COURSE GUIDE – EXTENDED FORM

Academic year 2026 – 2027

1. Program information

1.1 University	University of Oviedo
1.2 Faculty	Faculty of Chemistry
1.3 Department	Chemical and Environmental Engineering
1.4 Field	Chemical Engineering
1.5 Study level	Master
1.6 Specialization	Chemical and Biochemical Process Technology - CBPT

2. Course information

2.1.1 Course name				**Analysis and Synthesis of Chemical Processes**			
2.1.2 Course code				MINQUI01-1-17	2.1.3. Course category Fundamental/Specialized/Complementary		S
2.2 Course instructor				Paula Oulego Blanco			
2.3 Course instructors for applied activities (S, L, P, Pr)					Paula Oulego Blanco		
2.4 Year of study [2]	1	2.5 Semester[3]	2	2.6 Evaluation type[4]	E, A	2.7 Course type [5]	DOB

3. Amount of time estimated for course activities (hours / term)

3.1 Hours /week	2.5	3.2 course	1.5	3.3a sem.	0.5	3.3b laboratory		3.3c project	0.5	3.3.d. practice		
3.4 Total hours from curriculum[6]	35	3.5 course	21	3.6a sem.	7	3.6b laboratory		3.6c project	7			

Time spent for related activities[7]	Hours
Study of recommended books, course support, scientific papers and course notes	30
Practical skills development	28
Preparation of seminars / laboratory works / project phases / home works / presentations	25.5
Evaluation[8]	3
Other activities:	

3.7 Total hours of individual study [9]	86.5
3.8 Total hours per semestre[10]	121.5
3.9 Number of credits	4.5

4. Prerequisites (optional)

4.1 Curriculum[11]	
4.2 Learning outcomes	

5. Requirements

5.1 Conditions for course delivery[12]	Blackboard, video projector
5.2 Seminar / Laboratory / Project delivery requirements[13]	Blackboard, video projector, optimization software (EXCEL, GAMS or similar)

6. Overall objective of the course

This course aims to study in depth the synthesis and design of a process, addressing different strategies for the selection and sizing of equipment. Special attention will be paid to economic, quality, energy saving, safety and waste minimization aspects.

7. Learning outcomes

Knowledge	The student / graduate will: 1. Be able to formulate and solve complex problems in the fields of process and product design.
Skills	The student / graduate will: 2. Be able to evaluate and make decisions about new designs or improvements of existing ones. 3. Be able to apply different strategies for addressing uncertainty and scale-up issues in the design of chemical processes.
Responsibility and autonomy	The student / graduate will: 4. Be able to integrate policies about energy saving, resources optimization, sustainability, safety and environmental issues in the stage of synthesis of a chemical process.

8. Teaching methods

Lectures are focused on theoretical or practical activities given in a fundamentally expository way, and supported by graphic material made available to students in advance. Lectures are complemented with practical activities with a high degree of student participation: seminar and project sessions. The seminars are focused on practical learning through problem-solving and practical exercises. Project sessions are dedicated to analyse practical cases in student groups to promote the development of transversal abilities related to team work, oral and written communication, take decisions under conditions of uncertainty considering ethical and social responsibilities, etc.

9. Course content

9. 1. Courses[15]	**Teaching methods**	**Time allocation**
9.1.1. Analysis and synthesis of processes. Hierarchical strategies and global optimization for decision making. Advanced calculation tools.	Interactive lecture. Clarifying explanations.	6 hours
9.1.2. Synthesis and optimization of processes: Pinch technology. Heat exchanger networks and integration of reaction, separation and auxiliary systems.		4 hours
9.1.3. Economic optimization of processes. Production planning.		4 hours
9.1.4. Integration of safety and environment in the design of processes.		4 hours
9.1.5. Design in the presence of uncertainty. Sizing and scaling		3 hours
Course bibliography: *Books:* Biegler, L.T., Grossmann, I.E., Westerberg, A.W., "Systematic Methods of Chemical Process Design", Prentice Hall, Nueva Jersey (1997). El-Halwagi. M.M. Process Integration. Elsevier B.V., Amsterdam (2006). Seider, W.D., Seader, J.D., Lewin, D.R., Widagdo, S., "Product and Process Design Principles: Synthesis, Analysis and Design", John Wiley & Sons, Nueva York (2008). Smith, R., "Chemical Process Design and Integration", John Wiley & Sons, Ltd., West Sussex (2005).		
9.2a Seminar	**Working methods** [16]	**Time allocation**
Problem solving of optimization and process design.	Exercises and problem solving	7 hours
9.2b Project	**Working methods** [16]	**Time allocation**
Practical cases of analysis and synthesis of chemical processes. Practical cases of integration of heat integration in reaction, separation and auxiliary systems.	Work in groups of students to address and discuss practical cases.	7 hours
Bibliography for applied activities (seminar / laboratory / project): Same bibliography as courses.		

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation method	10.3 Percentage of the final grade
10.4 Final Exam	Completeness and correctness of knowledge. Degree of mastery of specialized terminology and communication skills. Ability to apply acquired skills. Ability to process data and solve given problems.	Summative assessment test (final evaluation).	40%
10.5a Seminar	Ability to apply learned knowledge in practice. Ability for analysis, personal interpretation, originality, and creativity	Active participation in activities. Assignments.	30%
10.5b Project	Ability to apply learned knowledge in practice. Ability for analysis, personal interpretation, originality, and creativity	Active participation in activities.	30%

10.6 Conditions for passing
Grades from 0 to 10 points will be awarded to each activity of the course. The score of the Final Exam must be, at least, 4 points and the score of the Seminar and Project activities, at least, 5 points. The Final Evaluation of the module is determined by considering the scores and weights assigned to each activity within the course. A minimum grade of 5 certifies the achievement of the minimal learning outcomes required for the course and the awarding of the corresponding study credits.

Date:

Course instructor: Paula Oulego Blanco

Course instructors for applied activities: Paula Oulego Blanco

Date of approval by the department:

Head of Department: Manuel Rendueles de la Vega

Date of approval by the Faculty Council:

Dean, José Javier Borge Álvarez