offers a 5-year Integrated Master Degree on Energy and Environment Engineering. The University of Lisbon is also one of the Portuguese Universities involved on the MIT-Portugal Program, in particular in the area of Sustainable Energy Systems. In this context, a Doctoral Program and Diploma of Advanced Studies were created in the academic year of 2007/08. This set of Sustainable Energy Systems Studies at the University of Lisbon, and the connected research activity, are both shortly presented.

Keywords: Renewable Energy Education

1. Introduction

In the academic year of 2004/05 the University of Lisbon started a 4-year graduation course on Energy and Environment at the Faculty of Sciences. This course, with a strong renewable energy flavour, was launched in close cooperation with the National Institute of Engineering, Technology and Innovation (INETI) involving the Renewable Energy and the Energy Engineering & Environmental Control departments of this institution. This graduation course was adapted to the Bologna process during the academic year of 2006/07, as a 5-year Integrated Master Degree on Energy and Environment Engineering which is currently attracting a significant number of good students, both in the first and in the fourth years (1st and 2nd cycles respectively). The first students are expected to finish this Master Degree in the academic year of 2008/09.

To complete a coherent set of programs in this area, the University of Lisbon launched a Doctoral Program and Diploma in Advanced Studies in the area of Sustainable Energy Systems in the academic year of 2007/08. This was done in the context of the MIT-Portugal Program.

2. Master Degree on Energy and Environment Engineering

The Integrated Master's degree on Energy and Environment Engineering is a 5 year program that graduates professionals with capacity of intervention in the areas of renewable energies, energy efficiency, and mitigation of the environmental impacts of conventional energy production technologies. Conclusion of the first three years of the program (180 ECTS) gives the student a Bachelor's Degree in Engineering Sciences, with specificity in Energy and Environment. Although this graduation degree allows for a straight access to the labour market, it is mainly a mobility diploma,

permitting to apply for second cycles (Master's degrees), namely, in other Engineering areas. Reciprocally, the 4th year of the course provides an access point for students with other first cycle backgrounds.

The first three years of the Master program are similar to any other mainstream Engineering programs, like Mechanical, Electrical or Electronic Engineering, but include a few “flavour” short courses like, for instance, “Earth, Environment and Climate”, “Energy Sustainability”, “Climate Change”, or “Solar Radiation and Energy”. During the first three semesters of the last two years, the students attend 6 ECTS mandatory courses on “Energy Efficiency”, “Electrical Distribution Networks”, “Combustion Technologies”, “Energy and Environment”, “Climate Changes and Emission Trading”, “Hydrogen and New Energy Vectors” and “International Energy and Environment Law”. During this period the students also attend six 6ECTS optional courses to be chosen from the following group: “Photovoltaic Energy”, “Solar Thermal Energy”, “Wind Energy”, “Heat Transfer in Buildings”, “Energy Systems in Buildings”, “Geothermal Energy”, “Biomass Energy” and “Ocean Energy”. Two of the six optional courses can be substituted by professional activity in a relevant area for the Master program.

The Master’s course is organized by the Department of Geographic Engineering, Geophysics and Energy (DEGGE), a teaching and research unit of the Faculty of Science of the University of Lisbon, with competences in the areas of Geophysics, Geographical Information Systems and Renewable Energies, in particular, Solar Photovoltaic and Energy in Buildings. Teaching is further supported by research developed by the following groups: SESUL-Centre for Sustainable Energy Systems of the University of Lisbon (<http://sesul.fc.ul.pt/>), CGUL-Centre of Geophysics of the University of Lisbon (<http://www.igidl.ul.pt/>), the Department of Renewable Energies (DER - <http://www.ineti.pt/uo/uo/?uo=143>) and the Department of Energy Engineering and Environmental Control (DEECA - <http://www.ineti.pt/uo/uo/?uo=141>) of INETI.

Since the first graduations will take place by the end of the 2008/09 academic year, information about the acceptance of these students by the labour market isn’t yet available. However, a significant number of successful summer internships in companies were carried out this year by the most advanced students. The result of these first contacts seem to be positive, since the companies involved are now clearly open to maintain the contact with these students, creating an opportunity for them to develop their Master Thesis in a company environment.

Moreover, the foreseen growth of the renewable energy industry in Europe, such as estimates by the European Renewable Energy Council, forecasts that that by 2010 their will be about 1 million jobs in the area of the renewable energies, and doubling by 2020. In order to ease integration in the labour market of recently formed students, connections with leading companies in the areas of this Master's degree are being actively promoted.

3. Doctoral Program in Sustainable Energy Systems

The Doctoral Program in Sustainable Energy Systems of the Faculty of Sciences of the University of Lisbon (<http://mit.fc.ul.pt>) was developed in the context of the MIT-Portugal Program, in collaboration with the Massachusetts Institute of Technology (MIT), the Oporto University (FEUP), the Technical University of Lisbon (ISEG and IST) and the University of Coimbra. The first year of the doctoral program conjugates formal postgraduate teaching with development of individual research projects.

Some of the courses of the 4th and 5th years of the Master Degree program serve as optional disciplines for the Doctoral Program in Sustainable Energy Systems of the Faculty of Sciences of the University of Lisbon.

The actual PhD projects are integrated within national and international research projects that are conducted by certified research centres, in particular the SESUL and the CGUL.