

Energy Sources

Academic Year: (2022 / 2023)

Review date: 29-07-2022

Department assigned to the subject: Department of Thermal and Fluids Engineering

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
 Environmental impacts and costs
 Understanding of the energy transition and decarbonization

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 proportional to its teaching time in both exams of continuous evaluation, up to 14/15, and 1/15 for the practical.

A detailed program, available in the teaching material, will expand this information. It will be delivered when the resources applicable are known, academics, laboratory and informatics.

LEARNING ACTIVITIES AND METHODOLOGY

- Theoretical conferences. masterclasses. 1.3 ECTS
- Application and exercises classes. Applications of the theory. 1.1 ECTS
- Practice in a computer room or laboratory. 0.2 ECTS
- Individual or group work by students. 0.4 ECTS. Homework delivered as a report.

Masterclasses, 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 or proposed by the students, will be explained.

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

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

Tentative:

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 with basic concepts and for performing exercises.

A set of MOOC videos is available for basic concepts and for performing the exercises.

ASSESSMENT SYSTEM

Theory 14/15 is formed by:

-Continuous grading formed by two class exercises of each student on announced

days, depending on the agenda for the year., and the rooms available and on the academics available for watching.

-In the final written exams of the whole program, it is possible to improve the grading of each of both parts separately.

They will grade in a global way the knowledge, abilities, and capabilities acquired during the course using tests and short quizzes, besides numerical application exercises.

-1/15 the grading of the compulsory practical. If the practicals have not been passed during the course an extraordinary practical exam must be passed by asking the practicals 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 to reach a determined grade. Only if the theory grading is approved.

% end-of-term-examination: 40

% of continuous assessment (assignments, laboratory, practicals...): 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

- Lecuona A 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.

- William C. Reynolds (Author), Piero Colonna Thermodynamics: Fundamentals and Engineering Applications , Cambridge University Press, 2018

ADDITIONAL BIBLIOGRAPHY

- Many. Internet Many. There are links on the class notes delivered, many, many, but recent