COURSE DATA

Data Subject	
Code	34764
Name	Chemical Engineering Laboratory II
Cycle	Grade
ECTS Credits	4.5
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	School of Engineering	3	Second term

Subject-matter

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	18 - Experimentation in chemical engineering	Obligatory

Coordination

Name	Department
LLOPIS ALONSO, FRANCISCO	245 - Chemical Engineering

SUMMARY

The objective of this matter is that the students are able to plan and carry out experimental studies similar to those of a chemical process industry, to explain the results and reporting.

specifically:

• work with different equipment and devices for industrial applications related to chemical reactors.

• make measurements with accuracy and precision.

• proceed methodically in carrying out the calculations.

• write clearly reports the practices.

Contents: Design and conduct experiments in the field of chemical engineering, especially in systems with fluid flow, chemical reaction kinetics and reactors.

The course is obligatory and is offered in the third year of the degree of Chemical Engineering in the second semester. The laboratory classes will be taught in Spanish 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

Have adquired the skills of the subjects:
* Chemical reaction engineering I and II

OUTCOMES

1401 - Degree in Chemical Engineering

- G4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering.
- G5 - Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and analogous work.
- G10 - Ability to work in a multilingual and multidisciplinary environment.
- TE1 - Knowledge of material and energy balances, biotechnology, matter transfer, separation operations, chemical reaction engineering, reactor design, and valorisation and transformation of raw materials and energy resources.
- TE3 - Ability to design and manage applied experimental procedures, especially for determining thermodynamic and transport properties, and modelling of phenomena and systems in the field of chemical engineering, systems with fluid flows, heat transfer, matter transfer operations, kinetics of chemical reactions and reactors.

LEARNING OUTCOMES

Manage multiple computers and devices of industrial application. (Outcomes G5)

Take measures with accuracy and precision. (Outcomes G5)

Ask experimental devices to understand and apply the basic principles of chemical engineering. (Outcomes G4, TE1, TE2)

Operate equipment in facilities of the chemical process industry. (Outcomes G4, TE1, TE2)

Ability to analyze equipment, to assess their suitability and to propose alternatives. (Outcomes G4, TE1, TE2)

Select and apply appropriate mathematical methods to get results from the data obtained in the laboratory. (Outcomes G4, TE1, TE2)

To analyze critically the results obtained by performing the labs. (Outcomes G4)

Write clearly, understandably and organized reports of work done in the laboratory. (Outcomes G4, G10)

Find, select and understand the information in specialized literature sources. (Outcomes G5)

To acquire the ability to work in groups. (Outcomes G10)

DESCRIPTION OF CONTENTS

1. Analysis of a battery of continuous stirred tank reactors

Analysis of a battery of two continuous stirred tank reactors. Steady-state study the process of ethyl acetate with sodium hydroxide. Influence of residence time. Preparation and titration of solutions

2. Analysis of a series of continuous stirred tank reactor

The analysis of a series of continuous stirred tank reactor and two continuous tubular reactors. Study of steady state and unsteady. Study of the DTR. Kinetics of crystal violet decoloration process. Influence of residence time. Preparation and titration of solutions.

3. Study of the best arrangement of several reactors ideal in a multiple reactor system

Study of the best arrangement of several reactors ideal in a multiple reactor system. Steady-state study the process of phenolphthalein with soda. Kinetics of the process. Influence of residence time. Preparation and titration of solutions.

4. Analysis of a adiabatic batch stirred tank reactor

Analysis of a adiabatic batch stirred tank reactor. Study of the kinetics of sodium tiosultate process with hydrogen peroxide. Influence of temperature and relative proportions of reactants. Preparation and titration of solutions.

5. Study of the kinetics of a discontinuous process in a stirred tank reactor

Kinetic study of basic hydrolysis of the ethyl acetate, in a batch stirred tank reactor. Titration of solutions. Influence of the temperature.

6. Study of the flow not ideal, in a battery of continuous reactors

Study of the flow not ideal, in a battery of continuous reactors. Influence of pulse signal introduced. Analysis of the DTR. Study of model by-pass and dead space. Study of the model of reactors in series.

7. Flow model of a battery of reactors in series

Flow model of a battery of reactors in series. Influence of the type of signal input. Analysis of the DTR. Comparison with the ideal models.

8. Study of the catalytic oxidative dehydrogenation of n-butane.

Study of the catalytic oxidative dehydrogenation of n-butane. Analysis of the yield and selectivity of the process. Influence of residence time. Basics concepts of applied catalysis. Chromatographic analysis

9. Reactor simulation

Reactor simulation by hydraulic means. Reactor simulation by computer.

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	45,00	100
Classroom practices	22,50	100
Development of group work	23,00	0
Study and independent work	5,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	10,00	0
Resolution of online questionnaires	2,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

Students will have a script of each practice in e-learning platform (Virtual Classroom).

Experiments will be carried entirely by students under the supervision of the teacher, in the laboratories of the Chemical Engineering Department. Prior to conducting the practice in the lab, students must present a summary of the same. This will verify that you have read the script for practice and have prepared accordingly. The main competences worked with these activities will be G4 , G5 , TE3.

Several sessions will be devoted to developing the interpretation of the practices carried out. The main competences worked with these activities will be G5 , G10 , TE1 , TE3.

At the end of the laboratory practices, a questionnaire will be carried out to verify the level of assimilation of the acquired knowledge

EVALUATION

The assessment of the matter will be held on an ongoing basis by assessing the following:

• Motivation and degree of autonomy in preparing and implementing the practices.

• The practice reports submitted.

• The individual examination.

Both assistance to practice sessions and calculations in the laboratory and the examination are mandatory and necessary to overcome this module.

The note will assign 5% continuous evaluation (questionnaires before and first practice), 25% examination and 70% for lab reports. The student will need to obtain a minimum score of 5 to pass the course.

The student must obtain a minimum grade of 4 out of 10, to mediate with the other parties.

If a minimum mark of 4 (out of 10) is not gotten in the exam, the final mark will be the grade obtained in the exam.

The subject will be passed when the average final mark is equal or greater than 5 (out of 10).

If the student still does not reach the minimum grade of 5, the student must repeat the exam in the second call on the official date, and/or submit the report with a grade lower than 5. The qualification criteria will be the same.

The exams will have theoretical and practical questions. Achievement of competences G4 , G5 , G10 , TE1 , TE3 will be evaluated.

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” (https://goo.gl/UdDYS2)

REFERENCES

Basic

- ESCARDINO A., BERNA. A.
Introducció a l'Enginyeria dels Reactors Químics.
Universitat de València. (2003)
- SANTAMARÍA, J.M.; HERGUIDO, J.; MENÉNDEZ, M.Á., MONZÓN, A.
Ingeniería de reactores,
Síntesis, Madrid (1999)
- LEVENSPIEL, O
Ingeniería de las reacciones químicas
México : Limusa Wiley, (2004)

Additional

- FROMENT, G.F., BISCHOFF, K.B.
Chemical Reactor Analysis and Design,
2nd ed., John Wiley and Sons. New York. (1990).
- NAUMAN, E.B.
Chemical Reactor Design.
John Wiley and Sons. New York. (1987).
- FOGLER, H. S.
Elements of Chemical Reaction Engineering,
3rd ed., Prentice Hall. New Jersey, (1999)

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The contents initially established in the Course Guide are maintained.

Workload and planning of teaching

Workload:

The activities described in the Course Guide with their time dedication are maintained.

Planning of teaching:

The material for the follow-up of the classes allows to continue with the teaching time planning both in days and in time, whether the teaching is face-to-face in the classroom or not.

Teaching methodology

The development of the subject is articulated as has been established in the teaching model for the second semester (https://www.uv.es/etsedoc/Web/Modelo%20Docente_GIQ_2C.pdf).

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes, these will be replaced by non-person sessions following the established timetable.

Evaluation

The evaluation system described in the Course Guide in which the activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for sanitary reasons that affect the development of any face-to-face evaluable activity, it will be replaced by a test/activity of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade of the course will remain unchanged, as established in this guide.

References

The recommended references in the Course Guide are maintained, since they are available.