

## Energy Sources

Academic Year: ( 2019 / 2020 )

Review date: 20-01-2020

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: LECUONA NEUMANN, ANTONIO

Type: Compulsory ECTS Credits : 3.0

Year : 2 Semester : 1

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Applied Physics  
 Engineering Thermodynamics  
 Introduction to heat machines and engines  
 Heat transfer

## OBJECTIVES

Knowledge and capabilities for understanding, analyzing, exploiting and managing the different energy sources  
 Knowledge and capabilities to understand energy politics and standards

## DESCRIPTION OF CONTENTS: PROGRAMME

1. Energy and society. Primary sources of energy, transformations and consumption. Historic evolution. Energy and development. Energy intensity. Energy politics.
  2. Resources and energy consumption. Environmental impact. Energy balance. Efficiencies and their limits.
  3. Classification of energy sources. renewables and non renewable energy sources.
  4. Nuclear energy. Fission and fusion. Reactors and power plants. Fuel cycle, residues.
  5. Oil. Liquid and gaseous fuels. Uses and prices. Conversion.
  6. Coal, Characteristics and uses. Politics. Carbon emissions abatement.
  7. Renewable energy, classification and uses. Politics. Solar energy. Sun geometry. Sky model.
  8. Solar-thermal energy for the production of heat, cold and electricity. Collectors. Powerplants.
  9. Photovoltaic energy. Energy storage. Cost of energy.
  10. Atmospheric energy. Wind energy. Development and management.
  11. Wind energy, technology. Hydroelectric and marine energy.
  12. Biomass. Classification and uses. Transformations.
- Each item participates approximately in equal part of 70% of the total ECTS. 20% corresponds to the classroom exercises and 10% to the practicals.

## LEARNING ACTIVITIES AND METHODOLOGY

Master classes, where the knowledge that the student must acquire will be taught. For facilitating its development the students will have a recommendation of basic references for following the conferences and develop the following work.

In class problem and questions solution and discussion, where the problems posed to the students will be explained.

Solving application exercises and quizzes for self-evaluation and acquire the required capabilities.

Computer or laboratory practicals, where problems are solved using computers.

1. Environmental impact of atmospheric pollutants and economic cost of the energy consumption of a dwelling, or equivalent.
2. Estimation of the amortizing time of a domestic condensing boiler, or equivalent.

There is a set of teaching videos styled as MOOC for helping in basic concepts and for performing exercises.

## ASSESSMENT SYSTEM

Theory 90% that is formed by:

-60% of continuous grading formed by one or two class exercises of each student at announced days, depending on the agenda for the year.

-40% for the final written exam of the whole contents.

They will grade in a global way the knowledge, abilities, and capabilities acquired during the course

using test and short quizzes, besides numerical application exercises.

-10% the grading of the compulsory practicals. If the practicals have not been passed during the course an extraordinary practical exam must be passed by asking the practical coordinator at the end of the teaching. This is also possible for the documented impossibility to attend the practical sessions.

Delivering proposed exercises in a voluntary action could help reaching a determined grade. Only those cases will be considered.

Up to an additional 10% of the grade can be obtained attending voluntary sessions and/or performing a voluntary exam about them.

<b>% end-of-term-examination:</b>	40
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60

#### BASIC BIBLIOGRAPHY

- Lecuona A Apuntes para la asignatura Fuentes de Energía, Servicio de reprografía de la UC3M, Open Course Ware UC3M, Aula Global, 2012
- Legrand M Apuntes para la asignatura Fuentes de Energía, Servicio de reprografía de la UC3M, Open Course Ware UC3M, Aula Global, 2013
- López R Guiones de prácticas, Servicio de reprografía de la UC3M, Open Course Ware, 2013.

#### ADDITIONAL BIBLIOGRAPHY

- Fay J. A., Colomb D. S Energy and the Environment, Oxford University Press, 2002