COURSE DATA

DATA SUBJECT

Code: 34765
Name: Chemical engineering laboratory III
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

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

SUBJECT-MATTER

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	Experimentation in chemical engineering	COMPULSORY

COORDINATION

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SUMMARY

The subject Chemical Engineering Laboratory III is a four-monthly compulsory subject taught in the fourth year of the Degree in Chemical Engineering. In the curriculum of the University of Valencia has a total of 4.5 ECTS credits, which represent a total number of working hours of 112.5 hours, 67.5 contact hours and 45 non-contact hours.

The subject is a part of the same name matter, key in the Chemical Engineering curriculum due to the importance that it has in the knowledge and management of equipments that are part of chemical industrial processes.

The course is eminently practical. The overall objective is to familiarize with experimental methods related to the study of Basic Operations of mass transfer. For this purpose, the student must:

- Develop experimental studies of varying degrees of difficulty in facilities similar to that existing in chemical process industry.
- Handle with precision differents devices and equipment.
- Perform experimental measurements with accuracy and precision.
- Proceed methodically in carrying out the calculations.
- Proceed methodically in carrying out tables and graphs.
- Manage industrial simulators.
- Write in a clear and organized way a written report.
- Prepare a clear and organized display.
- Make an oral exposure in a clear and organized way.
- Critically analyze the results of an experiment.

The **contents** of this subject are related to the design and experimentation in the field of chemical engineering, especially focussed to the study of Basic Operations of mass transfer.

Observations: The practical classes will be taught in Spanish or Valencian as stated in the course information 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

To successfully overcome the course is recommended that the student possesses a number of chemical engineering previous knowledge that it must have been acquired in previous courses with subjects as Bases of Chemical Engineering, Process and Products Engineering and the student must be registred in the subject Unit Operations of Chemical Engineering.

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.

Collaborate effectively in work teams, assume responsibilities and leadership roles, and contribute to collective improvement and development.

Design and manage applied experimental procedures, especially for determining thermodynamic and transport properties, and model phenomena and systems in chemical engineering, fluid flow systems, heat

transfer, mass transfer operations, chemical reaction kinetics and reactors.

Knowledge for carrying out measurements, calculations, valuations, appraisals, expert opinions, studies, reports, work plans and other similar work.

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

Solve problems with initiative, make decisions, think creatively and critically, and communicate and convey knowledge, skills and competences in the field of industrial engineering.

Understand material and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, reactor design, and the valorisation and transformation of raw materials and energy resources.

Work in a multilingual and multidisciplinary environment.

DESCRIPTION OF CONTENTS

1. Introduction to the subject Chemical Engineering Laboratory III

Description of the subject: objectives, contents, learning outcomes, activities and time planning, methodology and evaluation system.

2. Trayed rectification columns

Study of the operation of a trayed rectification column. Experimental determination of the vapor liquid equilibrium of a binary mixture. McCabe-Thiele method for calculating overall efficiency. Fenske method for calculating overall efficiency. Calculation of the individual efficiency. Influence of the vapour flow on the values of individual and overall efficiency.

3. Packed rectification columns

Study of the operation of a packed rectification column. Experimental determination of the vapor liquid equilibrium of a binary mixture. McCabe-Thiele method for HETP calculation. Calculation of the mass transfer coefficient. Influence of the vapour flow on the values of HETP and mass transfer coefficient.

4. Absorption in packed columns

Study of the operation of a packed absorption column. Flooding phenomenon. Calculation of the filling specific surface. Calculation of the mass transfer coefficients. Influence of the liquid phase and the gas phase flows on the mass transfer rate.

5. Drying process

Study of the operation of a drying column. Influence of the air stream temperature in the drying process rate. Influence ot the air flow in the drying process rate. Application the diffusion model to estimate the water diffusion coefficient through a solid material.

6. Air-water interaction

Study of the operation of a cooling water column with air. Application of the design equations to calculate the mass and energy transfer coefficients. Influence of the feed rates of air and water in the values of the coefficients of mass and energy transfer.

7. Adsorption

Study of the operation of an adsorption column. Experimental determination of the breakthrough curve and the breakthrough time: influence of the feed flow rate.

8. Simulation of chemical processes

Description and training to use Aspen Hysys® simulator. Resolution of case studies. Practical application of the knowledge and skills to the design, simulation and optimization of processes.

9. Oral exposure

Oral exposure of one of the practices developed in the laboratory: fundamentals, experimental device, design of experiments, results and conclusions.

10. Visits to industrial installations

First contact with installations of two industrial processes of products development.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Laboratory	45,00
Classroom practices	22,50
Total hours	**67,50**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	37,00
Independent study and work	4,00
Preparation of lessons	0,00
Preparation for assessment activities	4,00
Resolution of case studies	0,00
Total hours	**45,00**

TEACHING METHODOLOGY

The development of the course is organized around six themes: attendance to laboratory sessions, attendance to the simulation sessions, industrial site visits, seminars, conducting programmed works and non programmed tutorial lessons.

Students will complete one introductory laboratory session, 8 laboratory sessions 4.5 h each one, five simulation sessions (16.5 h), two visits to industrial installations, an oral exposure and a practical exam (which include both the simulation part and the laboratory part) according to the programmed timetable for each group. Attendance at all the above activities is obligatory and necessary to overcome this subject.

The laboratory practices will be made in groups of two students. Each pair of students will perform in the laboratory the experimental part of four of the six practices listed in section *Description of Contents* of this guide in two consecutive sessions of 4.5 hours each.

Before entering the laboratory, students will know in good time the practices to realize. They will have a script of each practice in the e-learning platform ¿Aula Virtual¿ of the University of Valencia which could be downloaded. The experiments will be conducted entirely by students under teacher supervision in the laboratory 4.0.7 of Chemical Engineering Department.

Prior to conductig the experimental session, students will individually answer a questionnaire about the practice in question to check the level of preparation.

In addition, each pair of students must submit a written report of each of the practices. The reports will have a compulsory deadline previously established. Report submittion is a necessary condition for overcoming this subject.

Simulation sessions also will be made in groups of two studentes. Four sessions of three hours each and one session of 4.5 h have been programmed for each group, according to the timetable of the group the students belong to.

With respect to the seminars, in the first one the rules for the proper organization of the subject, the methodology and evaluation system will be explained, and practical partners will be stablished. In the second seminar students will expose individually to the group one of the practices conducted in the laboratory. For the preparation of the exposure they will have the guidance and supervision of the teachers of the subject.

The planned dates for performing visits are not confirmed because they depend on the availability of the installation to visit. Students will be informed in good time the date once it will be concretize through e-mail.

All the work proposed to the students will be divided into three types: Questionnaires, written reports and oral exposure. Questionnaires will be done at the start of each practice, and written reports and oral exposure will have a timetable for completion and submittion.

EVALUATION

Assistance to laboratory and simulation sessions, industrial site visits, the delivery of reports of the practices, performing oral exposure, performing questionnaires and exam are obligatory and necessary for overcoming this subject.

The average of the questionnaires prior to each practice must be 5 out of 10. This minimum is a requirement to be able to take the exam of the laboratory. If students do not achieve this minimum, they will go directly to the second call where they will have to obtain this minimum prior to the exam of the laboratory.

The final mark of the course will be obtained from the note of the reports of practices and oral exposure (60%), the note of the questionnaires (10%) and the exam of the laboratory part (10%) and the note of the exam of the simulation part (20%). Both the laboratory exam and the simulation exam will be carried out:

- in the first call, in one of the sessions of the usual schedule of the subject.
- in the second call, on the official date of the call.

For overcoming the subject, the mark of each of the reports and the exam of the laboratory must be higher than 40 points, the average mark of the reports must exceed 50 points and also the mark of the simulation exam must exceed 50 points. It will be necessary to obtain a final mark of at least 50 points to overcome the subject.

Students who have failed this subject in the first round by not attending the laboratory sessions or simulation will not have another chance to pass it. Since, laboratory and simulation sessions are a non-recoverable and obligatory activity for the course to be passed.

Students who have failed this subject in the first call for not having obtained a minimum of 40 in the lab exam or 50 in the simulation exam will have the chance to approve on the second call by retaking the corresponding exam on the date it will be established. Students who have failed this subject in the first call for not having obtained a minimum of 50 on the average mark of the reports will have the chance to approve on the second call by repeating written reports of the practices with a mark lower than 50 and / or performing oral exposure again. If students haven¿t got a minimum final mark of 50 they must retake the exam on the second call.

To apply for advanced call, student must have done all the compulsory activities defined in the teaching guide.

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).

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