PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: UNIT OPERATIONS OF CHEMICAL ENGINEERING

MATTER: Chemical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

GENERAL CHARACTERISTICS*

Type: ☐ Basic training, ☑ Compulsory elective, ☐ Optional
☐ Final degree project, ☐ Practicum

Duration: Semianual **Semester/s**: 3
Number of credits ECTS: 6
Language/s: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (the meaning of the course in relation to the studies. Between 100 and 200 words.)

The Chemical Engineering uses the same concepts of fluid mechanics, strength of materials, heat transport than any other branch of engineering industry. However, it is distinguished by introducing two concepts not contained in other disciplines: the chemical reaction and mass transfer.

Since the middle of s. XX basic concept of operations or chemical process unit has been used to generally describe the parts that comprise the chemical industry processes. This is something like parts infant architecture, in which multiple buildings may be constructed. Processes in this case. This concept, however, has evolved to what is now called Chemical Engineering Science, which is based on what is called transport phenomena.

This course is devoted to establishing the basis for the development and application of methods and models in chemical engineering. Specifically, we develop the basic techniques of material balances, we present the model of equilibrium stages and an introduction to mass transport for calculating separation operations and their practical applications. We present the fundamentals of chemical kinetics and their application to Chemical Reaction Engineering.

COMPETENCES (of the course made in relation to preassigned competences in this area.)

• Understand and apply fundamental knowledge of the basic operations of chemical engineering (E2).
• Identify, formulate and solve simple balances, separation operations and chemical reactors (E4).
• Knowledge that enable them to take measurements, calculations and similar work (E5).
• Ability to assess the impact of basic or unit operations of chemical engineering in sustainable development of the Company (T6).
• Knowledge of material and energy balances, biotechnology, mass transfer, separation processes, chemical reaction engineering, reactor design, and recovery and processing of raw materials and energy resources (TE12).

* These characteristics should not be changed without the approval of the responsible for higher level academic structures (matter, module and/or syllabus).

PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: UNIT OPERATIONS OF CHEMICAL ENGINEERING

MATTER: Chemical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

PREREQUISITES* (modules, matters, courses and knowledge needed to follow the course. Can be stated that courses must have been completed.)
Have completed the basic training module.
CONTENTS (as a relationship of the chapters that constitute the contents, or topics covered, of the course to a second level detail.)

1. The chemical industry
2. Units and Dimensions in Chemical Engineering.
3. Material and energy balances.
4. Separation operations equilibrium stages.
5. The mass transport model.
6. Chemical Reaction Engineering.

METHODOLOGY

TRAINNING ACTIVITIES* (Complete the table relating activities, workload in ECTS credits, and competences.)

Training activities	ECTS Credits	Competences
Sessions presentation of concepts (A1)	0,91	E2, E4, T6, TE12
Sessions for resolution of exercises, problems and cases (A2)	0,91	E4, TE12
Seminars (A3)	0,18	E2, T6, TE12
Personal mandatory activities professor-student (A4)	0,04	--
Practical work / laboratory (A5)	1,09	E2, E5, T6, TE12
Oral and writing presentations (A6)	0,11	--
Personal study activities by students (A7)	2,00	E2, E4, E5, T6, TE12
Evaluation activities (exams, tests,…) (A8)	0,22	E2, E4, E5, T6, TE12
Jobs (A9)	0,55	E2, E4, T6, TE12
Visits to companies (A10)	--	--
TOTAL	**6,00**	

* These characteristics should not be changed without the approval of the responsible for higher level academic structures (matter, module and/or syllabus).

PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: UNIT OPERATIONS OF CHEMICAL ENGINEERING

MATTER: Chemical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

EXPLANATION OF THE TEACHING METHODOLOGY (justifying the teaching methods used in relation to the competences and course contents. Between 100 and 200 words.)

The teaching methods used in the course is based on a dynamic exhibition (presentation of content) followed by an active dynamic (the student solves problems, some of which are subsequently discussed or corrected by the teacher and laboratory or pilot plant) . It encourages the use of laptop computers available to students to solve problems and cases, through which promote the active participation of the students, facilitating the acquisition of knowledge and practice in problem solving. Students perform and expose a paper on a topic proposed by the teacher.

For the student's personal study, are provided for the course materials, collections and supplemental materials problems through the learning management system of IQS. Students already have the necessary software.

EVALUATION

EVALUATION METHODS* (Fill in the table relating evaluation methods, competences and weight in the qualification of the subject.)

Evaluation Methods	Weight	Competences
Final Exam (A)	40%	E2, E4, T6, TE12
Examination / s Partial / s / control / s scheduled / s (B)	--	--
Activities done in class (C)	30%	E2, E4, T6, TE12
Presentations and / or oral examinations (F)	15%	E2, E4, T6, TE12
Modeling, Proposed, etc.. (G)	10%	E5
Laboratory reports (H)	--	
Work in other centers (Practicum) (J)	--	--
Participations (K)	5%	T6

LEARNING OUTCOMES (Explanation of the achievements of students that allow competences evaluation, relating to competences and evaluation methods.)

• The student must demonstrate basic knowledge of the basic operations of chemical engineering (E2) [Final examination, monitoring and experimental work or field].
• The student must demonstrate proficiency in identifying, formulating and solving simple problems in the field of analysis, material balances, basic operations of equilibrium stages and calculating chemical reactors (E2) [Final Exam, Jobs and presentations].
• The student must demonstrate sufficient knowledge to perform measurements, calculations and evaluations own basic operations dela chemical engineering (E5) [Experimental work and field].

* These characteristics should not be changed without the approval of the responsible for higher level academic structures (matter, module and/or syllabus).

PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: UNIT OPERATIONS OF CHEMICAL ENGINEERING

MATTER: Chemical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

• The student must demonstrate ability to assess the impact of the basic operations of chemical engineering in sustainable development of society (T6) [papers and presentations].

QUALIFICATION (Explanation of the calculation system of qualifying the course.)
The final grade for the course will be conducted in accordance with the table of assessment methods.

EVALUATION OF COMPETENCES (Defining expressions of calculation for each competence based on corresponding evaluations activities.)

The skills assessment is obtained:

E2: corresponds to the rating of the knowledge section of the final examination of the monitoring and evaluation work.
E4: you get the qualification section of Troubleshooting exam.
E5: you get the lab work.
T6: exposure is obtained in the work to be performed, specific questions of monitoring and the final exam.
TE12: exposure is obtained in the work to be performed, specific questions of monitoring and the final exam.

TEXTBOOKS (recommended and accessible to students.)

- W. L. McCabe, J. C. Smith y P. Harriott, *Operaciones unitarias en ingeniería química*, McGraw-Hill, 7ª ed., México 2007.
- J. F. Izquierdo, J. Costa, E. Martínez de la Ossa, J. Rodríguez y M. Izquierdo, *Introducción a la Ingeniería Química: problemas resueltos de balances de materia y energía*, Reverté, Barcelona 2011.
- O. Levenspiel, *Ingeniería de las reacciones químicas*, México, Limusa Wiley, 2004.
- H. S. Fogler, Elements of chemical reaction engineering, Upper Saddle River, NJ, Prentice Hall, 2006
- D. W. Green y R. H. Perry, *Chemical Engineers' Handbook*, 8ª ed., McGraw-Hill, New York 2008.

PERSONA CIÈNCIA EMPRESA

Universitat Ramon Llull

TITLE OF COURSE: UNIT OPERATIONS OF CHEMICAL ENGINEERING

MATTER: Chemical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

HISTORICAL DOCUMENT

EARLIER CHANGES

July 1, 2011. Rosa Nomen

August 29, 2012. Julià Sempere

LAST REVISION

May 8, 2015. María Luisa Espasa

* These characteristics should not be changed without the approval of the responsible for higher level academic structures (matter, module and/or syllabus).