COURSE DATA

DATA SUBJECT

Code: 34782
Name: Energy technology and process integration
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	Escola Tècnica Superior d'Enginyeria	4	Second quarter

SUBJECT-MATTER

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

COORDINATION

GIMENEZ GARCIA JUAN BAUTISTA

MARTINEZ SORIA VICENTE

SUMMARY

The elective course ***Energy Technology and Integration*** is taught in the fourth year of the Chemical Engineering degree. It consists of 4.5 ECTS in the curriculum. This course aims to provide students with practical knowledge related to technology, management, integration and energy efficiency of processes and equipment. This course serves as a complement to the knowledge acquired in previous courses related to energy and its use, as well as in the design of processes and equipment involved in energy transfer, such as 'Applied thermodynamics and heat transfer' and 'Basic operations in chemical engineering II'.

The contents of the course are summarized in: energy sources, fuels and combustion, energy integration and efficiency, renewable energy technology, energy management, cogeneration systems and furnaces.

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

Student should have acquired the skills of the subjects: Basis of Chemical Engineering I and II, Applied Thermodynamics and Heat Transfer, Fluid Mechanics and Unit Operations in Chemical Engineering II.

COMPETENCES / LEARNING OUTCOMES

1401 - Degree in Chemical Engineering

Act autonomously in learning, make informed decisions in different contexts, issue judgements based on experimentation and analysis and transfer knowledge to new situations.

Contribute to the design, development and implementation of solutions that respond to social demands, guided by the Sustainable Development Goals.

Demonstrate critical and self-critical thinking, considering professional ethics, moral values and social implications of the different activities carried out throughout the degree.

Propose creative and innovative solutions to complex situations or problems, typical of the area of ¿¿¿¿connection, to donate responses to the various professional and social needs

Recognise and apply the basic principles of the various subjects within this applied and professional field to deepen the learning outcomes already covered in the core subjects.

DESCRIPTION OF CONTENTS

1. Introduction

Energy sources. Energy supply and demand. Current status and perspectives. Primary, intermediate and final energy: energy transformations.

2. Energy management

Tools and techniques of energy management. Energy Audit: Energy Company profile: production process, consumption, cost, etc.. Benchmarking: indicators, sector specific consumption, use of best practices, etc.. Analysis of opportunities for improvement. Economic calculations: estimation of benefits. Energy

certificate. Energy management systems.

3. Integration and energy efficiency

Concept of energy saving and energy efficiency. Energy saving techniques. Practical examples of improvements in thermal efficiency: boilers, insulation, burners, heat recovery, etc. Process integration. Heat exchanger networks.

4. Fuels

Fundaments. Oil, coal and subproducts. Biomass. Others. Types and properties of fuels. Stoichiometry and thermochemistry of combustion.

5. Renewable energy technology

Concept and types. Solar: thermal, thermoelectric, photovoltaic. Wind. Small hydro. Biomass. Biofuels: types.

6. Cogeneration systems and furnaces

Cogeneration. Benefits. Types of systems. Gas turbine. Steam turbine. Combustion engine. Combined cycle. Measure of efficiency. Economic prospects. Constituent elements of a furnace. Classification of furnaces. Energy balance of furnaces.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	25,00
Classroom practices	20,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	20,00
Independent study and work	35,00
Preparation of lessons	10,00
Preparation for assessment activities	2,50
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

Theoretical activities: topics will be developed in the lectures by providing a comprehensive and integrated vision, analyzing in more detail the key aspects of greater complexity and encouraging at all times, student participation. Also adequate resources for the subsequent preparation of the issue in depth by the student will be recommended.

Practical work: Practical classes will complement the theoretical activities in order to apply the basics and expand the knowledge and experience they acquire during the performance of the proposed work. This will be done in the classroom or in small groups. They include the following types of classroom activities:

- Classes of problems and issues in the classroom. The teacher will explain a number of sample problems that allow students to acquire the skills necessary to analyze, formulate and solve the problems of each topic. Student skills for decision making will be enhanced.

- Discussion sessions and troubleshooting or work. In these sessions, which are conducted in small groups, are analyzed and discussed a series of exercises or work previously posed by the teacher and the students worked in small groups.

Tutorials: In them, the teacher will guide the student on all elements of the learning process. In addition, the teacher will guide the student on the most appropriate methodology for learning basic knowledge of the subject.

The exercises will work and proposed a timetable for completion and delivery by the students. It will consist of individual growth or small group of case studies of application.

EVALUATION

Assessment of student learning will take place proposing two types of evaluation:

A) This method is only applicable to students who have attended more than 80% of the classes. 5% of the grade will be for the assessment of student participation and attendance. 25% of the grade will be for the evaluation of the work. The remaining 70% corresponds to a test score. Be a minimum requirement to pass the course more of a 4.5 on the exam (over 10.0)

B) The mark will be obtained from record of an exam (80%) to be held on the official date and the grade obtained in the work (20%). Be a minimum requirement to pass the course more of a 4.5 on the exam.

Students who choose Option A), and do not pass the course in the first option must be submitted to the consideration of the second opportunity and the evaluation form will then be that of the B mode).

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

- M. Alarcón, Tecnología Energética en Ingeniería Química Diego Marín Ediciones, 2007
- J.M. Fernández, Tecnología de las energías renovables, AMV Ediciones 2009
- Y. Calventus et al. Tecnología Energética y medio ambiente Ediciones UPC 2006
- IDAE, Guías Técnicas de Ahorro y Eficiencia Energética 2007-2010.
- J.M. Lujan, J.L. Peidró y C. Guardiola. Problemas de Tecnología y Gestión Energéticas. Universidad Politécnica de Valencia 2003
- R. Sinnott and G. Towler Diseño en Ingeniería Química Editorial Reverté 2012
- Cámara Oficial de Comercio e Industria de Madrid y Comunidad de Madrid. Manual de Auditorías Energéticas. Madrid 2003
- Mejoras horizontales de ahorro y eficiencia energética .Sector industrial. Energía térmica. Edita Junta de Castilla y Leon