Course guide
280659 - 280659 - Inspection and Non-Destructive Testing

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and 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: 4.5
Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: JUAN ANTONIO MORENO MARTÍNEZ PhD
Others: Primer quadrimestre: JUAN ANTONIO MORENO MARTÍNEZ - DT, GESTN, GTM

REQUIREMENTS
Have the following subjects approved:
280642 GTM; 280643 GTM / GESTN; 280646 GTM / GESTN; 280652 GTM; 280653 GTM; 280654 GTM; 280655 GTM; 280656 GTM;
280663 GESTN; 280664 GESTN; 280666 GESTN; 280667 GESTN; 280668 GESTN; 280669 GESTN; 280671 GESTN; 280674 GESTN.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
GTM.CE33. Knowledge of inspection procedures and the functioning of the Classification Societies.

Transversal:
COE N2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
STCW:
MCE.1. A-III/2-3. Function: Maintenance and repair at the management level
MCE.2. A-III/2-3.2 Detect and identify the cause of machinery malfunctions and correct faults
MCE.3. A-III/2-KUP 3.2.1 Practical knowledge: Detection of machinery malfunction, location of faults and action to prevent damage
MCE.4. A-III/2-KUP 3.2.2 Practical knowledge: Inspection and adjustment of equipment
MCE.5. A-III/2-KUP 3.2.3 Practical knowledge: Nondestructive examination
ME.1. A-III/1-3. Function: Maintenance and repair at the operational level
ME.2. A-III/1-3.2 Maintenance and repair of shipboard machinery and equipment
ME.3. A-III/1-KUP 3.2.4 The use of appropriate specialized tools and measuring instruments

TEACHING METHODOLOGY
- Lectures for theory (expository method) and laboratory sessions for practices (demonstration method).
- Use of ICT and teaching support platform ATENEA.
- Company visits
LEARNING OBJECTIVES OF THE SUBJECT

On the other hand, one of the objectives of this subject is to provide the knowledge, understanding, and proficiency of the competency "NAME OF THE COMPETENCY STCW ATTACHED TABLE OF SUBJECTS?", competency required and defined in Section A-III/1 Mandatory minimum requirements for certification of officers in charge of an engineering watch in a manned engine-room or designated duty engineer in a periodically unmanned engine-room (propulsion power of 750 kW or more) of the Seafarers' Training, Certification and Watchkeeping (STCW) International Code.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>67.5</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>20.0</td>
<td>17.78</td>
</tr>
<tr>
<td>Hours large group</td>
<td>25.0</td>
<td>22.22</td>
</tr>
</tbody>
</table>

Total learning time: 112.5 h

CONTENTS

1. Description:
Presentation of the subject: Objectives, bibliography, theoretical contents, method of evaluation, definition of the practices of laboratory, prevention of risks and measures of environmental hygiene. ATENEA digital campus.

Related activities:
Visit to the NDT laboratory

Full-or-part-time: 7h 30m
Theory classes: 2h
Laboratory classes: 1h
Self study: 4h 30m

3. PENETRANT TESTING EXAMINATION (PT)

Description:
UD1: INTRODUCTION TO THE TERMINOLOGY AND HISTORY OF END.


UD2: PHYSICAL PRINCIPLES OF THE METHOD AND ASSOCIATED KNOWLEDGE


UD3: KNOWLEDGE ABOUT THE PRODUCT AND CAPACITY OF THE METHOD AND ITS DERIVED TECHNIQUES.

Typical defects according to the manufacturing process (forged, cast, rolled, welded products, etc.)

Unit4: TEAM.

UNIT5: PRE-TEST INFORMATION.
Verification according to written instructions that the object to be tested is in suitable conditions for it. Written instructions are given. Information about the test object, preparation of written instructions. Identification or designation. Material, dimensions, field of application. Product family type. Catalog of defects. Test conditions. Applicable standards and codes assigned to the test object.

U6: TESTING
Performing the assay according to written instructions. Preparation and performance of the test. Preparation of written instructions in accordance with EN 1371-1, EN 10228-2, EN 1289.

UD7: EVALUATION AND REPORT
Test report and test report verification. Test report Welding according to EN571-1; Castings according to EN 137 1- 1; Forgings in accordance with EN 10228-2; Laminated products. Report of simple imperfections of welded, forged, rolled and cast products. Basis of the evaluation. Observation conditions according to EN ISO 3059. Reference blocks No. 1 and No. 2 according to EN ISO 3452-3. Other reference blocks used. Batch report of the calibration of the test units. Evaluation. Verification of the quality of the indication. Report of discontinuities according to EN 1289, EN 1371-1, EN 10228-2.

UNIT8: ASSESSMENT.

UD9: QUALITY ASPECTS
Staff qualification. Personnel qualification (according to ISO 9712). Equipment verification. Written instructions. Document traceability. Review of the applicable standards for the product and the application of the END.

UD10: SAFETY AND ENVIRONMENTAL CONDITIONS

UD11: INNOVATIONS
Special facilities. Automotive installations (examples).

Related activities:
Laboratory practice of Penetrating Liquids: Type I, II and III / A, B, C, D, E.

Full-or-part-time: 22h 30m
Theory classes: 6h
Laboratory classes: 3h
Self study: 13h 30m

3. MAGNETIC PARTICLE INSPECTION (MT)
Description:
UD1: INTRODUCTION TO THE TERMINOLOGY. HISTORY OF THE END.

UD2: PHYSICAL PRINCIPLES OF THE METHOD AND ASSOCIATED KNOWLEDGE
Basic physical phenomena. Electrical circuits, typical values, units. Magnetic circuits, typical values, units. magnetic field created by electrical circuits. Indefinite rectilinear conductor. Long magnetic coil. Flat or short magnetizing coil. Passage of flux from a magnetic medium to a


UD3: KNOWLEDGE ABOUT THE PRODUCT AND CAPACITY OF THE METHOD AND ITS DERIVED TECHNIQUES.


Unit4: TEAM
Field force measurement devices. Photometers and radiometers.
Equipment selection considerations (EN ISO 9934-2 and EN ISO 9934-3). Elements to take into account, materials and components to control, areas to control. Objective of the essay. Place and environment. Selection of the type of technique.
Current type. Magnetic flux technique. (Open and closed circuit).
Current flow technique. Induced current flow. Combined system.
Multidirectional magnetization and Rotating field.

UNIT5: PRE-TEST INFORMATION.
Application of written instructions. Identification or designation of the material:

UD7: EVALUATION AND REPORT.
Classification of indications: welding according to EN 1290; pieces cast according to EN 1369; forgings according to EN 10228-1; rolled products. Essay report. Checking the report trial. Basic aspects of evaluation. Observation conditions. (IN ISO 3059) according to a reference block; other reference blocks used; calibration of test units. Batch test report.
Evaluation and verification of the quality of the indication. Report imperfections according to EN 1290. EN 1369, EN 10228-1

UNIT8: ASSESSMENT.
Assessment of the influence of manufacturing and material discontinuities.

UD9: QUALITY ASPECTS.
Personnel qualification (according to ISO 9712). Equipment verification.

UD10: SAFETY AND ENVIRONMENTAL CONDITIONS

UNIT11: PROGRESS
Special installation and equipment.
Related activities:

Full-or-part-time: 22h 30m
Theory classes: 6h
Laboratory classes: 3h
Self study: 13h 30m

4. ULTRASONIC TESTING (UT)

Description:
UD1. Introduction to NDT terminology and history
UD2. Physical principles of the method and associated knowledge: Physical definitions and typical parameters.
UD3. Knowledge about the product and capacity of the method and its derived techniques
UD4. Equipment
UD5. Pre-trial information
UD6. Essays
UD7. Evaluation and report
UD8. Quality aspects
Unit10. Innovations

Related activities:

Full-or-part-time: 45h
Theory classes: 12h
Laboratory classes: 6h
Self study: 27h

5. OTHER TESTS: INDUSTRIAL RADIOGRAPHY (RT), INFRARED THERMOGRAPHY (TT), VISUAL INSPECTION (IV)

Description:
INTRODUCTION

Related activities:
Visit to SGS for X-rays and radioactive isotopes.
Interpretation of radiographs with the negatoscope.
Visual inspection of welding tubes
Thermography camera

Full-or-part-time: 14h 50m
Theory classes: 3h
Guided activities: 6h
Self study: 5h 50m
GRADING SYSTEM

1 Exam per course (Continuous assessment): will allow, if necessary, pass per course and those students who pass it will NOT have to go to the final exam in January. The exam per course will consist of a multiple choice test of each test method seen in class, usually Penetrating Liquids, Magnetic Particles and Ultrasound (some questions may need to do some small calculation). The result of these tests will be averaged with the grade of the internship dossier. The internship dossier only averages with the exam per course. 

\[ N_{\text{final}} = 0.50 \times N_{\text{Theory}} + 0.50 \times N_{\text{Practices Lab}} \]

\[ N_{\text{final}} = \text{final grade} \]

\[ N_{\text{Theory}} = \text{Qualification Tests} \]

\[ N_{\text{Internships}} = \text{Lab internship dossier qualification.} \]

2 Final exam January: In the case of not passing the course exam, the student will have to go to the final exam of January, also of test type AND ONLY IT WILL BE NECESSARY TO RECOVER THE PART OF THE SUSPENDED TEST.

3 Revaluation exam: In the case of not passing the final exam in January, those students who are in the conditions established by the Center will be able to go to the revaluation exam in February to be able to take the revaluation exam (it is necessary to the minimum grade is ? (3) must be submitted only from the suspended party. Important note: You must bring a calculator. The use of a mobile phone and / or tablet or any other device that can take photographs will not be allowed, they must be disconnected and saved for the duration of the exam. Failure to comply with these rules will result in expulsion and zero rating.

I ask for your collaboration!

EXAMINATION RULES.

- If you do not do any of the activities of laboratory or continuous evaluation, it will be considered as unrated.
- Those students who are in the conditions established by the Center to be able to present themselves to the re-evaluation exam, will have to present only of the suspended part.
- Note: The student will be assigned to a group of laboratory practices at the time of enrollment and no changes will be allowed during the course. Only in exceptional cases will the responsible professor assign the groups.

BIBLIOGRAPHY

Basic:

RESOURCES

Other resources:
- penetrating dye
- electromagnetic yoke
- equipment of tips and coil
- Thermographic camera
- UV light
- microscopes