Course guide
280643 - 280643 - Materials Science and Technology

Last modified: 29/01/2024

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Compulsory subject).
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: MARIA DEL MAR PÉREZ MADRIGAL

Others: Primer quadrimestre:
MARIA DEL MAR PÉREZ MADRIGAL - DT, GESTN, GTM
JORGE PUIGGALI BELLALTA - DT, GESTN, GTM
GUILLERMO REVILLA LÓPEZ - DT, GESTN, GTM

Segon quadrimestre:
LUIS JAVIER DEL VALLE MENDOZA - GESTN, GTM
MARIA DEL MAR PÉREZ MADRIGAL - GESTN, GTM
JORGE PUIGGALI BELLALTA - GESTN, GTM
GUILLERMO REVILLA LÓPEZ - GESTN, GTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
GTM.CE21. Knowledge of the fundamentals of materials science and its application to real behavior of solid structures, facilities and marine equipment.
GESTN.CE8. Knowledge of science and technology of materials and capacity for selection and evaluation of their behavior

STCW:
ME.1. A-III/1-3. Function: Maintenance and repair at the operational level
ME.2. A-III/1-3.1 Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board
ME.3. A-III/1-KUP 3.1.1 Characteristics and limitations of materials used in construction and repair of ships and equipment
ME.4. A-III/1-KUP 3.1.2 Characteristics and limitations of processes used for fabrication and repair

TEACHING METHODOLOGY

· To Obtain, understand and summarize knowledge in the subject field.
· To tolve problems related to the subject field.
· To develop reasoning and critical thinking in the field of the subject and being able to express it orally and written.
· To deliver a Lab notebook after the practical sessions
. Perform autonomous work tasks.
. If applicable, group work and oral presentation of content.

LEARNING OBJECTIVES OF THE SUBJECT

To know the fundamentals of material science and technology and applying these principles to the selections, operation and maintenance of the martitime systems equipment.

STUDY LOAD

Type	Hours	Percentage
Hours large group	27,0	18.00
Hours small group	6,0	4.00
Hours medium group	27,0	18.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Estructura i propietats dels materials

Description:
The crystalline structure. Metallic structures BCC, FCC and HPC. Metallic, ionic and covalent materials propesrties. Essays and normative. Mechanical essays. Hardness essays. Fatigue essays.

Full-or-part-time: 36h
Practical classes: 6h
Laboratory classes: 2h
Guided activities: 7h
Self study : 21h

2. Metalls i aliatges

Description:
Metals, especially those employed in nautical sciences. Metal alloys. Phase diagrams.

Full-or-part-time: 30h
Theory classes: 6h
Guided activities: 3h
Self study : 21h

3. Materials ceràmics

Description:
Ceramic, especially those used of nautical interest. Glasses: types, composition and properties.

Full-or-part-time: 11h
Theory classes: 2h
Guided activities: 3h
Self study : 6h

4. Materials polimèrics

Description:
Polymers and copolymers. Thermal properties. mechanical properties. Base polymer and additives. Thermoplastics of general use. Thermosets of general use. Engineered polymers and special polymers. Polymer degradation.

Full-or-part-time: 31h
Theory classes: 5h
Laboratory classes: 2h
Guided activities: 6h
Self study : 18h

5. Materials compostos

Description:
Matrix and reinforcement polymers. Types and properties of composites used in ship building.

Full-or-part-time: 16h
Theory classes: 3h
Guided activities: 4h
Self study : 9h

6. Corrosió

Description:
Galvanic cells. Chemical corrosion mechanism. Anti-corrosion methods. Surface treatment. Paints. Antifouling treatments.

Full-or-part-time: 26h
Theory classes: 5h
Guided activities: 6h
Self study : 15h

GRADING SYSTEM

The final mark is calculated according to:
Nfinal = 0,5 Npf + 0,40 Nac + 0,10 NeL

Nfinal: Final mark.

Npf: Final exam mark.
Nac: Continuous assessment.
NeL: Practical lab sessions mark
The final exam may include test, problems and development questions on the syllabus of the subject.
The continuous assessment consist in different collective and individual activities all along the course.
The mark of the practical lab sessions is the average of the different lab activities.

The re-assessment act will comprise the whole syllabus of the subject

EXAMINATION RULES.

· If one of the laboratory activities or the final test is not carried out, it will be considered as No-Show (NP).
· If the partial test is not taken, it will be considered as not scored (0).
· Laboratory activities are mandatory in order to pass the subject. Failure to do so results in a No-Show (NP) in both NeL and Nfinal.
· The Final Qualification (Nfinal) will be considered No-Show (NP) if Npf or NeL are NP. Therefore, taking the final test is mandatory in order to pass the subject.
· In no case can you have any type of form in the learning controls or tests.
· To be able to take the re-evaluation exam, the student must have a grade between 3.0 and 4.9 as final grade in the course (Nfinal).

BIBLIOGRAPHY

Basic:

- Callister, William D. ; Rethwisch, David G.. Ciencia e ingeniería de materiales. 2a ed. Barcelona: Reverté, 2016. ISBN 9788429172515.
- Casanovas Salas, J.; Aleman, C. Introducción a la ciencia de los materiales. Barcelona: Cálamo, 2002. ISBN 8495860112.
- Petrucci, Ralph H. [et al.]. Química general : principios y aplicaciones modernas [on line]. 11a ed. Madrid: Pearson Prentice Hall, 2017 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6751. ISBN 978849035533.

RESOURCES

Other resources:

Villalobos, Miquel. Ciència i tecnologia dels materials : pràctiques i temes de l'assignatura. 2011