

**COURSE DATA****DATA SUBJECT**

Code: 46566
Name: Polymer Science and Technology
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2261 - Master's Degree in Chemical Engineering	Escola Tècnica Superior d'Enginyeria	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2261 - Master's Degree in Chemical Engineering	Optatividad	ELECTIVES

COORDINATION

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SUMMARY

The subject Science and Technology of Polymers is an optional subject of the Master's degree in Chemical Engineering, which is taught in Spanish and English during the second semester, and consists of 3 ECTS credits.

This course combines knowledge of the scientific base, properties and characterization of polymeric materials, with technological knowledge of the different transformation methods, as well as aspects related to the degradation and recovery of waste, all within the framework of the circular (bio)economy. This results in advanced training of students in the scientific and technological field of polymer materials.

Specifically, the subject is organized into four different thematic blocks: 1. Structure, classification and properties of polymer materials; 2. Advanced characterization of polymers; 3. Processing technologies of polymer materials; and 4. Circularity in the plastic sector.

LEARNING OUTCOMES (RD 1393/2007): The main learning outcomes are:

- Know and be able to predict the behaviour of polymers and polymer-based compounds, according to their nature and production technology. - Know and know how to apply specific characterization techniques of



polymers. - Know the different degradation mechanisms and the monitoring and stabilization techniques in the polymer industry. - Know the ways of recovery for plastic waste and be able to determine the most appropriate for a given waste.- - Being able to analyse cases of development of polymeric materials within the framework of the circular (bio)economy.

In addition to those learning outcomes explicated in the verified memory, the following learning outcomes will be obtained: - Know how to interpret and use the information necessary to solve the practical cases proposed. - Become familiar with specialized bibliographic sources to find, select and understand information. - Know how to critically analyse the results obtained both when solving the problems and the proposed practical applications. - Make presentations in public with rigor, clarity and order.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

This subject is closely related to Materials Science I and II, as well as Environment and Sustainability, all of them from the study plan corresponding to the Degree in Chemical Engineering. Therefore, prior knowledge of materials science and sustainability is recommended.

Knowledge of English is also recommended in order to be able to successfully pass the practical part of the subject, as well as to be able to access the bibliographical sources available in this language.

COMPETENCES / LEARNING OUTCOMES

2261 - Master's Degree in Chemical Engineering

Adapt to changes and be able to apply new and advanced technologies and other relevant developments with initiative and entrepreneurship.

Apply critical reasoning to their knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience and practice, in order to establish economically viable solutions to technical problems.

Be able to apply the scientific method and the principles of engineering and economics to formulate and solve complex problems in processes, equipment, facilities and services in which matter changes its composition, state or energy content, these changes being characteristic of the chemical industry and of other related sectors such as pharmacology, biotechnology, materials science, energy, food or the environment.

Be able to assess the need to complete their technical, scientific, language, computer, literary, ethical, social and human education, and to organise their own learning with a high degree of autonomy.

Be able to defend criteria with rigor and arguments and to present them properly and accurately.

Be able to solve unfamiliar and ill-defined problems that have specifications in competition by considering



all possible methods of solution, including the most innovative ones, and selecting the most appropriate, and correct implementation by evaluating the different design solutions.

Be able to take responsibility for their own professional development and specialisation in one or more fields of study.

Communicate and discuss proposals and conclusions in specialised and non-specialised multilingual forums, in a clear and unambiguous manner.

Design, build and implement methods, processes and equipment for the comprehensive management of supplies and waste - solids, liquids and gases - in industries and be able to assess their impacts and risks.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

DESCRIPTION OF CONTENTS

1. Structure, classification and properties of polymer materials

- 1.1 Myths and Realities
- 1.2 The Current State of the Sector
- 1.3 Introduction to Polymer Materials
- 1.4 Families of Polymer Materials
- 1.5 Characteristics of Polymer Materials
- 1.6 Properties of Polymer Materials

2. Advanced characterisation of polymer materials

- 2.1. Polymer Characterization
- 2.2. Thermal Analysis
- 2.3. Chromatography
- 2.4. Spectroscopy
- 2.5. Microscopy
- 2.6. Mechanical Analysis
- 2.7. Other Characterization Techniques

3. Processing technologies of polymer materials

- 3.1. Processability of polymeric materials
- 3.2. Additives and compounding
- 3.3. Processing of thermoplastic polymers
- 3.4. Processing of thermoset polymers and composite materials
- 3.5. Advanced polymer processing techniques



4. Circularity in the plastics' sector

- 4.1 Degradation and stability
- 4.2 End-of-life of plastic materials
- 4.3 Material recovery: Mechanical recycling
- 4.4 Material recovery: Chemical recycling
- 4.5 Energy recovery
- 4.6 Biological recovery

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	20,00
Classroom practices	10,00
Total hours	30,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	2,00
Individual or group project	14,00
Independent study and work	9,00
Preparation of lessons	5,00
Preparation for assessment activities	10,00
Resolution of case studies	5,00
Total hours	45,00

TEACHING METHODOLOGY

The teaching methodology will consider the following aspects:

-Theory sessions. The students will be offered a global vision of the subject to be discussed and the key concepts that must be developed will be emphasized, as well as the resources to be used for the preparation of the subject in depth. In these sessions, some practical applications may be raised, as an example, in order to enhance the assimilation of the concepts introduced.

-Practical sessions. On the one hand, the teaching staff will carry out a series of typical problems, exercises and case studies through which the acquisition of competences on the different aspects of the subject will be encouraged. On the other hand, the students will work similar activities, with the supervision of the teaching staff. Likewise, other practices for autonomous and/or group work will be proposed. This block may include laboratory or company visits and/or presentations by expert researchers

EVALUATION



The assessment components of this course are:

- PO: Objective Test. Theoretical and practical questionnaires. Minimum passing grade: 5.0.
- ACT: Activities. A list of specific tasks to be submitted throughout the course. These activities cannot be retaken.
- TR: Project. A group project to be developed throughout the course and submitted at the end. Minimum passing grade: 5.0.

In both the ordinary and extraordinary calls, the course grade will be calculated as follows:

30% PO + 15% ACT + 55% TR

If a student fails either PO or TR, the final grade will be the lower of the two.

Partial grades for assessment components will not be carried over between academic years.

In any case, the evaluation system will be governed by the provisions of the Regulations for Evaluation and Qualification of the University of Valencia for Bachelor's and Master's Degrees (<https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639>)

REFERENCES

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