



IDENTIFYING DATA

Cellulose, pulp and paper

Subject	Cellulose, pulp and paper			
Code	P03G370V01803			
Study programme	(*)Grao en Enxeñaría Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language				
Department				
Coordinator	Lorenzo Fouz, David			
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Web				
General description				

Competencies

Code	
B3	CG-03: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Químicos.
B8	CG-08: Capacidade para identificar os diferentes elementos: recursos naturais renovables susceptibles de protección, conservación e aproveitamento.
B23	CG-23: Capacidade para aplicar e desenvolver as técnicas de aproveitamento de produtos forestais madeirables e non madeirables.
B32	CG-32: Capacidade para caracterizar as propiedades anatómicas e tecnolóxicas das materias primas forestais madeirables así como das tecnoloxías e industrias destas materias primas.
C37	(*)CE-37: Coñecementos dos principios básicos da química da celulósica e papeleira e dos seus procesos industriais.
D1	(*)CBI 1: Capacidade de análise e síntese.
D3	(*)CBI 3: Capacidade de comunicación oral e escrita tanto na lingua vernácula como en linguas estranxeiras.
D13	(*)CBS 1: Aprendizaxe autónoma.

Learning outcomes

Expected results from this subject	Training and Learning Results		
(*)CE-37: Capacidad para conocer, comprender y utilizar los principios de los procesos industriales de fabricación de celulosa y papel	B3 B8 B23 B32	C37	D1 D3 D13
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.	I 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	Training and Learning Results
Short answer tests	(*)Bloques de definiciones (20) y bloques de respuestas conceptuales (10)	70	B3 C37 B8 B23 B32

Practical tests, real task execution and (*)Presentación en clase del trabajo asignado / or simulated.	10	B3 B8 B23 B32	C37	D13
Troubleshooting and / or exercises (*)Dos ejercicios prácticos	20	B8 B23 B32		D13

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

1. Smook G. A, **Handbook for pulp and paper technologists**, 2002,
2. Herbert Sixta, **Handbook of Pulp. 2 Volume**, 2006,
3. Hans Ulrich Suess, **Pulp Bleaching Today**, 2010,
4. Pratima Bajpai, **Environmentally Friendly Production of Pulp and Paper**, 2010,
5. Varios Autores, **5. Papermaking Science and Technology (19 vol.)**, 1999,

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