COURSE DATA

Data Subject	
Code	34785
Name	General services and auxiliary systems
Cycle	Grade
ECTS Credits	4.5
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	School of Engineering	4	First term

Subject-matter

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	23 - Optional subjects	Optional

Coordination

Name	Department
FERNANDEZ DOMENE, RAMON MANUEL	245 - Chemical Engineering
PICAZO RODENAS, MARIA JOSE	245 - Chemical Engineering

SUMMARY

The course General Services and Auxiliary Systems generally aims to provide students with practical knowledge and operational energy services necessary for the operation of industrial facilities. The course addresses in a comprehensive and integrated way various support systems necessary in almost any chemical plant (mains water, electric and thermal energy, transport of materials, fire protection).

This is an elective course that is taught quarterly basis in the fourth year of an undergraduate degree in Chemical Engineering. In the curriculum currently in place consists of a total of 4.5 ECTS. The contents of the course are divided into four sections:

- Fire protection.
- Energy services.
- Operational services.
- Electrical installations.

Observations: The classes will be taught in the language as stated in the course sheet available on the website of the degree.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is necessary that the student has acquired the skills of the core subjects of Chemical Engineering Applied Thermodynamics and Heat Transfer, Fluid Mechanics, Electrical and Electronic Principles and Graphic Expression.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1401 - Degree in Chemical Engineering

- O1 - More comprehensive skills than those acquired in compulsory subjects.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Learning results

- To understand the fundamentals of fire water networks and their importance in industrial facilities.
- To know the different types of industrial equipment based for steam generation.
- To know the operation and perform energy analysis of cogeneration plant.
- To identify the major variables and parameters for control or optimization of different energy production operations and other ancillary services.
- To know the types and characteristics of industrial boilers and furnaces.
- To know the modes of production cooling and to analyze the machines and mechanical compression refrigeration systems and absorption.
- Understand the fundamentals for designing networks of drinking water, sanitary and industrial manufacturing facilities.
- To know the basis for the distribution of compressed air and other industrial gases within a facility.
- To understand the fundamentals of electrical installations for use in their respective fields of application.
- To understand the elements of power lines, their essential characteristics, their maneuvers and possible risks in order of their application for the design, estimating, project power lines.
- To know the material transport systems for industrial plants inside.
- To know the rules and regulations in force in the matter.

(Skill O1).

Skills to acquire

The student must be able to:

- Select the different elements of active and passive fire.
- Dimension generating equipment and steam distribution networks.
- Analyze the main technical aspects of cogeneration systems.
- Correctly calculate the main parameters cycles quantifiers cooling machines.
- Estimate the need for water supply to an industrial and distribution network dimensioning.
- Estimate the need for compressed air supply to an industrial and distribution network dimensioning.
- Select the materials commonly used in the design of low voltage installations.
- Dimension properly basic elements of a low-voltage installation.
- Operate specifications, regulations and mandatory standards.

DESCRIPTION OF CONTENTS

1. Introduction

Auxiliary services in the chemical industry.
Types of services and location in the chemical plant.
Energy needs and services in the plant.

2. Energy services

Steam generation. Steam distribution network.
Cogeneration systems.
Refrigeration systems.

3. Antifire systems

Firestop Systems.
Active Protection Systems.
Regulation
Calculating the Equipped Fire Hydrant Networks.

4. Operational services

Tap water and sanitary water. Industrial water.
Compressed air. Other industrial gases.

5. Electrical facilities

Introduction.
Switchgear.
Calculation and design of three-phase and single phase systems.
Transformers.
Protection systems: overcurrent and overvoltage devices. Earthing devices.
Lighting installations.
Distribution boards.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	25,00	100
Classroom practices	20,00	100
Development of group work	7,00	0
Development of individual work	20,00	0
Study and independent work	20,00	0
Preparing lectures	13,00	0
Preparation of practical classes and problem	7,50	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

Lecture sessions: We will use the lecture model, where the teacher will give an overview of the issue impacting on the key to understanding it. Also he/she will recommend adequate resources for the further deepening of the subject by the student.

Practical sessions: Practical classes will complement the theoretical activities in order to apply the basic concepts and extend them with the knowledge and the experience that the students acquire during the course. This will be done in the classroom or in small groups. They include the following types of classroom activities:

- Classes of problems in the classroom. The professor will explain a number of sample problems that allow students to acquire the necessary skills to analyse, formulate and solve the problems of each unit. It will enhance students' skills for decision-making.

- Discussion sessions and problem solving. In these sessions, to be held in small groups, we will analyse and discuss a series of exercises or works previously raised by the teacher and the worked by the students in small groups.

Tutorials: The tutorials will arise as voluntary sessions to resolve any doubts arising in the resolution of problems that students must perform on their own.

(Skill O1).

EVALUATION

Method of evaluation A:

The evaluation of the student learning will take place through continuous assessment and final evaluation.

- **Continuous assessment**: It is based on:

  - Student participation in the teaching-learning process, given the resolution of questions raised in class, individually and / or in small groups (15% of the final grade).
  - The resolution of a number of problems or activities that students must solve, individually or in small groups, and deliver on the date indicated (35% of the final grade).

- **Final Assessment**: The student must make a single objective test consisting of an examination at the end of the semester that will be valued at 50% of the final grade. The exam will consist of both theoretical and practical issues as problems in order to verify that they have assimilated the basic concepts of the subject.

To qualify for this type of evaluation, the student must deliver 75% of the issues, problems or proposed activities.

Method of evaluation B:

Alternatively, to the evaluation method described above, the evaluation may be performed by a final exam counting 75% of the final mark, keeping the assessment of the activities developed during the course, but with a proportionally reduced weight.

In both evaluation methods, to pass is necessary to obtain an average rating of 5 out of 10, provided on the final exam to obtain a grade equal to or greater than 5 points (out of 10).

(Skill O1).

Anyhow, the evaluation system will be based on the guides stated in the “Reglament d’Avaluació i Qualificació de la Universitat de València per a Graus i Màsters” (ACGUV 108/2017)

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

Basic

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- The Steam and Condensate Loop, Spirax-Sarco Ltd.
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- Lagunas Marqués, A. Instalaciones eléctricas de baja tensión comerciales e industriales : cálculos eléctricos y esquemas unifilares. Thomson. Paraninfo, Madrid, 2005.
- Carrasco, E. Reglamento electrotécnico para baja tensión: e instrucciones técnicas complementarias (ITC) BT01 a BT51. Real Decreto 842/2002: índice analítico de términos más utilizados. Editorial Tébar. España, 2007 (ebook)

Additional

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- Gaffert, G. A. Centrales de vapor. Editorial Reverté, Barcelona 1981.
- Calventus, Y y col., Tecnología energètica y medio ambiente, Tomo II, Ediciones UPC, 2006
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- López López, A.; López Toro, L.M.; López Toro, F.J. Instalaciones eléctricas de baja tensión 2003: teorías y prácticas para la realización de proyectos y obras. Ediciones Díaz de Santos. España. 2007 (ebook)