**Code: 1680** **Environment and Energy**
**Degree: 1st cycle – Environmental Engineering**
**Curricular Year: 3rd** **Semester Course: 2nd**
**Credits: 6 ECTS** **Compulsory**
**Language:** Portuguese/English
**Responsible:** Olívio Godinho Patrício
**Other lecturer (s):** Elizabeth da Costa Neves Fernandes d'Almeida Duarte and Cláudia Saramago de Carvalho Marques dos Santos Cordovil
**Web Site:** http://www.isa.utl.pt/home/node/4004

1. **Contact hours:**
   **Lectures** 28 **Praticals/Laboratory** 42 **Others** 14 **Total** 84

2. **Objectives**

- Provide the student with a general overview of energy; analyzing both primary and secondary sources
- Provide the student with knowledge of materials, equipment and systems which allow him to understand the energy production/conversion processes from waste, bio fuels and biomass in such a way as to minimize negative environmental effects and reduce energy dependence.
- Contribute to an understanding of the workings of industrial plants for the conversion/production of renewable, non-renewable and alternative energies and their impact on the environment.
- Contribute to the development of activity directly or indirectly related to the consumption and production of energy with a view to improving energy efficiency and reducing environmental impact.

3. **Programme:**

1 – General concepts of energy, units and energetic equivalents
  1.1 – Energy sources and forms
  1.2 – The energy conversion process
2 – The integration of renewable energies in order to minimize environmental impact in urban, agricultural, forestry and industrial activities.
3 – National strategies and the implementation of the “Renewable Energy” directive.
4 – Characteristics of waste and biomass which can be used for energy production
5 – Production/conversion technologies for primary energies
6 – Processes for the transformation and use of biomass energy: biological processes and chemical, biochemical, physical and physical-chemical processes.
  6.1 – Pyrolysis
  6.2 – Gasification
7 – Bio fuels
  7.1 – Biodiesel, Biomethanol, Bioethanol and Biogas
8 – Energy efficiency from the obtention of bioenergies. Treatment and Valorization of Bioenergy sub-products
9 – Production/conversion technologies of secondary energies.
10 – Environment and economic aspects of renewable energy production
11 – Integrated energy production systems in special circumstances. Case studies.
12 – Solar energy
  12.1 – Solar thermal energy
  12.2 – Solar photovoltaic energy
  12.3 – Solar passive energy
  12.4 – Solar electrical energy
13 – Wind energy
14 – Geothermal energy
15 – Mini hydroelectric power generation
16 – Cogeneration and trigeneration.
17 – Energy efficiency. General considerations on energy production in special circumstances
18 – Sea energy
19 – Nuclear energy
20 – Final considerations on energy

**4. Bibliography:**

**Main Bibliography**

- Cordovil, C., *Elementos de apoio à disciplina de Energia e Ambiente*, Serviço de Reprografia do ISA, 2010.
- Duarte, E., *Elementos de apoio à disciplina de Energia e Ambiente*, Serviço de Reprografia do ISA, 2010.
- Patrício, O., *Elementos de apoio à disciplina de Energia e Ambiente*, Serviço de Reprografia do ISA, 2010.

**Other Bibliography**

- Collares Pereira, M., *Energias Renováveis, a Opção Inadiável*, SPES, 1998.
- Hinrichs, R. e Kleinback, M., *Energia e Meio Ambiente*, Thomson, 2004.

**5. Assessment:**

Assessment is made through two written tests and a research work on a proposed theme. The students are dispensed from the final assessment if they have obtained a final classification of 10 marks or more in the arithmetical average.
Students who at any point of the assessment process have a mark lower than 8 out of 20 will have to sit the final exam.

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| **6.** Estimated Workload: | 168 | Hours |
| **7.** Last Update: | 13/7/2010 | |