

## SUBJECT TEACHING GUIDE

### G1109 - Materials and Mechanical Technology

#### Degree in Maritime Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Maritime Engineering			Type and Year	Compulsory. Year 3
Faculty	School of Maritime Engineering				
Discipline	Subject Area: Materials and Mechanical Technology Module in Common with the Naval Branch				
Course unit title and code	G1109 - Materials and Mechanical Technology				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. CIENCIA E INGENIERIA DEL TERRENO Y DE LOS MATERIALES				
Name of lecturer	MARIA VICTORIA BIEZMA MORALEDA				
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Other lecturers	ISIDRO ALFONSO CARRASCAL VAQUERO ANDRES SANCHEZ ABELLEIRA				

### 3.1 LEARNING OUTCOMES

- To develop the abilities to identify the problems of the service materials  
To know the main techniques to use in order to define a service materials failures  
To estimate the useful life of metallic and non metallic component or structures using in aggressive environments  
To know advanced techniques of materials characterization  
Study in depth the anticorrosive methods using in marine environments
- IN ACCORDANCE WITH RULE III/2 . OF THE STCW CONVENTION IN ITS AMENDED FORM, the results are required after the acquisition of the competence to program the operations, whose knowledge, comprehension and sufficiency involve in the subject a theoretical knowledge.  
Competent results should also be obtained from the proper use of hand tools, machines, and measuring instruments for build and repairing activities in a ship. The lectures may provide results such as:  
  
 characterization and limitations of materials used for the construction and repair of ships and equipment, characteristics and process limitations used for manufacturing and repair, properties and parameters relating to the manufacture and repair of systems and components  
 Methods for safe temporary emergency repairs  
 Safety measures to be adopted to ensure a safe working environment and for the use of hand tools, machine tools and measuring instruments  
 Use of hand tools, measuring machines use of different types of sealants and packaging  
 As far as competence Maintenance and repair of onboard machines and equipment is concerned, the necessary basic mechanical knowledge, both theoretical and practical, maintenance, repair, such as dismantling, shall be provided, adjustment and reassembly of machinery and equipment,, use of specialized tools and appropriate measuring instruments and Project characteristics and selection of materials for Construction
- To be able solve problems related to materials and application to real solid behaviour in structure , installations and marine components and elements.

### 4. OBJECTIVES

- To know metallic, polymeric, ceramic and composite materials, in particular ferrous alloys, light metallic systems and superalloys, in order to establish a very clear relationship between chemical composition and properties. To know the main physico-chemical-mechanical properties of materials pointing out the study in marine and petrochemistry environments.
- To study the corrosion and anticorrosive methods applied to metallic systems and degradation phenomenon in non metallic materials
- To know the machining way of metallic materials, point out and using the real tools employed in situ in a ship.
- To deep in welding process

6. COURSE ORGANIZATION	
CONTENTS	
1	Introduction: metallic materials, ceramic materials, polymeric materials and composite materials Evolution of the employ of materials: from Neolithic to S. XXI
2	Materials Characterization Tests Destructive Tests: including metallographic characterization, Non Destructive Tests Some of these methods will be used at laboratory practices
3	Physic Metallurgy of Metallic Systems Concept of metal. Defect in materials. Diffusion Laws, Equilibrium Diagrams, Application to metallic and ceramic materials
4	Steels: Properties and Applications Classification of steel Role of the main chemical elements in steels Equilibrium Diagram Fe-Fe <sub>3</sub> C. Thermal and Thermochemical treatments Steels for particular applications
5	Properties and Application of: Non Ferrous Alloys Cu and alloys, Light Alloys ( Al, Mg, Ti, Be), Superalloys ( Fe, Ni and Co), Refractory Materials ( Mo, W, Ta, Nb)
6	Corrosion and Protection of metallic system Introduction and corrosion classification Description of the main corrosion morphologies Electrochemical Corrosion high Temperatures Corrosion Anticorrosion methods
7	Non Metallic Materials: Polymers, Ceramic and Composites Classification of Polymers. Properties and application. Degradation Classification of Ceramic: Properties and application. Degradation Classification of Composites: Properties and application. Degradation
8	Metallic manufacturing by plastic deformation
9	Tools employed at mechanical area in a ship
10	Welding and Plastic deformation for shaped

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
The evaluation is designed in two very well defined concepts: 50% final examination. This ones implies a test, short and concise questions and problems 50%: student active participation. it scope of consideration: partici`pation during lectures, inform of	Written exam	Yes	Yes	50,00
There are a very clear current evaluation, daily, considering laboratoy inform, in situ practices of machining, etc	Laboratory evaluation	Yes	Yes	50,00
		No	No	0,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
It is a necessary requisite to pass both examns, of two implied departments, to pass Materials and Technology It is necessary that the lectures attendance be 85% minimum The minimum calification of examamination must be minum 4.0 to average with additional activities, problmes collections, lecture participation, last year work and oral exposition, etc. The lab practices are obligatory				
<b>Observations for part-time students</b>				
Students who are in a part time situation may take a partial examination, to be determined by the teachers and pupils depending on the availability of both. In any case, preferably in November. Practices are mandatory, so channels of substitution would be established.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
<b>BASIC</b>
"Colección de problemas resueltos de ciencias de materiales aeroespaciales / Eva Mª Pérez Soriano, Cristina Mª Arévalo Mora, Isabel Montealegre Meléndez. Sevilla : Editorial Universidad de Sevilla, 2018. ISBN: 978-84-472-1900-1 "Ciencia e Ingeniería de los Materiales", J. M. Montes, F. G. Cuevas, J. Cintas, Ed. Paraninfo, España, 2014 "Introducción de la Ciencia e Ingeniería de Materiales para Ingenieros", 7 ed.J. F. Shackelford, Editorial Prentice-Hall.. 2010 "Ciencia e ingeniería de materiale"s / William D. Callister, Jr., David G. Rethwisch. Edición: 2ª ed. Barcelona : Reverté, 2016. ISBN: 978-84-291-7251-5 "Ciencia e ingeniería de los materiales / D. R. Askeland, Pradeep P. Phulé ; 4ª ed. México, D.F. : CENGAGE Learning, 2009 PROBLEMAS DE CIENCIA DE MATERIALES F. Salas Vicente, E, F. Segovia López, A. Vicente Escuder, Ed. UPV, 2019  Materials for Engineers" / W. F. Hosford. New York : Cambridge University Press, 2008. "Fundamento de la Ciencia e Ingeniería de los Materiales" Smith, MCGRAW-HILL, 2010 "Fundamentos de Manufactura Moderna", Materiales, procesos y sistemas. M. P. Groover, Prentice Hall, Méjico, 1997 "Tecnología de los materiales en ingeniería" / José Antonio Puértolas Ráfales, Ricardo Ríos Jordana, Miguel Castro Corella. Madrid : Síntesis, D.L. 2016. ISBN: 978-84-9077-405-2 (O.C.)  - "Tecnología Mecánica 1" , Tomás Vidondo, Claudino Alvarez, Ed. Edebé, España 1976 - "Tecnología Mecánica 2" , Tomás Vidondo, Claudino Alvarez, Ed. Edebé, España 1978 - "Máquinas Prontuario" , Nicolás Larburu Arrizabalaga, Ed. Paraninfo, España 2008 - "A. L. Casillas" , Máquinas, cálculos de Taller.

