Course guides
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: 2021  ECTS Credits: 4.5  Languages: Catalan, Spanish

REQUIREMENTS
Have the following subjects approved:
280642 GEM; 280643 GEM / GESTN; 280646 GEM / GESTN; 280652 GEM; 280653 GEM; 280654 GEM; 280655 GEM; 280656 GEM; 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

TEACHING METHODOLOGY
- Lectures for theory (expository method) and laboratory sessions for practices (demonstration method).
- Use of ICT and teaching support platform ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT
On the other hand, one of the objectives of this subject is 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>
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<tbody>
<tr>
<td>Self study</td>
<td>67.5</td>
<td>60.00</td>
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<tr>
<td>Hours large group</td>
<td>25.0</td>
<td>22.22</td>
</tr>
<tr>
<td>Hours small group</td>
<td>20.0</td>
<td>17.78</td>
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</tbody>
</table>

**Total learning time:** 112.5 h

### CONTENTS

#### 1. PENETRANT TESTING

**Description:**

**THEORY PROGRAM:**

- INTRODUCTION TO THE TERMINOLOGY, PURPOSE AND HISTORY OF THE END.
- PHYSICAL PRINCIPLES OF THE METHOD AND ASSOCIATED KNOWLEDGE.
- SECURITY AND ENVIRONMENTAL CONDITIONS.
- KNOWLEDGE ABOUT THE PRODUCT AND CAPACITY OF THE METHOD AND ITS DERIVATIVE TECHNIQUES.
- TEAM.
- INFORMATION PREVIOUS TO THE TEST.
- VALUATION.
- ESSAYS.
- EVALUATION AND REPORT.
- INNOVATIONS.
- QUALITY ASPECTS.

**PROGRAM OF LABORATORY PRACTICES:**

- Identification of defects in parts and test specimens with real and artificial discontinuities; macrographs
- Selection of suitable materials for an assay.
- Management of: aerosols; thermometers; white light meters; black light intensity meters; use of UV-A light; standard blocks and comparators.
- Writing written instructions: exercises.
- Test with visible penetrant liquids removable with water (Method A, Type II)
- Test with visible penetrant liquids removable with solvent (Method C, Type II)
- Test with fluorescent penetrating liquids removable with water (Method A, Type I)
- Test with solvent-removable fluorescent penetrant liquids (Method C, Type I)
- Test with post-emulsifiable fluorescent penetrant liquids (Method D, Type I)
- Evaluation of discontinuities according to acceptance or rejection criteria.
- Writing the test report. Formats
- Management and application of applicable regulations

**Note:** The agenda includes the contents of ISO / TR 25107: 2006

**Specific objectives:**

- Select the ideal method and technique.
- Get your own indication.
- Interpret and evaluate said indication.
- Report the results of the trial.

**Related activities:**

- Delivery of the study activities associated with the subject and carrying out the corresponding tests.
- Delivery of the report of the laboratory practice(s) corresponding to the type and test technique carried out.

**Full-or-part-time:** 2h

**Theory classes:** 2h
2. MAGNETIC PARTICLE TESTING

Description:
THEORY PROGRAM:
- INTRODUCTION TO THE TERMINOLOGY. HISTORY OF THE END.
- PHYSICAL PRINCIPLES OF THE METHOD AND ASSOCIATED KNOWLEDGE
- KNOWLEDGE ABOUT THE PRODUCT AND CAPACITY OF THE METHOD AND ITS DERIVATIVE TECHNIQUES.
- TEAM
- INFORMATION PREVIOUS TO THE TEST.
- TEST.
- EVALUATION AND REPORT.
- VALUATION.
- ASPECTS ON QUALITY.
- SECURITY AND ENVIRONMENTAL CONDITIONS
- PROGRESS

LABORATORY PRACTICES:
- VISUALIZATION OF THE MAGNETIC FIELD CREATED BY A PERMANENT MAGNET.
- CONTACT WITH DIFFERENT TYPES AND COLORATIONS OF PARTICLES.
- PREPARATION OF HUMID PARTICLE BATHS AND USE OF THE CENTRIFUGAL TUBE.
- USE AND REMOVAL OF THE CONTRAST LACQUER
- DESCRIPTION AND HANDLING OF YUGOS OF CONTINUOUS AND ALTERNATE CURRENT.
- CALCULATION OF MAGNETIZATION CURRENTS FOR DIFFERENT TECHNIQUES.
- UTILIZATION OF THE BERTHOL CROSS.
- USE OF THE KETOS RING
- USE OF RESIDUAL MAGNETIC FIELD METERS
- MAGNETIZATION THROUGH COIL.
- MAGNETIZATION THROUGH POINT OF CONTACT.
- MAGNETIZATION THROUGH FIXED BED.
- DEMAGNETIZATION PROCESSES
- EMPLOYMENT OF BLACK LIGHT.
- MEASUREMENTS OF TEMPERATURE AND LIGHTING.
- EXAMINATION OF DIFFERENT PROBES USING DIFFERENT TEST TECHNIQUES.
- ACCEPTANCE CRITERIA ACCORDING TO DIFFERENT REGULATIONS.
- ELABORATION OF TEST REPORTS.
- ELABORATION OF TECHNICAL INSTRUCTIONS

Note: The agenda includes the contents of ISO / TR 25107: 2006:

Specific objectives:
- Select the ideal method and technique.
- Get your own indication.
- Interpret and evaluate said indication.
- Report the results of the trial.

Related activities:
- Delivery of the study activities associated with the subject and carrying out the corresponding tests.
- Delivery of the report of the laboratory practice (s) corresponding to the type and technique of the test carried out

Full-or-part-time: 1h
Theory classes: 1h
3. ULTRASONIC TESTING

Description:
THEORY PROGRAM:
- INTRODUCTION, OBJECT AND HISTORY OF ULTRASOUND-PHYSICAL PRINCIPLES
- ULTRASOUND INSPECTION TECHNIQUE
- EQUIPMENT AND ACCESSORIES
- DEFECTOLOGY
- TECHNICALS OF TEST AND EVALUATION OF THE INDICATIONS-
REFERENCE DOCUMENTS AND REPORTS-EVALUATION AND WELDING REPORTS
- QUALITY ASPECTS

PROGRAM OF LABORATORY PRACTICES:
- Documentary support: Procedures; rules; Reports and preparation written instructions.
- Calibration and adjustment operations: V1, V2, etc.
- Practices with normal probe.
- Practices with angle probe
- Practices with bicristal probe.
- Exploration of type test tubes.
- Detection, location and sizing techniques. Exercises.

Specific objectives:
- Select the ideal method and technique.
- Get your own indication.
- Interpret and evaluate said indication.
- Report the results of the trial.

Related activities:
- Delivery of the study activities associated with the subject and carrying out the corresponding tests.
- Delivery of the report of the laboratory practice (s) corresponding to the type and test technique carried out.

Full-or-part-time: 1h
Theory classes: 1h

4. OTHER ESSAYS: VISUAL INSPECTION, THERMOGRAPHIC INSPECTION AND RADIOGRAPHICAL INTERPRETATION

Description:
- BASIC PRINCIPLES.
- APPLICATIONS.

Specific objectives:
INTRODUCTORY CONCEPTS

Related activities:
- Delivery of the study activities associated with the subject and carrying out the corresponding tests.
- Delivery of the report of the laboratory practice (s) corresponding to the type and test technique carried out.

Full-or-part-time: 1h
Theory classes: 1h
GRADING SYSTEM

The final grade is the sum of the following grades:
\[ N_{\text{final}} = 0.50 \cdot N_{\text{Theory}} + 0.50 \cdot N_{\text{Practices}} \]

\( N_{\text{final}} \): final grade.
\( N_{\text{partial Theory}} \): qualification of theory tests (tests).
\( N_{\text{partial Lab. Practices}} \): qualification of laboratory practices.

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