Renewable Energies

Academic Year: (2023 / 2024) **Review date: 28/03/2023 13:01:25**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: GARCIA HERNANDO, NESTOR

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Thermodynamics.
Heat Transfer
Fluid Mechanics.

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
CG4. Knowledge and ability to apply current legislation as well as the specifications, regulations and mandatory standards in the field of Industrial Engineering.
CG5. Adequate knowledge of the concept of company, institutional and legal framework of the company. Organisation and management of companies.
CG6. Applied knowledge of company organisation.
CG8. Knowledge and ability to apply quality principles and methods.
CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

OBJECTIVES

Objectives

To introduce to the student in the socials problems associated with the consumption of conventional energy sources

To provide the student with a specific knowledge about the captation, conversion, and use of renewables sources, considering energetical, economical and environmental aspects.

To evaluate the renewable technologies and the energy savings for the economy and the nature conservation.

At the end of the course the student will be able to:

- Understand the energy consumption of fossil origin and their associated environmental impact, as well as the basic concepts of these technologies.
- Evaluate conventional and renewable energy sources.
- Design renewable systems for the production of tape hot water, heating and refrigeration.
- Evaluate and design biomass systems.

DESCRIPTION OF CONTENTS: PROGRAMME

1.- Introduction to energy sources.
2.- Pollutant emisions assocated to energy conversion.
3.- Wind Energy.
4.- Thermo solar energy (low temperature).
5.- Photovoltaic solar energy.
6.- Thermoelectric solar energy.
7.- Biomass energy.
8.- Other renewable energy (Mini-hicraulic, Geothermal, Wave energy).

LEARNING ACTIVITIES AND METHODOLOGY

The methodology will include:

1. Lectures where the main concepts are explined. Lecture notes and bibliography will be available for the students to facilitate learning.
2. Problems solving classes where the mathematical proceduce to analyze renewable energy system will be established.
3. Problem solved by the student to consolidate the knowledge adquired in the classes.
4. Reports writing by the students concerning renewable energies.
5. Laboratory works based on informatic calculation; visits to experimental installations concerning renewable energies.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

The evaluation will be based in the following criterias:

- Individual problems solving.
- Group reports.

A final test will be carried out to evaluate the global knowledge adquiered by the students.

BASIC BIBLIOGRAPHY

- A. Goetzberger and V.U. Hoffman Photovoltaic Solar Energy Generatio, Springer, 2015

- John A. Duffie and William A. Beckman Solar Engineering of Thermal Process, John Wiley & Sons, 1980 o posterior

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