

## COURSE: PROCESSES AND PRODUCTS

**SUBJECT:** Processes and Products

**MODULE:** Process and Product Engineering

**STUDIES:** MASTER IN CHEMICAL ENGINEERING

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### GENERAL FEATURES \*

**Type:**  Basic training,  Mandatory,  Elective

Master thesis,  Internship

**Duration:** Four months

**Semester/s:** 1

**Number of credits ECTS:** 3

**Language/s:** English.

### DESCRIPTION

#### BRIEF DESCRIPTION AND JUSTIFICATION

Description and analysis of industrial processes and products, from oil and petrochemical industry to food and biotechnological industries.

We will pay special attention to the technology used in those industries. We will analyze some processes taking into account not only the process itself, but also its economy, energy consumed and environmental impact.

#### COMPETENCIES

- CB8 – The student is able to integrate knowledge and handle complexity involving judgments based on incomplete or limited information, including issues on social and ethical responsibilities linked to the application of his/her knowledge and judgments.
- CG1 – The student can design, manage, execute and expose a project.
- CT1 – The student is able to communicate effectively both orally and in writing with specialized partners and with non-specialized audiences in the field of Chemical Engineering.
- CT2 – The student is able to communicate in English and use English as a working language in the field of Chemical Engineering.
- CT3 – The student is able to work in multidisciplinary environments, individually or as a team member.
- CT5 – The student is able to assess the impact of Chemical Engineering in the sustainable development of society.
- CE2 – The student can design products, processes, systems and services for the chemical industry as well as optimize other already developed, on the technological basis the various areas of Chemical Engineering, involving processes and transport phenomena, separation operations and reactor engineering, both chemical and nuclear, electrochemical or biochemical.

#### PREREQUISITES\*

\* These features should not be modified without the approval of organs responsible for the high-level academic structures (subject, module and/or study plan).

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To have the admission at the Master of Science in Chemical Engineering of the Universitat Ramon Llull.

### CONTENTS

1. Discussion of selected processes from refining and fossil fuels, syngas, phosgene, ammonia, olefins and polyolefins, organic solvents, aromatic compounds, PVC, PET or aramids, as example. Milk, sugar, meat, rubber, starch or paper, to treat:
2. Scale-up. From discontinuous to continuous. Process Intensification.
3. Safety and thermal risk.
4. Life cycle analysis.

### METODOLOGY

#### TRAINING ACTIVITIES\*

Training Activities	ECTS Credits	Competencies
Concept sessions	0,86	CB8, CG1
Sessions solving exercises, problems and cases	0,15	CB8, CE2
Seminars	0,28	CT3, CT5
Presentations	0,04	CT1, CT2, CT5
Personal study activities of students	1,63	CB8, CE2
Evaluation activities	0,04	CB8, CT1, CT2, CT5
<b>TOTAL</b>	<b>3,00</b>	

#### EXPLANATION OF TEACHING METHODOLOGY

- Showroom on presentation or explanation (possibly including demonstrations) by a teacher.
- Solving exercises approach / solve problems and exposure / discussion of cases by a teacher with the active participation of students.
- Instruction by a teacher in order to review, discuss and answer questions on materials and topics presented in the exhibition sessions and meetings concepts for solving exercises, problems and cases. Includes visits to companies and facilities.
- Oral presentation by students.
- Personal work student to acquire the skills of each subject.
- Oral or written tests to assess the skills acquired.

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### EVALUATION

#### METHODS OF EVALUATION \*

Methods of evaluation	Weight	Competencies
Final exam	35 – 45% (40)	CB8, GC1, CE2
Following up activities	30 – 40% (30)	CB8, CG1, CT3, CE2
Homework and presentations	10 – 20% (20)	CT1
Participation	10%	CT5

#### LEARNING OUTCOMES

The aim of the course is to acquire:

- Ability to integrate knowledge and handle complexity, formulating judgments based on information that include reflecting on social and ethical responsibilities.
- Ability to design a project.
- Ability to work in multidisciplinary environments.
- Ability to assess the impact of chemical engineering in sustainable development of society.
- Ability to design products and processes of the various areas of chemical engineering.

#### EVALUATION

The final exam has a weight between the 35 and 45% of the final grade.

The following up activities consists on written work and individual or grouped talks over a specific project different for each team, normally formed by two or three students. Its weight is between the 30 and 40% of the final grade.

Homework and presentations has a value between 10 and 20% and consist on the oral presentation of the project assigned to each team.

The active participation in the classroom has a value of the 10% of the total punctuation.

At the beginning of the course, the professor will express the exact weight of each concept. Normally it will has values of 40, 30, 20 or 10.

#### EVALUATION OF COMPETENCIES

The evaluation of the competencies is making according to the table of training activities.

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When two competencies are evaluated by two different methods of evaluation, like for competencies CB8, GC1 and CE2, the grade of each competency is the weighted average of the value obtained by each method of evaluation.

### BIBLIOGRAPHY (recommended and student accessible.)

#### Encyclopedia:

1. Ullmann's Encyclopedia of Industrial Chemistry; Release 2010, 7th Edition accessible from IQS Library's web
2. Kirk-Othmer. Chemical Engineering & Industrial Chemistry; 1999-2014 by John Wiley and Sons, Online ISBN: 9780471238966

#### Basic textbooks:

3. A. Heaton; An introduction to Industrial Chemistry, 3<sup>rd</sup> edition, Chapman & Hall, 1996, ISBN: 0-7514-0272-9.
4. J. A. Moulijn, M, Makkee, A. E. Van Diepen; Chemical Process Technology, 2<sup>nd</sup> edition, John Wiley & Sons Ltd., 2013, ISBN: 978-1-4443-2025-1
5. A. Vian; Introducción a la Química Industrial, Reverté, Barcelona 1994

#### Advanced or complementary books:

6. A. Jess, P. Wasserscheid; Chemical Technology, Wiley-VCH Verlag GmbH & Co. 2013, ISBN 978-3-527-30446-2
7. H. H. Szmant; Organic Building Blocks of the Chemical Industry, John Wiley & Sons, 1989
8. H. H. Szmant; Industrial Utilization of Renewable Resources, Technomic, Lankaster 1986

#### Scientific works:

9. Scifinder

#### Price of products:

10. <http://www.icis.com/chemicals/channel-info-chemicals-a-z/> (last connection 08/10/2017)

#### IQS electronic library:

11. <http://biblioteca.iqs.es/ca/presentacio>
12. <http://biblioteca.iqs.es/es/presentacion>



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### **DOCUMENT RECORD**

#### **PREVIOUS CHANGES**

Rosa Nomen. 30/04/2013

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Rosa Nomen. 01/10/2015

Rosa Nomen. 01/10/2016

Rosa Nomen. 08/10/2017

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Rosa Nomen. 25/09/2018