

**Proyecto/Guía docente de la asignatura****Project/Course Syllabus**

Se debe indicar de forma fiel cómo va a ser desarrollada la docencia. Esta guía debe ser elaborada teniendo en cuenta a todo el profesorado de la asignatura. Conocidos los espacios y profesorado disponible. Los detalles de la asignatura serán informados por el Campus Virtual.

Se recuerda la importancia que tienen los comités de título en su labor de verificar la coherencia de las guías docentes de acuerdo con lo recogido en la memoria de verificación del título y/o en sus planes de mejora. Por ello, **tanto la guía, como cualquier modificación** que sufra en aspectos "regulados" (competencias, metodologías, criterios de evaluación y planificación, etc..) deberá estar **informada favorablemente por el comité de título ANTES** de ser colgada en la aplicación web de la UVa. Se ha añadido una fila en la primera tabla para indicar la fecha en la que el comité revisó la guía.

The syllabus must accurately reflect how the course will be delivered. It should be prepared in coordination with all teaching staff involved in the course and once the available teaching spaces and instructors are confirmed. Specific details regarding the course will be communicated through the Virtual Campus.

It is important to recall the key role of the Degree Committees in verifying the coherence of course syllabi with the official degree verification report and/or any improvement plans. Therefore, the syllabus — as well as any changes affecting "regulated" aspects (such as learning outcomes, teaching methods, assessment criteria, and course schedule) — must receive prior approval from the Degree Committee BEFORE being published on the UVa web application.

A new row has been added to the first table to indicate the date on which the Committee reviewed the syllabus.

Asignatura <i>Course</i>	Chemical Engineering Product		
Materia <i>Subject area</i>	Product Engineering		
Módulo <i>Module</i>	Process & Product Engineering		
Titulación <i>Degree Programme</i>	Master in Chemical Engineering		
Plan <i>Curriculum</i>	542	Código <i>Code</i>	53746
Periodo de impartición <i>Teaching Period</i>	2nd Semester	Tipo/Carácter <i>Type</i>	Compulsory
Nivel/Ciclo <i>Level/Cycle</i>	Master	Curso <i>Course</i>	1
Créditos ECTS <i>ECTS credits</i>	4,5		
Lengua en que se imparte <i>Language of instruction</i>	Spanish/English		
Profesor/es responsable/s <i>Responsible Teacher/s</i>	Facundo Mattea María José Cocero Alons		
Datos de contacto (E-mail, teléfono...) <i>Contact details (e-mail, telephone...)</i>	Mariajose.cocero.alonso@uva.es fmattea@uva.es 982423174		
Departamento <i>Department</i>	Chemical Engineering and Environmental Technology		
Fecha de revisión por el Comité de Título <i>Review date by the Degree Committee</i>	13/07/2026		

En caso de guías bilingües con discrepancias, la validez será para la versión en español.



In the case of bilingual guides with discrepancies, the Spanish version will prevail.

Situación / Sentido de la Asignatura

1.

Course Context and Relevance

1.1 Contextualización

Course Context

This course is a compulsory topic, that is taught in the second semester of the first year of the Master in Chemical Engineering. It is a subject of marked practical character, where students learn to develop products supported in his chemical engineering background, from the idea to the commercialization.

1.2 Relación con otras materias

Connection with other subjects

The subject is related to the "sustainability and excellence", focused on promoting students' entrepreneurship, in the opportunity to develop innovative products that can be commercialized.

1.3 Prerrequisitos

Prerequisites

Knowledge of balances of matter and energy, and separation and reaction processes

2. Resultados del proceso de formación y de aprendizaje (RD 822/2021) o competencias (RD 1393/2007)***Learning outcomes (RD 822/2021) or competences (RD 1393/2007)***

Para los planes de estudio al amparo del RD 822/2021 deben completarse conocimientos o contenidos, habilidades o destrezas y las competencias.

Para los planes de estudio al amparo del RD 1393/2007 deben completarse las Competencias Generales y las Competencias Específicas.

For study programmes under RD 822/2021, it is necessary to specify knowledge or content, skills or abilities, and competences.

For study programmes under RD 1393/2007, General Competences and Specific Competences must be included.

General Competences

- CG02. Devise, project, calculate, and design processes, equipment, industrial facilities and services in the field of chemical engineering and related industrial sectors in terms of quality, safety, economy, rational and efficient use of natural resources, and environment preservation.
- CG03. To lead and manage in a technical and economical way projects, facilities, plants, companies and technology centres in the field of chemical engineering and related industrial sectors.
- CG04. Perform appropriate research, design and lead the development of engineering solutions, in new or uncertain environments, relating creativity, originality, innovation and technology transfer.
- CG06. To be able to analyse and synthesize the continuous progress of products, processes, systems and services using criteria of safety, economic viability, quality and environmental management.
- CG07. Integrate knowledge and face the complexity of making judgments and decision making, based on incomplete or limited information, including reflections on the social and ethical responsibilities of professional practice.
- CG08. To lead and define multidisciplinary teams, capable of solving technical changes and management needs in national and international contexts.
- CG09. Communicate and discuss proposals and conclusions in multilingual, specialized and non-specialized forums, in a clear and unambiguous way.
- CG10. Adapt to changes, being able to apply new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit.
- CG11. To possess the abilities of the autonomous learning to maintain and to improve the own competences of the chemical engineering that allow the continuous development of the profession.

Specific Competences

- CEP01. Apply knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience, and practice, with critical reasoning to establish economically viable solutions to technical problems.
- CEP02. Design products, processes, systems and services of the chemical industry, as well as the optimization of others already developed, taking as technological base the chemical engineering bases, processes, transport phenomena, separation operations and engineering reactions chemical, nuclear, electrochemical and biochemical
- CEP04. Ability to solve problems that are unfamiliar, incompletely defined, and have competing specifications, considering possible methods of solution, including the most innovative, selecting the most appropriate, and being able to correct the implementation, evaluating the different design solutions.

**2. Resultados del proceso de formación y de aprendizaje (RD 822/2021) o competencias (RD 1393/2007)*****Learning outcomes (RD 822/2021) or competences (RD 1393/2007)***

Para los planes de estudio al amparo del RD 822/2021 deben completarse conocimientos o contenidos, habilidades o destrezas y las competencias.

Para los planes de estudio al amparo del RD 1393/2007 deben completarse las Competencias Generales y las Competencias Específicas.

For study programmes under RD 822/2021, it is necessary to specify knowledge or content, skills or abilities, and competences.

For study programmes under RD 1393/2007, General Competences and Specific Competences must be included.

SECTION 1. INTRODUCTION TO INNOVATION IN PRODUCT

1. SCIENTIFIC AND TECHNOLOGICAL SURVEILLANCE APPLIED TO PRODUCT DEVELOPMENT. Intellectual property protection: patents, trademarks and trade names.
2. SUSTAINABILITY IN THE PRODUCT. Carbon footprint and water footprint. The responsibilities of the chemical process industry.
3. TYPES OF PRODUCTS. Commodity products. Molecular products. Microstructures. Nanoparticles. Devices.

SECTION 2. PRODUCTS DEVELOPMENT

4 DOWNSTREAM PROCESSING Solvent classification. Solvent evaporation. Reverse osmosis. Freeze-drying. Spray-drying. CO₂-drying. Micro / nanoparticles. Methods "Top-down": milling and ultra-homogenization. Methods "Bottom-up": crystallization / precipitation. The role of supercritical fluids in marinization processes. Practical case.

FORMULATION OF PRODUCTS

5. FORMULATION OF ACTIVE COMPOUNDS IN LIQUID PHASE: emulsions, nano suspensions, micelles and liposomes. Practical case: development of a liquid-phase active compound product.
- 6 FORMULATION OF ACTIVE COMPOUNDS IN SOLID PHASE Encapsulation of active compounds. Encapsulation materials. Encapsulation techniques. Coacervation. Spray drying. Practical case

BIOMASS TO PRODUCTS

- 7 POLYMERS & BUILDING BLOCKS FROM LIGNOCELLULOSIC BIOMASS I. Lignocellulosic biomass biorefinery. Products from cellulose.
- 8 POLYMERS & BUILDING BLOCKS FROM LIGNOCELLULOSIC BIOMASS. II Lignocellulosic biomass biorefinery. Products from lignin.

SECTION 3. CASE STUDIES.**9. PRACTICAL CASES**

Business mode. (Incoming Professionals program).

10. OPPORTUNITIES TO SUPPORT PROJECT DEVELOPMENT.

Research & development project proposals.

CHEMICAL ENGINEERING PRODUCT DESIGN PROJECT

Development of a product. Individual and group tutorials (Seminars 4 & 5).

SEMINARS & TASK

SEMINAR 1. Biopolymers from biomass I

Objective: To know and extract the information that can be obtained from the patents

Task 1. Patent study about a bio-based polymers selected among the high major industrial production.

SEMINAR 2 Carbon Footprint.

Objective: Comparative study about the cost of energy from petroleum coke and from biomass that reduces the carbon footprint.

To use SENDECO2 Data Base. <https://www.sendeco2.com/es/>

Task 2. Evaluate the cost associated with the energy production by fuel, biomass pellets and wastes without a CO2 emission factor.

SEMINAR 3 Biopolymers from biomass. II

Task 3 Bibliographic study. Production processes, products, uses and market. Market study about commercial products made from the renewable biopolymer, and its composites.

SEMINAR 4. Case study.

Innovate product development bases in research studies

SEMINAR 5. Development of a new product I.

Product proposal: background literature and patents study, market study about similar products. Business model
Project content. First project informs.

SEMINAR 6. Development of a new product II.

Products development: product composition and characteristics, blocks diagram, mass balance and energy consume. Industrial equipment selection. specification sheets. Applications & marketing.
Second inform submission

g Material docente

g Teaching material

Es fundamental que las referencias suministradas este curso estén actualizadas y sean completas. El profesorado tiene acceso, a la **plataforma Leganto de la Biblioteca** para actualizar su bibliografía recomendada ("Listas de Lecturas"). Si ya lo ha hecho, puede poner tanto en la guía docente como en el Campus Virtual el enlace permanente a Leganto.

La Biblioteca se basa en la bibliografía recomendada en la Guía docente para adaptar su colección a las necesidades de docencia y aprendizaje de las titulaciones.

Si tiene que actualizar su bibliografía, el enlace es el siguiente, [https://buc-](https://buc-uva.alma.exlibrisgroup.com/leganto/login?auth=SAM)

[uva.alma.exlibrisgroup.com/leganto/login?auth=SAM](https://buc-uva.alma.exlibrisgroup.com/leganto/login?auth=SAM) (acceso mediante tus claves UVA). Este enlace te envía a la página de autenticación del directorio UVA, el cual te redirige a Leganto. Una vez allí, aparecerán, por defecto, las listas de lectura correspondientes a las distintas asignaturas que imparte ("instructor" en la terminología de Leganto / Alma). Desde aquí podría añadir nuevos títulos a las listas existentes, crear secciones dentro de ellas o, por otra parte, crear nuevas listas de bibliografía recomendada.

Puede consultar las listas de lectura existentes mediante el buscador situado en el menú de arriba a la izquierda, opción "búsqueda de listas".

En la parte superior derecha de cada lista de lectura se encuentra un botón con el signo de omisión "•••"

It is essential that the references provided for this course are up to date and complete. Faculty members have access to the Library's Leganto platform to update their recommended reading lists. If they have already done so, they may include the permanent Leganto link both in the course syllabus and on the Virtual Campus.

The Library relies on the recommended bibliography listed in the course syllabus to adapt its collection to the teaching and learning needs of each degree programme.

To update your bibliography, please use the following link: [https://buc-](https://buc-uva.alma.exlibrisgroup.com/leganto/login?auth=SAM)

[uva.alma.exlibrisgroup.com/leganto/login?auth=SAM](https://buc-uva.alma.exlibrisgroup.com/leganto/login?auth=SAM) (access using your UVA credentials). This link takes you to the UVA directory authentication page, which will then redirect you to Leganto. Once there, the reading lists associated with the courses you teach will appear by default ("instructor" in Leganto/Alma terminology). From this platform, you can add new titles to existing lists, create sections within them, or alternatively, create new recommended reading lists. You can browse existing reading lists using the search bar located in the top left menu, under the "Find Lists" option.

In the top right corner of each reading list, you will find a button marked with an ellipsis "•••" (three dots). Clicking it opens a menu that includes, among other



(puntos suspensivos), a través del cual se despliega un menú que, entre otras opciones, permite "Crear un enlace compartible" que puede dirigir o bien a la lista de lectura concreta o bien al "Curso" (asignatura). Este enlace se puede indicar tanto en el apartado "g. Materiales docentes" (y subapartados) de la Guía Docente como en la sección de Bibliografía correspondiente a la asignatura en el Campus Virtual Uva.

Para resolver cualquier duda puede consultar con la biblioteca de tu centro. [Guía de Ayuda al profesor](#)

options, the ability to "Create a shareable link", which can point either to a specific reading list or to the entire course. This link can be included in section "g. Teaching Materials" (and its subsections) of the Course Syllabus, as well as in the Bibliography section of the course page on the UVa Virtual Campus.

If you have any questions, please contact your faculty library. [Guía de Ayuda al profesor](#)

g.1 Bibliografía básica

Required Reading

Bibliography.

Product engineering. Molecular structure and properties. J Wei. Oxford University Press 2007.

Chemical product design. E L Clussler. G O Moggridge. Cambridge 2011

Surfactants science and technology. D Myers. Wiley.2006

Ullmann's Encyclopedia of Industrial Chemistry, John Wiley & Sons 2003

Natural Product Extraction: Principles and Applications M A. Rostagno, and J Prado. RSC 2013.

Encapsulation Nanotechnologies. V Mittal. Wiley 2013.

<http://www.epo.org/>

g.2 Bibliografía complementaria

Supplementary Reading

Manuscripts about specific applications that will be distributed from the virtual classroom

European patent office. <https://www.epo.org/en>

Searching for patents <https://www.epo.org/en/searching-for-patents>

Uva library <https://biblioteca.uva.es/>

g.3 Otros recursos telemáticos (píldoras de conocimiento, blogs, videos, revistas digitales, cursos masivos (MOOC), ...)

Additional Online Resources (microlearning units, blogs, videos, digital journals, massive online courses (MOOC), etc.)

Technical videos distributed throughout the virtual campus.

4. Objetivos

Course Objectives

Chemical engineering fundamental knowledge applied to the development and innovation of commercial products.

1 INTRODUCTION TO INNOVATION IN PRODUCTS.

Understand the usefulness of patents as a source of funding for research and as a source of information.

Calculate the carbon footprint in the development of a product and how to reduce it.

Know different types of products, market, procurement and applications

Know how to obtain products from renewable raw materials, as an alternative to products obtained from petrochemical industry.

2. PRODUCT ENGINEERING DEVELOPMENT.

Develop innovative products, through knowledge of procurement and formulation processes.

Know different formulations in liquid phase, and the procedures to produce them.

Know different processes to obtain solid phase products with sizes of micro and nano-particles.

Know different processes to obtain formulations in solid phase.

Know lignin Biorefineries to obtained products.

Know products from cellulose and lignin.

3. DEVELOPMENT OF A PRODUCT.

Develop an innovative industrial product. Case studies.

Develop a business model of a product

Learn how to write and prepare a project application to obtain financing for the stages of research and development of a product.

5. Métodos docentes y principios metodológicos

Instructional Methods and guiding methodological principles

The theoretical classes will use, mainly the expository method to transmit the fundamental knowledge of the subject. In the virtual campus the student will have in advance the material used for the presentations and a reference book on the subject presented.

Seminars where the student will develop tasks related to 1. the use of patent search engines, search of technical and scientific information in publications and patents. 2 Bibliographic study about removable products. 3 Carbon Footprint practical exercises.

Project based learning. The student will develop different aspects of product development in case-based tasks. Laboratory of experimentation with industrial equipment for products development.

6. Tabla de dedicación del estudiantado a la asignatura

Student Workload Table

ACTIVIDADES PRESENCIALES o PRESENCIALES o A DISTANCIA ⁽¹⁾ <i>FACE-TO-FACE/ ON-SITE or ONLINE ACTIVITIES⁽¹⁾</i>	HORAS HOURS	ACTIVIDADES NO PRESENCIALES <i>INDEPENDENT / OFF-CAMPUS WORK</i>	HORAS HOURS
Lectures	12	Self-study and individual work	48
Lab innovative products development	9	Study and autonomous group work	20
Seminars	24		
Total on-site	45	Total off-site	68
Total presencial <i>Total face-to-face</i>	45	Total no presencial. <i>Total non-face-to-face</i>	68
TOTAL presencial + no presencial <i>Total</i>			

- (1) Actividad presencial a distancia es cuando un grupo sentado en un aula del campus sigue una clase por videoconferencia de forma síncrona, impartida por el profesor. *Distance face-to-face activity refers to a situation in which a group of students, seated in a classroom on campus, attends a class via live videoconference delivered by the instructor in real time.*

7. Sistema y características de la evaluación

Assessment system and criteria

INSTRUMENTO/PROCEDIMIENTO ASSESSMENT METHOD/PROCEDURE	PESO EN LA NOTA FINAL WEIGHT IN FINAL GRADE	OBSERVACIONES REMARKS
Tasks	25 %	
Cases study	10 %	
Project + oral exam	30 %	
Written test	30 %	
Assessment of the students' attitude and participation in the training activities.	5%	

CRITERIOS DE CALIFICACIÓN ASSESSMENT CRITERIA
Convocatoria ordinaria. First Exam Session (Ordinary) Topics from section 2. Product project ... Convocatoria extraordinaria^(*) Second Exam Session (Extraordinary / Resit) ^(*): written + oral part (20% + 20%), tasks 30%, product project 30% (document 20%+10% oral) ...

(*) Se entiende por convocatoria extraordinaria la segunda convocatoria.

RECORDATORIO El estudiante debe poder puntuar sobre 10 en la convocatoria extraordinaria salvo en los casos especiales indicados en el Art 35.4 del ROA 35.4. "La participación en la convocatoria extraordinaria no quedará sujeta a la asistencia a clase ni a la presencia en pruebas anteriores, salvo en los casos de prácticas externas, laboratorios u otras actividades cuya evaluación no fuera posible sin la previa realización de las mencionadas pruebas."

<https://secretariageneral.uva.es/wp-content/uploads/VII.2.-Reglamento-de-Ordenacion-Academica.pdf>

(*)The term "second exam session (extraordinary/resit)" refers to the second official examination opportunity.

REMINDER Students must be assessed on a scale of 0 to 10 in the extraordinary session, except in the special cases indicated in Article 35.4 of the ROA: "Participation in the extraordinary exam session shall not be subject to class attendance or participation in previous assessments, except in cases involving external internships, laboratory work, or other activities for which evaluation would not be possible without prior completion of the aforementioned components."

<https://secretariageneral.uva.es/wp-content/uploads/VII.2.-Reglamento-de-Ordenacion-Academica.pdf>



8. Consideraciones finales

Final remarks

El uso de IA Generativa está permitido en ciertas tareas de esta asignatura.

- Para conocer en cuáles se permite, se aconseja revisar con detalle las especificaciones de dichas tareas cuando estas aparezcan en el aula virtual, en el cronograma de la asignatura y/o en el temario detallado.
- Es responsabilidad del/de la estudiante conocer y aplicar estos requisitos específicos.



