Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2025/26

Faculty 345 - Faculty of Engineering - Bilbao **Cycle** .

Degree GITECI30 - Bachelor`s Degree in Industrial Technology Engineering **Year** Third year

COURSE

27321 - Chemical Technology **Credits, ECTS:** 6

COURSE DESCRIPTION

"Chemical Technology" is a compulsory course of the 2nd semester of the 3rd year of the Industrial Technologies Engineering. This course is based on the first year Chemistry course and on the 2nd year Thermodynamics course. Its contents will be further developed within the courses that form the 4th year intensification in Industrial Chemical Engineering.

The learning process will be oriented towards the application of the concepts developed in this course to different technological areas such as chemistry, materials, environment, etc. Mass and Energy balances of different production processes are considered in the first part of this course so the students gain an overall overview of the different technologies and units involved in industrial chemical processes. The design of some of these units is considered in the second part of the course. In this way:

i) Basic knowledge about chemical reaction kinetics and its applications to solve simple design examples of ideal, homogeneous and isothermal chemical reactors.
ii) The students¿ previous knowledge related to variable composition systems, mono or multiphasic, is broadened introducing, at elementary level, the main alternatives that can be applied to separation and purification processes based on volatility or solubility differences (distillation, crystallization and absorption). The design of some of the equipment where these processes take place is also considered, as for example, the evaporators.

Throughout these topics and the solution of exercises and numerical problems the students will get a deeper understanding on the application of these concepts to common systems in chemical process engineering and related areas.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The competence to be developed by the students throughout this course is the E06 and it corresponds to the M03 module (Specific Technologies):

To get basic and applied knowledge about mass and energy balances, biotechnology, mass transfer, separation processes, chemical reaction engineering, reactor design and the transformation and valorization of raw materials and energy resources.

The results of the learning process in this course are focused on getting a deeper understanding of technical topics (whose basic knowledge has been acquired in the previous module), so that, the students that pass this course will be able, within the field industrial chemical engineering and relating areas:

- To understand real problems from the field of the industrial engineering within any of its specialties. Besides that, it is considered especially relevant to develop capacities to evaluate the importance of any industrial problem and to adopt decisions to avoid human, environmental and/or economic loses.
- To solve through structured procedures, multidisciplinary problems in any industrial field.
- To design and implement industrial facilities and production and control processes, taking into account relevant aspects such as energetic, mechanic- structural, electrical or environmental ones.

Theoretical and Practical Contents

AT THE CLASSROOM:

1. Introduction to Chemical Technology
2. Mass and Energy Balances
3. Introduction to engineering chemical kinetics
4. Elements of Unit Operations

TEACHING METHODS

Classroom activities:
In the lectures brief expositions supported by audiovisual resources hosted at eGela will be used to present the basic concepts and the fundamental laws of each of the topics to be covered. These presentations will be combined with the discussion with students of relevant everyday or industrial examples in order to clarify the corresponding concepts.

Exercises:
Further work at the classroom will be dedicated to the resolution of theoretical questions as well as numerical exercises that allow a better and deeper understanding of the most important aspects of the considered topics. Some of them will be worked at the classroom and some others can be solved by the student. These problems can be presented to the professor in order to be considered in the final mark. All these questions and exercises will be available through eGela platform.

Activities for continuous evaluation:
Finally, to ensure a continuous learning process of students several activities (labwork, complex exercise resolutions, tests¿) under the direct supervision of the professor will be carried out both individually or as teamwork.

The dates when these activities must be carried out will be published before the starting date of the course at the Webuntis platform.

Each student must present at the end of each session a written report.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30	1,5	22,5	3	3				
Horas de Actividad No Presencial del Alumno/a	45	0	33,75	11,25	0				

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Individual assignments 15%
- Practical work 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of this course will be carried out taking into account the following items:
- Written exam: 70 %
- Continuous evaluation: 30%, divided into:
  - Deliverables: 15 %. Reports, presentations, work-problems, ¿ developed by the students along the course.
  - Lab-work and related practices: 15 %. Evaluated through the questionnaires and written reports delivered by the students and their behavior at the lab. The practicum activities will only evaluated if assisted to all of them.

Those students that get a mark lower than 5.0 out of 10 in the written exam will not pass this course.

The students who present a written document reigning to the continuous evaluation activities before the 9th week of the term must pass an additional exam in order to prove the acquisition of the corresponding competences.

The final mark will be calculated through the following formula:

Final mark = 0.70 (written exam mark) + 0.15 (labwork mark) + 0.15 (deliverables).

- If the written exam mark is higher than 5.0 and the final mark calculated using the previous formula is equal or bigger than 5, the final mark will be the one resulting from the application of the formula.
- If the written exam mark is higher than 5.0 and the final mark calculated using the previous formula is lower than 5, the final mark will be the one resulting from the application of the formula.
- If the written exam mark is lower than 5.0, the final mark will be the same as the exam.

If the health situation avoids the development of any teaching or evaluation activity, a non-presential alternative will be used and the students will be promptly informed

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

For the extraordinary call, all the grades from the ordinary call higher than 5 (deliverables, lab-work and/or final exam) are kept.

If the written exam is not passed, the students will have the chance to be examined in a written exam. A mark of 5.0 will be required to pass this exam and the grade resulting from the formula to pass the course. If the continuous evaluation is not passed in its entire value (30%), the students will have two options:
- Option 1: to be evaluated only in the written exam (70%) and to obtain, after applying the formula, a grade of 5.0 or higher.
- Option 2: to be evaluated from both the written exam and the continuous evaluation in their entire contents. In such case, the students will have to contact the professor one week before the extraordinary exam to notify that they are willing to be examined in an additional test that considers all the parts of the continuous evaluation. Even when part of the continuous evaluation (labs, reports..) were passed, the students will be examined in its entire parts. This will be performed via an additional test.

The final mark will be calculated following the same formula and criteria as in the ordinary call.

MANDATORY MATERIALS

The students must use the materials containing questions and exercises delivered by the teaching staff and available at the eGela platform.

The syllabus of the course as well as the instructions for the practical work will also be available at this same platform in order to facilitate the learning process.

BIBLIOGRAPHY

Basic bibliography

Basic Principles and Calculations in Chemical Engineering. (6th edition) Himmelblau. Prentice-Hall, 1996
Elementary Principles of Chemical Processes. (3rd edition) Felder and Rosseau. Wiley, 2005
Chemistry. A Project of the American Chemical Society. ACS. Freeman, 2004
Chemical Principles. The Quest for Insights. (3rd edition) Atkins y Jones. Freeman, 2005
Introduction to Chemical Engineering. Thompson y Ceckler. Mc Graw-Hill, 1977
Understanding Engineering Thermo. Levenspiel. Prentice-Hall, 1996

Detailed bibliography

Introduction to Chemical Engineering Thermodynamics. (7th edition) Smith et al. Mc Graw-Hill, 2005
Chemical, Biochemical and Engineering Thermodynamics. (4th edition) Sandler. Wiley, 2006
Mass and energy balances. Reklaitis. Wiley, 1983
Chemical Engineering Kinetics. (3rd edition) Smith. Mc Graw-Hill, 1981
Chemical Reaction Engineering. (2nd edition) Levenspiel. Wiley, 1998
Elements of Chemical Reaction Engineering. (4th edition) Fogler. Prentice-Hall, 2006
Chemical and Process Analysis. Luyben y Wenzel. Prentice Hall, 1988

Journals

Web sites of interest

OBSERVATIONS