Electric power stations I

Academic Year: (2023 / 2024) **Review date: 10/05/2023 12:11:16**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: VEGA BLAZQUEZ, MERCEDES DE

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Thermal engineering

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.
COCIN1. Ability to draft, sign and develop projects in the area of industrial engineering for construction, renovation, repair, preservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial plants and installations and automation and manufacturing processes.
COCIN4. Ability to resolve problems with initiative, decision-making, creativity, and critical reasoning skills and to communicate and transmit knowledge, skills and abilities in the Industrial Engineering field.
COCIN5. Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar jobs.
CEP1. Capacity to design a system, component or process in the area of electrical engineering in compliance with required specifications.
CEP2. Knowledge and ability to apply computational and experimental tools for analysis and quantification of electrical engineering problems.
ECRT9. Ability to design electrical power plants.

By the end of this content area, students will be able to have:
RA1.3. Coherent knowledge of the branch of electrical engineering including some at the forefront of their branch in electric power generation.
RA2.1. The ability to apply their knowledge and understanding to identify, formulate and solve problems of electric power generation using established methods.
RA2.2. The ability to apply their knowledge and understanding to analyse engineering products, processes and methods.
RA2.3. The ability to select and apply relevant analytic and modelling methods in electric power generation.
RA3.1. The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements.
RA3.2. An understanding of design methodologies, and an ability to use them.
RA4.1. The ability to conduct searches of literature, and to use data bases and other sources of information.
RA4.2. The ability to design and conduct appropriate experiments, interpret the data and draw conclusions.
RA5.1. The ability to select and use appropriate equipment, tools and methods in electric power generation.
RA5.2. The ability to combine theory and practice to solve electrical engineering problems.
RA5.3. An understanding of applicable techniques and methods in electric power generation, and of their limitations.

RA5.4. An awareness of the non-technical implications of engineering practice.
RA6.3. Demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice.

OBJECTIVES

The objectives of this course are to provide a sound basis in thermodynamics of vapor and gas power systems, employed in electric power plants, and study their operating principles and technology as well as to provide the operating and characteristics of hydraulic turbines and power plants.

At the end of the course, the student will be able to:
-Identify the main systems of a thermal power plant and understand its operation;
-Identify the main systems of an hydraulic power plant and understand its operation;
-Evaluate the performance of the energy conversion processes taking place in the power plants
-Analyze energy savings and environmental impact of power plants.

At the end of the course, the student will be able to:
· identify the characteristics, requirement and economic considerations of energy systems in their relationship with professionals in this sector.
· understand the mechanical-thermal systems that interact with the most common configurations of electric generators and the important phenomena influencing the quality of the energy produced.
· have skills to work in power stations or companies operating such stations where they will be compulsory to interact with professionals specialising in energy matters.
· better understand the technical and operative documentation of electricity generating groups and modules.
· behave as professional who must be responsible for saving energy.

During the course the following skills will be trained:
-solve problems
-find, communicate and discriminate relevant information concerning power plants
-work in groups in order to solve complex problems

After the course, the student is expected to have
. A critical attitude versus the analysis of the performance and operation of the systems
. A colaborative spirit in order to obtain from different agents the information and knowledge necessary to complete complex problems

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DESCRIPTION OF CONTENTS: PROGRAMME

Energy. Sources of energy. Electric sector
Energy conversion plants.
Classification of types of power stations.
Thermal power generation. Steam power plants. Solar thermal power plants. Nuclear power plants. Alternating engines. Gas turbines.
Hydraulic plants.
Cogeneration.

LEARNING ACTIVITIES AND METHODOLOGY

(1) Magister courses
(2) Problems solved by the teacher
(3) Problems solved by the pupils
(4) Practice in laboratory.
(5) Project in groups
Answers and the correction of the problems is done in common and this may serve to develop the hability to analyze and communicate relevant information.

ASSESSMENT SYSTEM

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

The evaluation is based on:
-exercices etc.
-Individual evaluation in short tests (35%): 2 exams
-Final exam (50%).
-Project in groups (15%) : Design and Performance of a powerplant system to respond for a given demand over a period of time.

BASIC BIBLIOGRAPHY

- Breeze, Paul A. Power generation technologies , Elsevier, 2005

- El-Wakil, Mohamed Mohamed Powerplant technology , McGraw-Hill, 1984

- Elliott, Thomas C. Standard handbook of powerplant engineering, McGraw-Hill, 1998

- Moran, Michael J. Fundamentos de termodinámica técnica , Reverté, 2004

ADDITIONAL BIBLIOGRAPHY

- Drbal, Lawrence F. Power plant engineering, Kluwer Academic Publishers, 2003

- J.A. Soriano Termodinámica Lógica y Motores Térmicos, Ciencia 3, 1999

- S.L. Dixon Fluid Mechanics and Thermodynamics of Turbomachinery, Butterworth, 1999

- Sabugal García, Santiago Centrales térmicas de ciclo combinado / teoría y proyecto, Díaz de Santos, 2006