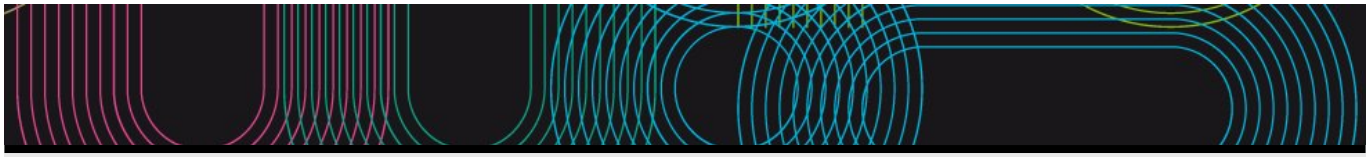

IDENTIFYING DATA				
Chemical industries of the wood, cellulose, pulp and paper				
Subject	Chemical industries of the wood, cellulose, pulp and paper			
Code	P03G370V01805			
Study programme	Grado en Ingeniería Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Sánchez Bermúdez, Ángel Manuel			
Lecturers	Sánchez Bermúdez, Ángel Manuel			
E-mail	asanchez@uvigo.gal			
Web	http://eqea.uvigo.es/			
General description				

Training and Learning Results	
Code	
B1	Ability to understand the biological, chemical, physical, mathematical and representation systems necessary for the development of professional activity, as well as to identify the different biotic and physical elements of the forest environment and renewable natural resources susceptible to protection, conservation and exploitations in the forest area.
B11	Ability to characterize the anatomical and technological properties of wood and non-timber forest raw materials, as well as the technologies and industries of these raw materials.
C37	Knowledge of the basic principles of the chemical transformation of wood and its industrial processes, in particular cellulose and paper.
D2	Ability to communicate orally and written in Spanish or in English
D5	Capacity for information management, analysis and synthesis
D10	Autonomous Learning

Expected results from this subject	Training and Learning Results		
1. Knowledge and understanding of wood engineering to the necessary level to complain the rest of the competitions of the degree, including notions of the last advances. 2. Capacity to analyze products, processes, and complex systems in his field of study; choose and apply analytical methods, calculations, and experimental notable of notable form and interpret properly the results of these analyses. 3. Capacity to project, design, and develop chemical processes oriented to the obtaining of products of the forest biomass. Capacity to make bibliographic research, consult and use databases and other sources of information. 4. Capacity *ydiseñar experiments, interpret results, and obtain conclusions in his field of study. 5. Practical competition to resolve complex problems, make complex projects of engineering and make specific investigations for his specialty. 6. Knowledge of separation methods and the unit operations in chemical engineering, teams and tools, technological processes, and of wood engineering and his limitations in the field. 7. Capacity to apply norms of engineering in his specialty.	B1 B11	C37	D2 D5 D10

Contents

Topic	
Unit operations and Transport Phenomena.	Matter Transfer Based Unit Operations. Heat Transmission Based Unit Operations. Simultaneous Heat and Matter Transfer based Unit Operations. Operations with solids Extensive and Intensive Properties. Definitions and relations. Similarities and differences between the transport of extensive properties. Molecular and turbulent transport. Material and Energy Balances.
2. Chemical composition of the wood. Possibilities of obtaining of products of this biomass.	Cellulose: Presence, Structure, and Properties of the molecule. Polymorphism, supramolecular structure, microfibers, and macro fibers. Hemicellulose: Classification and definitions. Basic units of construction. Chemical Structure of mananes, xylanes, galactanes and glucanes. Content in Hard and Soft Wood. Pectins: Definitions, Structural Units, Chemical Composition. Homogalacturonane and ramnogalacturonane. Lignin: presence, structural units and training of macromolecules of lignin, complex lignin-polysaccharide. *Suberina: Presence in the wood and other fabrics of the trees, chemical structure and function. Wooden extracts: occurrence, definitions, systematic; *terpenos and *terpenoides, *extractivos phenolic, fats, waxes, sour *grasos and *esteroles of soft and hard wood. Tannins of soft and hard wood. Inorganic constituents.
3. Wood Products	Chemical pathways for the integral valorization of wood. Cellulose, and Hemicellulose Derived Products. Wood Polysaccharides and their Applications. Other Valorizable Components of Wood.
4. Paper Pulp and cardboard. Study of Specific Processes of the obtaining Paper Pulp and its Derivatives.	Chemical processes, semi-chemical, mechanical, thermomechanical, and paper recovery. Prime matters. Properties of Fibers. Forest Feedstocks, Seasonal Vegetables, Waste Cellulosics, and Paper Recovery. The process of production of Pulp. Unit Operations. Digestion, Bleaching, Disintegration, Purification, Refinning.
5. Biorrefineríes	Bioenergy, Carbon Cycle and CO2 Captture. Basic Concepts about biorefineries: biofuels, bioproducts, and other materials. Microalgae Biorefineries.
6. Energy Valorization of Wood	Legislation and Energetic and Environmental Policy. Vegetal Biomass and Energy. Biofuels Biogas and Waste Management.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	15	0	15
Laboratory practical	21	24	45
Case studies	15	15	30
Problem solving	0	10	10
Mentored work	0	50	50
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Descriptive Lectures ching about the necessary concepts to solve the problems and the Cases of Study.
Laboratory practical	Experiments are conducted in the laboratory. The evaluation of the Student's Work will be done from his attitude and competition in the laboratory as well as the report in some format requested: experiment report, poster, scientific article, or presentation.
Case studies	Students must present some cases of study and will make all the numerical calculations and simulations related to their realization.
Problem solving	Students will solve problems in an autonomous way involving concepts treated in the masterclasses and the studies of cases and practices.

Mentored work	students have to perform a mentored preparation of a project related to: - Simulation of a process. - Modelling. - Laboratory Experiment. That has to document in a suitable form.

Personalized assistance

Methodologies	Description
Lecturing	Follow-up by Platform of and e-Learning. Publication of tutorials, presentations, and specific bibliography in MOOVI. Personalized mentoring both face-to-face and online.
Laboratory practical	Students wil find published guides, in MOOVI, for the realization of the laboratory experiments. They have to do some tasks related to: preparation, experiments calculations, and data processing as well as the corresponding report in the required format, as homework.
Case studies	Practical Case Studies shall be proposed to students to be solved with data and expertise obtained from lectures. That supply him with the professor. These practical cases should be delivered as Moodle tasks in MOOVI.

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	When being fundamentally descriptive the knowledges poured in the lectures will not be directly evaluate.	10	B1 C37 B11
Laboratory practical	Laboratory experiments will performed from which, at least three, go to avaliation. The rubric of the score for each delivery format will publish in MOOVI.	20	B11 C37
Problem solving	Problems ara a part of the exame and/or partial proofs realized during the class time. Also in form of deliverables in MOOVI. The grading will e done by the use of rubricsl published in MOOVI.	30	D2 D5
Mentored work	The work end of subject is a laboratory experimelt, or simulation, or mixed, and have to be delivered in a report format. Rubric for grading wil be published in MOOVI.	40	

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Eero Sjöstrom, **Wood Chemistry Fundamentals and Applications**, 2, ACADEMIC PRESS, INC., 1993

Tanja Wüstenberg, **Cellulose and Cellulose Derivatives**, 1, WILEY-VCH, 2013

Gunnar Henriksson, **Pulp and Paper Chemistry and Technology**, 1, Monica Ek, 2009

Many, **Biorefinery: From Biomass to Chemicals and Fuels**, 1, Michele Aresta, 2021

Many, **Cellulose Science and Technology**, Wiley, 2018

Deepansh Sharma, Anita Saini, **Lignocellulosic Ethanol Production from a Biorefinery Perspective**, 1, Springer, 2020

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/P03G370V01991

Subjects that are recommended to be taken simultaneously

Cellulose, pulp and paper/P03G370V01803

Subjects that it is recommended to have taken before

Chemistry: Chemistry/P03G370V01204

Other comments

Eligible matter for dual training projects as established by the memory of the degree.