

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

**Code:** 44998  
**Name:** Unit Operations in the Chemical Industry  
**Cycle:** Master's Degree  
**ECTS Credits:** 4  
**Academic year:** 2025-26

**STUDY (S)**

Degree	Center	Acad. year	Period
2249 - Master's Degree in Chemistry	Facultat de Química	1	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
2249 - Master's Degree in Chemistry	Química Tècnica	COMPULSORY

**COORDINATION**

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**SUMMARY**

Unit Operations in Chemical Industry is a compulsory subject that is taught in the first semester of the Master in Chemistry. In the curriculum of the University of Valencia it has a total of 4 ECTS credits. This subject aims students to apply the basic principles of chemical engineering, previously seen in the course Foundations of Chemical Engineering, to design and performance analysis of the unit operations commonly used in the chemical industry.

The study of Basic Operations begins with their classification according to the predominant physical phenomenon on which they are based: basic operations of mass transfer, basic operations of momentum transport in which a flow of fluids occurs and basic operations of heat transfer.

In the first group, the study of distillation will be approached as a representative basic operation of the separation by stages and very common in the chemical industry. In the second group, the circulation of liquids through pipes and filtration will be studied. Finally, the design and operation of heat exchangers for industrial use and evaporators, both controlled by heat transmission, will be studied.

The subject has an eminently applied character so that practical and theoretical aspects must be taken into account jointly. In this way, numerical questions and problems that simulate real situations will be solved. The theoretical concepts introduced will be applied in these practical components, thus familiarizing the



students with the mode of operation of the industry chemical processes.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

### OTHER REQUIREMENTS

Previous knowledge of chemistry taught in the degrees indicated in the recommended entry profile for Master's students is required.

Knowledge of mass and energy balances as well as of Transport Phenomena acquired in introductory courses to Chemical Engineering are required.

## COMPETENCES / LEARNING OUTCOMES

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Be able to conduct any type of research in the field of chemistry and/or the chemical industry, as a specialist.

Be able to design, conduct, analyse and interpret complex experiments and data, as a specialist.

Be able to solve complex chemistry problems, whether in the academic, research or industrial application areas at a specialization or masters-level.

Fomentar, en contextos académicos y profesionales del ámbito de la política económica, el avance tecnológico, social o cultural dentro de una sociedad basada en el conocimiento y en el respeto a: a) los derechos fundamentales y de igualdad de oportunidades entre hombres y mujeres, b) los principios de igualdad de oportunidades y accesibilidad universal de las personas con discapacidad y c) los valores propios de una cultura de paz y valores democrático.

Gain experience in the use of information tools and in the management of the information obtained.

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

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should demonstrate self-directed learning skills for continued academic growth.

## DESCRIPTION OF CONTENTS



## 1. Description and classification of Unit Operations

The Chemical Industry. Basic or unit operation. Classification. Unit operations controlled by the mass transfer. Unit operations controlled by heat transport. Unit operations controlled by momentum transport

## 2. Unit operations based on fluid flow

Circulation of incompressible fluids. Conservation principles. Loss of mechanical energy. Design of installations with pumps.- Filtration. Basics of filtration. Plate and frame filter press. Washing the cake. Filtration capacity. Optimal filtration conditions. Vacuum drum filters

## 3. Unit operations of heat transfer

Industrial heat exchangers. Description. Design and analysis of the operation of a heat exchanger for industrial use: Practical aspects of the design of heat exchangers. -Evaporation. Types of evaporators. Fundamental equations in an evaporator. Design and analysis of the operation of evaporators.

## 4. Unit operations of mass transfer

Separation processes. Phase equilibria. Simple distillation. Continuous distillation in plate columns

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	5,00
Theory	30,00
Seminar	5,00
<b>Total hours</b>	<b>40,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>0,00</b>

## TEACHING METHODOLOGY



The course will be taught in asynchronous online mode, where, among other training activities, applied practical problems will be solved in order to evaluate the students' understanding of the course. In addition, use will be made of the Virtual Classroom platform, a virtual space where all the information considered appropriate for the development of teaching and control of student participation in the proposed activities is deposited. Dynamics of continuous assessment (discussion and network activities, on-line, etc...).

## EVALUATION

First call:

The grade for the subject in the first call will be obtained from the results obtained in one or more presential exams and from the continuous assessment activities carried out throughout the course. The weighting of each of these parts will be done according to the following criteria:

Oral and/or written tests (exams) based on the learning outcomes and objectives of each subject, in their theoretical and/or practical part: 60%.

Continuous assessment of the activity developed by the student by means of problem solving, etc.....: 40%

The minimum grade in each of the two parts must be equal to or higher than 4.0 to be able to make the average.

The minimum overall grade to pass the course will be 5.0.

Second call:

The grade of the subject, in the second call will be obtained by applying the same criteria as in the first call.

## REFERENCES

- McCabe W.L., J.C. Smith, P. Harriot, Operaciones Unitarias en Ingeniería Química. 1ª edición en español. McGraw Hill, Madrid, 2007.
- Seader, J.D., J.E. Henley, Separation Process Principles. 2ª edición, John Wiley and Sons: New York, 2006.
- Sançhotello M., A.V. Orçillés, Transmissió de calor. Publicacions UV: Valencia, 2007



- Orchillés A.V., M. Sanchoello. Mecànica de Fluids. Publicacions UV: Valencia,2007.