

SUBJECT TEACHING GUIDE

370 - Special Metal Alloys

Master's Degree in New Materials

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in New Materials			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	Optional Module: Materials Subjects				
Course unit title and code	370 - Special Metal Alloys				
Number of ECTS credits allocated	5	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIA E INGENIERIA DEL TERRENO Y DE LOS MATERIALES				
Name of lecturer	MARIA VICTORIA BIEZMA MORALEDA				
E-mail	maria.biezma@unican.es				
Office	E.T.S. de Náutica. Planta: + 2. DESPACHO (237)				
Other lecturers	ISIDRO ALFONSO CARRASCAL VAQUERO JOSE MARIA SAN JUAN NUÑEZ				

3.1 LEARNING OUTCOMES
- Aim to deep into metallic alloys, in particular those most used in engineering
- To know of strong and important relationship between chemical composition, microstructure and properties of materials
- To obtain an ability to select the proper metallic system for each particular application
- To know the advance and development of last metallic alloys, point out multidisciplinary criteria
- Regard to the implementation of composites materiales with metallic matrix, CMMs, in a broad of industrial activities
- To obtain the ability of deep analysis against the strong and advanced industrial development , taking account the particular variables linked with each industrial sector

4. OBJECTIVES

- To know the main metallic alloys
- To look for relationship between manufacturing process and their behaviour in service
- To know manufacturing, processing of metallic alloys
- To understand the reason to use physicochemical-mechanics tests in order to characterize properties of advanced metallic systems
- To consider all variables to selection proper materials, including using probabilistic method, as Fuzzy one, for example, associated to corrosion phenomenon
- Be able to justify the strong relation between microstructure and nanostructure of metallic systems and their properties
- To organize visit to cantabria industries linked with this lectures in order to introduce to students to real manufacturing and market organization
- To know the corrosion behaviour of metallic systems

6. SUBJECT PROGRAM

CONTENTS

1	Ferrous alloys, steels, cast iron, Superalloys based Fe
2	Light alloys::Al, Be, Mg and Li alloys
3	copper alloys, nickel alloys, and different advanced superalloys (memory shape alloys, high entropy alloys, etc.)
4	Others alloys and composites materiales with metallic matrix

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final Oral presentation of an individual topic intensive daily activities with discussion, dissertation and forums Visits to industry and ellaborate a report related to its performance	Laboratory evaluation	No	Yes	10,00
Final personal work wherein students must present in an oral mode with high participation of all students. It is obligatory	Work	No	Yes	30,00
Daily evaluation	Others	No	Yes	60,00
TOTAL				100,00

Observations

The activities developed along the semester, laboratory lectures, enterprises visits, etc. are not able to recover

Observations for part-time students

The students that be vy partial time will have the chance to be avaluated looking for alternatives ways in order to show their improvements. Nevertheless lab activites are mandatories but it could be feasible to manage alternatvies.
Criteria of evaluation is : 50% finnal examination (only partial time students), 25% practical case resolution, and 25% oral presentation

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Materials Science and Engineering: An Introduction, 10th Edition
 William D. Callister Jr., David G. Rethwisch, 2018, ISBN: 978-1-119-40549-8
- Metals Handbook Desk Edition, 2nd Edition Ed. J.R. Davis, 1998
- H, Bhadeshia, R, Honeycombe,.: Microstructure and Properties, 4th Edition - 2017
 eBook ISBN: 9780081002728, ISBN: 9780081002704Y.
- Weng, H. Dong, Y. Gan, Advanced Steels. The Recent Scenario in Steel Science and Technology, Springer, 2011.
- M. F. Ashby, Materials Selection in Mechanical Design, 3rd edition, Elsevier, 2005
- M.J. Donachie and S.J. Donachie, Superalloys: A Technical Guide, 2nd ed., ASM International, 2002
- "Fundamental of Metal Matrix Composites" Butterworth-Heinemann, USA, 1993
- P. K. Mallik, Fiber-Reinforced Composites, Materials, Manufacturing and Design, 3rd CRC Press, 2007
- "Aleaciones ligeras". Edicions UPC, Barcelona, 2001.
- RUIZ PRIETO, J. M. "Metales y aleaciones no férreas" Ed. Fundación Gómez-Pardo, D.L. Madrid, 1976.
- "Aluminum and aluminum alloys". Materials Park, Ohio. ASM International, 1993
- FRANK, K. "El aluminio y sus aleaciones" Ed. Limusa-Noriega. México, 1992.
- KAINER, K. U. "Magnesium alloys and Technology". Editorial: Weinheim : Wiley-VCH, 2003.
- B. Geddes, H. Leon, X. Huang, Superalloys: Alloying and Performance, ASM International, 2010