66427 - Design of thermal systems

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	536 - Master's in Mechanical Engineering
ECTS	4.5
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

This course pertains to the elective module Advanced design of energy plants (second semester) of the Masters program in Mechanical Engineering. Its main objective is to provide to the students with the required skills and tools to analyze, sizing, select and improve conventional and advanced thermal devices and energy plants. The applications are focused both on the scientific and technological aspects as well as on economic and environmental issues.

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process that is designed for this subject is based on the following: 1. Lectures, given to the entire group, in which the teacher will explain the basic principles of the subject and resolve some representative problems of implementation of the subject to realistic cases. the participation of students in this activity will be sought. In parallel, the student must perform work study staff for better utilization of classes. 2. Troubleshooting and case studies. Practices

computer simulation and laboratory are distributed throughout the semester and whose assessment will form part of the final grade for the course. 3. Work tutored. Critical analysis of the state of the art equipment and advanced energy systems. Application of specialized software tools for analysis, design and / or operation of equipment and advanced energy systems. 4. Academic Tutorials: The teacher will provide the student certain procedures for approach and resolving doubts. mandatory tutoring assistance for monitoring case studies and tutored work will be scheduled.

5.2.Learning activities

The program that the student is offered to help you achieve the expected results includes the following activities ... Attended class (type T1). Lectures of theoretical contents and application. They will present the concepts and fundamentals basic equipment and thermal installations and their application in advanced energy production systems. The contents developed are: * Energy sources. renewable and non-renewable energy in heating installations. * Sources specializing in advanced equipment and systems for energy production information. * Thermal solar energy. solar thermal installations. Applications in industry and buildings. * Advanced technologies for electricity production. Solar Thermal Power. clean coal. Fuel cells and hydrogen. * Advanced systems cogeneration and polygeneration. energy recovery from waste. * Distributed generation. District heating and cooling. Energy storage. * Evaluation and optimization of energy systems. Energy, economy and sustainability Laboratory Practice (type T3). practical sessions will be held on subject content Work (T6 type). Activities that the student will personally and that the teacher will propose throughout the teaching period. With some regularity, Professor schedule tutoring sessions in order to keep track of progress.

5.3.Program

* Energy resources. Renewable and conventional energy resources in thermal plants.

* Specialized sources of technical information for devices and advanced energy systems.

* Solar thermal energy. Solar thermal energy plants. Applications to the industry and to the residential-commercial sector.

* Advanced power plants. Thermoelectric Solar. Clean coal technologies. Fuel cells and hydrogen.

* Advanced cogeneration and polygeneration systems. Waste to energy.

* Distributed generation. District heating and cooling. Energy storage.

* Evaluation and optimization of energy systems. Energy, economy and sustainability.

5.4.Planning and scheduling

Communication between the student and the teacher will be managed throughout the course through the platform of Digital Teaching Ring (ADD) of the University of Zaragoza. Here the teacher can distribute course materials (notes, presentations, and problems solved cases , technical and economic information on equipment and thermal installations and advanced energy production systems , specialized software, etc.) , make announcements and notifications students , etc.

66427 - Design of thermal systems

5.5.Bibliography and recomended resources

- G Sarlos et al. *Systemes Energetiques* . Presses Polytechniques Romandes, 2003.

RE Putman. *Industrial Energy Systems: Analysis, Optimization and Control* . ASME, 2004 (TERMO 30).

M Kaltschmitt et al. *Renewable Energy - Technology, Economics and Environment* . Springer, 2007.

JA Duffie, WA Beckman. *Solar Engineering of Thermal Processes* . Wiley, 2013 (TERMO 55).

S Kalogirou. *Solar Energy Engineering - Processes and Systems* . Elsevier, 2009.

TC Elliot et al. *Standard Handbook of Powerplant Engineering* . McGraw-Hill, 1998 (ELECTROT 182).

N Petchers. *Combined heating, cooling and power handbook* . Fairmont Press, 2003 (TERMO 206).

S Frederiksen, S Werner. *District Heating and Cooling* . Studentlitteratur, 2013.

I Dincer, M Rosen. *Thermal energy storage - Systems and applications* . Wiley, 2002 (TERMO 187).

JW Tester et al. *Sustainable Energy - Choosing among options* . MIT Press, 2005.