



## IDENTIFYING DATA

### Cellulose, pulp and paper

Subject	Cellulose, pulp and paper		
Code	P03G370V01803		
Study programme	(*)Grao en Enxeñaría Forestal		
Descriptors	ECTS Credits	Type	Year
	6	Optional	4th
Teaching language			
Department			
Coordinator	Lorenzo Fouz, David		
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Web			
General description			

## Competencies

Code		Typology
CG3	CG-03: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Químicos.	• know • Know How
CG8	CG-08: Capacidade para identificar os diferentes elementos: recursos naturais renovables susceptibles de protección, conservación e aproveitamento.	• know • Know How
CG23	CG-23: Capacidade para aplicar e desenvolver as técnicas de aproveitamento de produtos forestais madeirables e non madeirables.	• Know How
CG32	CG-32: Capacidade para caracterizar as propiedades anatómicas e tecnolóxicas das materias primas forestais madeirables así como das tecnoloxías e industrias destas materias primas.	• know • Know How
CE37	(*)CE-37: Coñecementos dos principios básicos da química da celulósica e papeleira e dos seus procesos industriais.	• know
CT1	(*)CBI 1: Capacidade de análise e síntese.	• Know How
CT3	(*)CBI 3: Capacidade de comunicación oral e escrita tanto na lingua vernácula como en linguas estranxeiras.	• Know How
CT13	(*)CBS 1: Aprendizaxe autónoma.	• Know How

## Learning outcomes

Learning outcomes	Competences
(*)CE-37: Capacidad para conocer, comprender y utilizar los principios de los procesos industriales de fabricación de celulosa y papel	CG3 CG8 CG23 CG32 CE37 CT1 CT3 CT13

New

## Contents

Topic	
1. Pulp, paper and cardboard	Requirements and sources of paper fibers. Chemical composition of wood. Behavior of cellulosic fibers
2. Characteristics of the wood	Effect of the morphology of the fibers on the properties of the paper. Identification of wood species

3. The resources of the wood.	Measurement of wood for pulp. Preparation of wood for the manufacture of cellulose. Quality control of the chips.
4. Processes for obtaining pastas	Mechanical, chemical, semi-chemical and dissolving pastes. Comparison of folders and applications thereof.
5. Sulphate process	Definition of terms and description of the kraft process. System of recovery of the chemical products. Chemistry of the kraft process and variables affecting sulfate cooking. Control Parameters.
6. Cooking equipment	Discontinuous and continuous digesters. Extended delineation. Biorefinerías
7. Processing of the pulp	Deflection, knot removal, washing, sorting of pastes, thickening, pumping, storing, mixing, drying, cutting and stacking.
8. Recovery of cooking liquors	Evaporation. Recovery boiler. Caustification. Calcination. Recovery of by-products.
9. Bleaching of folders	ECF and TCF sequences. Stages of bleaching. Circuit closure
10. Economy and operating strategy of a pasta factory	Basic economic considerations. Costs control
11. Preparation of pulp for paper production	Disintegration, refining, measurement and mixing of the composition
12. Use of secondary fibers	Disintegration of the paperboard and deinking
13. Non-fibrous additives in paper manufacturing	Non-fibrous additives applications: bonding, internal strength, wet strength resins, fillers, chemical dyes and pitch control.
14. Paper making	Wet and dry part
15. Reduction of contamination	Aqueous and atmospheric contamination in the pulp and paper industry
P1.	Optical microscopy Observation of hardwood fibers and conifers at different levels of refining. Observation of vessels, tracheids and parenchyma cells of different types of pastes.
P2.	Disintegration of pastes. Refining PFI. Schopper Grade Riegler UNE 57026, ISO 5263; UNE 57125, ISO 5264/2; UNE 57025, ISO 5267/1 Send Send Send
P3.	l refine on Valley stack. Formation of sheets UNE 57017, ISO 5264/1; UNE 57042, ISO 5269/1
P4.	Physical characteristics of the test sheets Gramaje (UNE 57104, ISO 5360); Thickness (UNE 57004, ISO 5270); Tear index (UNE 57033, ISO 1974); Burst index (UNE 57058, ISO 2758); Resistance to air passage. Gurley Method (UNE 57065, ISO 3687)
P5.	Case studies Chip quality; Specific consumption of wood; Factor H and G; Solids in black liquors

### Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	17	15	32
Outdoor study / field practices	4	10	14
Master Session	25	54	79
Short answer tests	2	0	2
Practical tests, real task execution and / or simulated.	1	10	11
Case studies / analysis of situations	1	5	6
Troubleshooting and / or exercises	1	5	6

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

### Methodologies

	Description
Laboratory practises	Carrying out the practical tests according to ISO and UNE standards for pulp, paper and cardboard
Outdoor study / field practices	Eucalyptus kraft pulp mill. Bleaching TCF. ENCE Business Group
Master Session	Exposure of the contents of the subject supported in PowerPoint presentations and videos

### Personalized attention

Tests	Description
Case studies / analysis of situations	

### Assessment

Description	Qualification	Evaluated	Competences

Short answer tests	(*)Bloques de definiciones (20) y bloques de respuestas conceptuales (10)	70	CG3 CG8 CG23 CG32 CE37
Practical tests, real task execution and / or simulated.	(*)Presentación en clase del trabajo asignado	10	CG3 CG8 CG23 CG32 CE37 CT13
Troubleshooting and / or exercises	(*)Dos ejercicios prácticos	20	CG8 CG23 CG32 CT13

### Other comments on the Evaluation

#### Sources of information

##### Basic Bibliography

##### Complementary Bibliography

1. Smook G. A, Handbook for pulp and paper technologists, 2002, Tappi press
2. Herbert Sixta, Handbook of Pulp. 2 Volume, 2006, Set. Wiley-VCH
3. Hans Ulrich Suess, Pulp Bleaching Today, 2010, Walter de Gruyter GmbH
4. Pratima Bajpai, Environmentally Friendly Production of Pulp and Paper, 2010, John Wiley & Sons, Inc.
5. Varios Autores, 5. Papermaking Science and Technology (19 vol.), 1999, Fapet Oy, Finland

#### Recommendations

##### Subjects that are recommended to be taken simultaneously

Quality control and prevention of occupational hazards in the forestry industry/P03G370V01804

##### Subjects that it is recommended to have taken before

Chemistry: Chemistry/P03G370V01204

Forest exploitation/P03G370V01601

Primary wood processing industries/P03G370V01706