

COURSE: Bonding technologies: Welding and adhesives		
DEGREE: Mechanical Engineering	YEAR: 4	TERM: 2

WEEKLY PLANNING								
WEEK	SESSION	DESCRIPTION	TEACHING (mark X)		SPECIAL ROOM FOR SESION (computer classroom, audio-visual classroom...)	WEEKLY PROGRAMMING FOR STUDENT		
			L E C T U R E S	S E M I N A R S		DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. Estim. 3,25h)
1	1	Topic 1. Non-destructive tests. Visual inspection. Acoustic inspection. Penetrating liquids. Magnetic particles. Induction currents: Eddy currents. X-ray and scintigraphy. Ultrasound Active thermography. Holographic interferometry. Test selection				Study of the different techniques of non-destructive tests. Search for test standards	1,5	3,25
2	2	Topic 2. Welding technology. Materials to be welded. Fe-C system. Thermal treatments of steels. Aluminum base alloys hardened by maturation or deformation.				Review of the concepts of alloy and especially steels and aluminum based alloys. Thermal treatments and hardening processes	1,5	3,25
3	3	Topic 2. Types of welding. Welding with fusion. Welding without fusion. Heat flux. Mass flow. Gases				Study of welding processes. Search for process information	1,5	3,25
4	4	Topic 3. Welding metallurgy. Solidification of the fusion bath. Transformations in the Fe-C system. Maturing hardened alloys. Alloys hardened by deformation. Galvanized steel.				Application of knowledge of physical metallurgy to welding	1,5	3,25
5	5	Topic 3. Welding metallurgy. Defectology Welding defects. Technologies for the study of defects through destructive and non-destructive tests. Metallography and END				Study of the application of test techniques to examples of welded joints	1,5	3,25

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6	6	Welding laboratory: defectology and metallography			laboratory	Study of the transformations produced by welding and defects produced	1,5	3,25
7	7	Topic 4. Introduction to adhesives. Basic concepts of adhesion. Formation of the adhesive bond. Design criteria and examples. Comparison of joining techniques. The interface. Adhesion models (mechanical, chemical bond, electrical, diffusion). Effect of weak layers of preferential breakage.				Review of the basic organic chemistry concepts. Case studies of adhesive joints of dissimilar materials proposed	1,5	3,25
8	8	Topic 5. Surface treatments. Surfaces characteristics: Roughness. Influencing factors. Pretreatments: Abrasion and cleaning				Application of surface treatments to cases of proposed adhesive joints	1,5	3,25
9	9	Topic 5. Surface treatments. Chemical treatments. Physical treatments. Surface analysis techniques.				Application of surface treatments to cases of proposed adhesive joints	1,5	3,25
10	10	Topic 6. Mechanical behavior and degradation. Mechanical properties of polymer materials. Mechanical requests for adhesive bonding. Analysis of single lap joints. Mechanics of fracture.				Search and evaluation of test standards	1,5	3,25
11	11	Topic 6. Mechanical behavior and degradation. Degradation Effect of temperature, humidity and solvents. Mechanical and thermal fatigue. Combined effects				Search for information on examples of damaged adhesive joints	1,5	3,25
12	12	Topic 7. Types of adhesives. Polymerization process. Types of adhesives. Dosing systems. Rigid adhesives: Epoxy, Cyanoacrylates, Anaerobics, Acrylics and Polyuretanes.				Study of polymerization concepts. Search for examples of industrial dosing systems	1,5	3,25
13	13	Topic 7. Types of adhesives. Flexible adhesives: Polysulphides, Silicones, Polyurethanes and Modified Silanes. Prepolymerized adhesives: in liquid phase, adhesive tapes and hot melts.				Selection of the most suitable adhesive for the cases of proposed joints	1,5	3,25
14	14	Laboratory of surface treatments and adhesion			laboratory	Surface preparations and adhesive joints of dissimilar materials	1,5	3,25
Subtotal 1							21	46

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			L E C T U R E S	S E M I N A R S		DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. Estim. 3,25h)	
Total 1 (Hours of class plus student homework)						67			
15		Tutorials, handing in, etc				Presentation of the works	1,8	-	
16	Assessment						3	4	
17									
18									
Subtotal 2							4,8	4	
Total 2 (Hours of class plus student homework)						9			
TOTAL (<i>Maximun 75 horas</i>)							75		