



The University of Cantabria offers a catalogue of courses taught in English that are integrated in different thematic programs. The courses are open to exchange students and it is possible to combine them with other regular courses in Spanish. For non-native students a B2 level of English is recommended.

#### Unit courses (6 ECTS)

##### Life Cycle Assessment

###### G799 - Spring

Life Cycle Assessment (LCA) is a well-known methodology applied to products, processes and services which consider its Full life cycle: From the cradle (as natural resources) to the grave (as wastes). The course covers all aspects about how to perform an LCA study: definition of the goal and scope as well as the target audience, gathering data on resource consumption and emissions, burdens to the environment, checking the robustness and significance of results and conclusions, and reporting and reviewing to ensure transparency and quality. This LCA course includes LCA Fundamentals as well as practical activities based on group projects. For the project development, the students learn how to use commercial LCA software.

##### Wastewater Treatment

###### G795 - Spring

This course provides the basic knowledge on wastewater treatment necessary to be able to successfully afford issues related to wastewater treatment, new water sources, desalination, sustainable management of water resources, etc. At the end of the semester the student should be able to: i) understand the current situation of demand and water availability, ii) conceptualize conventional wastewater treatment processes, iii) conceptualize process of obtaining reclaimed water and desalinated water and, iv) discriminate alternatives For water reclamation and desalination using sustainability criteria.

##### Advanced Separation Processes

###### G787 - Spring

This course covers the Fundamentals and applications of rate-controlled separation processes: membrane-based separation processes and solid-Fluid separations. The specific objectives to be achieved by the students are: i) to know and understand From a qualitative and quantitative point of view the phenomena taking place in membrane units and adsorption/ion exchange columns and, ii) to identify and compare advanced separation processes on their application in solving separation problems in the context of industry and environment. The course includes small-group laboratory assignments.

##### Analysis of Separation Processes

###### G1780 - Spring

This course covers the analysis and design of separation processes involving phase equilibria and mass transfer. Among the equilibrium-controlled separation processes, distillation, gas absorption/stripping and liquid-liquid extraction are studied. With respect to rate-controlled separation processes, special attention is paid to membrane-based separation processes as well as other advanced separation technologies such as adsorption. In addition, students will acquire the following transversal concepts and competences: continuous and batch processing, counter-current and co-current flow patterns, separation equipment, modeling of the performance of various separation systems, optimization of the design of separation systems to achieve targets for product purity, experience using modern computer software for designing separation processes and ability to develop and apply criteria for selecting among available separation technologies.

##### Dynamics and Control of Chemical Processes

###### G784 - Spring

The course provides an appropriate balance of dynamics and control theory and practice, the latter is developed through case studies and one mini group project. Part I provides an introduction to process control and in-depth discussion of dynamic process modeling, based on basic principles of mass and energy conservation. Part II is concerned with the analysis of the dynamic (unsteady-state) behaviour of processes. In addition, the important topics of empirical models and their development from plant data are presented. Finally, Part III addresses the Fundamental concepts of Feedback and Feedforward control. The topics include an overview of the process instrumentation that is necessary to implement process control: chemical composition, pressure, temperature, Flowrates, Final control elements. Chemical engineers need to master "Process Control" in order to be able to design and operate modern plants.



# Study in English at UC

# Chemical Engineering



## Chemical Kinetics and Reactor Design

### G1774 - Spring

This course covers the fundamentals of chemical reaction kinetics and the principles of reactor design for chemical processes. The specific objectives to be achieved by the students are: i) to know and understand the fundamentals of chemical reaction kinetics in homogeneous reactions, ii) to identify the mathematical relationships between the operation variables and the kinetic parameters to describe the kinetic behaviour of reactive systems, iii) to know the performance, design and optimization of ideal homogeneous reactors, iv) to develop and solve the mass, energy and momentum balances in ideal homogeneous reactors, and v) to understand and describe the performance of chemical reactors with deviations from ideal flow patterns. The subject consists of a theoretical part (60%) and a practical part (40%) developed in a compute, simulation lab.

## European Project Semester

### G1636 - Spring

This is a unique course of 30 ECTS aimed to integrate the fundamentals of chemical engineering disciplines for the optimum design of environmental, biotechnological and industrial processes. Along the semester students will take 3 regular courses G787 Advanced Separation processes, G795 Wastewater Treatment and G799 Life Cycle Assessment and will end up with the completion of the Final Degree Project. Approximately half of the scheduled time will be devoted to the development and acquisition of practical skills both in compute, rooms working with specialized software as well as in laboratory working with bench scale set-ups. Team-working in multidisciplinary and international groups is favoured as an important part of the training program that for the assessment requires preparation of written reports and oral presentations. The list of projects' proposals is renewed every year to match the training program to technical and scientific topics of actual interest.

## Product Design Project

### G1772 - Fall

The educational system in chemical engineering has in the past been focusing mainly on process design. In the last years the attention of product design has increasingly been much more importance. The changes in chemical, molecular, materials, and nano engineering have made the development of a whole new range of functionalised and specialised products possible. The aim of this course is to introduce the students to the structured approach of designing a chemical product. After a thorough introduction of the product concept design path (following the tradition of Cussler and Moggridge) the course utilizes several case studies of product design in order to introduce the concepts of specialty chemicals, micro- and macrostructured products and devices for chemical changes. Different methodologies are used: i) team work, ii) seminar by professional from industry, iii) visits and iv) use of real examples.

The courses of the **Master's Degree in Chemical Engineering** are also open to exchange students and it is possible to combine them with other regular courses in Spanish. For non-native students a B2 level of English is recommended.

### Unit courses (3 ECTS)

## Emerging Technologies in Chemical Engineering

### M2108 - Spring

The aim of the subject is to provide a novel approach through study cases of novel applications and technologies where chemical engineers play a decisive role. During the course, potential applications of Chemical Engineering in emerging sectors such as nanotechnology and biomaterials will be analysed. In this regard, the main learning outcomes focus on providing technical alternatives to solve environmental, industrial and social problems and on applying the fundamentals of Chemical Engineering to solve problems in related areas such as biomedicine and material science.

## Knowledge Dissemination in Chemical Engineering

### M2109 - Spring

This subject aims to provide the guidelines to elaborate in an adequate way and with certain originality develop reasoned arguments and written scientific/technical documents, such as scientific papers and technical reports, or to make reasonable assumptions. Students who overcame this subject will be able to publicly present ideas, procedures or research reports, convey emotions or give advice to individuals and organisations. In addition, analysis of results and the management of databases in the field of Chemical Engineering will be covered by the course.

## Courses in other disciplines

A complete list of courses taught in English can be found in the Following link:  
<http://web.unican.es/en/Studying/academic-offer/courses-taught-in-english>

Of special interest are the courses dealing with Spanish Language, History and Culture:

- **Spanish History and Culture.**  
G1806 - Spring
- **Spanish Language.** G1807 - Spring
- **European Culture and Civilization.**  
G1808 - Spring
- **Cross-Cultural Spanish Arts.**  
G1809 - Spring
- **Prehistoric European Art.**  
G1504-Spring
- **Contemporary Spain (1939-2009). Politics, Society and Culture.**  
G1810 - Spring
- **Discovering Spanish Landscapes**  
G1811 -Spring
- **Playing with Words: The Spanish Literature in its Main Texts.**  
G1812 - Spring



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