COURSE DATA

Data Subject	
Code	44998
Name	Operaciones unitarias de la industria química
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2249 - Master's Degree in Chemistry	Faculty of Chemistry	1	First term

Subject-matter

Degree	Subject-matter	Character
2249 - Master's Degree in Chemistry	5 - Química Técnica	Obligatory

Coordination

Name	Department
ORCHILLES BALBASTRE, ANTONI VICENT	245 - Chemical Engineering

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

2249 - Master's Degree in Chemistry

- 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.
- 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.
- Be able to design, conduct, analyse and interpret complex experiments and data, as a specialist.
- Be able to conduct any type of research in the field of chemistry and/or the chemical industry, as a specialist.

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

- Classify the unit operations based on predominant rate of transport.
- Describe the material processing stages before or after an industrial scale reaction stage and interpret or propose flow diagrams.
- State the basic principles of the main unit operations used in the chemical industry.
- Carry out basic equipment designs such as those of separation, fluid flow or heat transfer
- Knowing how to apply the knowledge acquired to contribute to the Sustainable Development Goals (SDGs), such as the sustainable management of water, raw materials and energy sources (SDGs 6 and 7) and to develop a professional work with the least environmental impact and using alternative raw materials (SDGs 11, 14 and 15)

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

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Tutorials	5,00	100
Seminars	5,00	100
TOTAL	**40,00**	

TEACHING METHODOLOGY

The subject will be taught through participatory lectures, classes with directed practical activity, seminars and workshops where, among other training activities, applied practical problems will be solved aimed at evaluation of the students understanding of the subject. In addition, use of the Virtual Classroom platform will be made, a virtual space where all the information deemed appropriate for the development of teaching and the control of student participation in the proposed activities is deposited. Dynamics of continuous evaluation (discussion and network activities, on-line, etc ...).

Due to organizational reasons, during the 2022-2023 academic year, attendance has been reduced to 80%

EVALUATION

First call:

The mark of the subject in the first call will be obtained from the results obtained in one or more 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 results and the objectives of each subject, in its theoretical and/or practical part: 60%

Continuous evaluation of the activity developed by the student through participatory assistance, problem solving, etc ...: 40%

In order to take the average, the minimum grade in each of the two parts must be equal to or greater than 4.0 over 10.

The minimum overall grade to pass the course will be 5.0 over 10.

Second call:

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

REFERENCES

Basic

- 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.

Additional

- Sanchotello M., A.V. Orchillés, Transmissió de calor. Publicacions UV: Valencia, 2007
- Orchillés A.V., M. Sanchotello. Mecànica de Fluids. Publicacions UV: Valencia,2007.