280687 - Maintenance and Repair of Radionavigation Equipment and Radio Communication Systems

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2020
Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN MARINE TECHNOLOGIES/BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2016). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: Mateu Llevadot, Jordi
Others: Recolons Martos, Jaume

Degree competences to which the subject contributes

Specific:
1. Knowledge of electronics applied to the ship and offshore installations and their application to board.
2. Knowledge and capacity to the operation, maintenance, redesign and repair of all existing systems on board a ship and ability to identify and address the different types of faults.

General:
3. ABILITY TO SHAPE, MANAGE AND IMPLEMENT COMPLEX SYSTEMS IN THE FIELD OF MARINE ENGINEERING. Ability to design, management and implementation of processes, systems and / or services in the field of marine engineering, including the development of projects in the field of specialization, knowledge of basic materials and technologies, decision making, the management of the activities under the project, conducting measurements, calculations and valuations, managing specifications, regulations and mandatory standards, assessment of the social and environmental impact of technical solutions, economic valuation and resource human and material involved in the project, with a systematic and inclusive vision.
4. IDENTIFY I resoldre Capacitat PER L'Ambit problemes IN MARINA DE L'ENGINYERIA. Capacitat per the plantejament i resolució de problemes de l'Àmbit enginyeria assumint marina iniciatives, prenet.
280687 - Maintenance and Repair of Radionavigation Equipment and Radio Communication Systems

To understand the operation and techniques of repair and maintenance of the radiocommunication and radionavigation equipment components and systems onboard.

This course will evaluate the following STCW competence:

A-III/6 E10. Maintenance and repair of bridge navigation equipment and ship communication systems

including the knowledge, understanding and proficiency on:

E.10.1 Knowledge of the principles and maintenance procedures of navigation equipment, internal and external communication systems

Theoretical knowledge:
E.10.2 Electrical and electronic systems operating in flammable areas

Practical knowledge:
E.10.3 Carrying out safe maintenance and repair procedures
E.10.4 Detection of machinery malfunction, location of faults and action to prevent damage

Transversal:
5. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
6. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
7. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

Teaching methodology

- To receive, understand and assimilate theoretical and practical knowledge.
- To analyze and reason situations and apply and justify the most adequate solutions.
- To perform the exercises and deliver them within the established schedule, taking into account the pace of theoretical learning, and in response to continuous work and constant assimilation of the contents.
- To perform the mandatory laboratory practices and submit the corresponding reports.

Learning objectives of the subject

To understand the operation and techniques of repair and maintenance of the radiocommunication and radionavigation equipment components and systems onboard.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>20.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>10h</td>
<td>6.67%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>5h</td>
<td>3.33%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## 280687 - Maintenance and Repair of Radionavigation Equipment and Radio Communication Systems

### Content

<table>
<thead>
<tr>
<th>Unit 1. Introduction to maritime radio communication systems</th>
<th>Learning time: 50h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study: 30h</td>
</tr>
</tbody>
</table>

### Description:

Basic concepts.
Onboard instrumentation: Radiocommunication equipment, radar units, integrated bridge systems.
Channels. Simple channels and duplex channels.
Types of propagation. Direct wave propagation, surface wave propagation and ionospheric propagation. Maritime communications frequency bands.
Main elements of a radio station.
Battery life.
Types of maintenance and equipment for the detection, location and repair of breakdowns.

### Specific objectives:

In this unit the following SCTW competences are assessed: A-III/6 E.10 Maintenance and repair of bridge navigation equipment and ship communication Systems: E.10.1 Knowledge of the principles and maintenance procedures of navigation equipment, internal and external communication Systems, Theoretical knowledge: E.10.2 Electrical and electronic systems operating in flammable areas.
## Unit 2. Transmission lines

### Description:
- Current and voltage waves in a conductor.
- Difference between a conductor and a transmission line.
- Power of an electric wave.
- Characteristics of a transmission line. Characteristic impedance.
- Propagation and reflection of electrical waves a transmission line.
- Stationary wave ratio.
- Adaptation of impedance.
- Types of transmission lines.
- Coaxial lines. Elements of a coaxial line.
- Common problems of a coaxial line.
- Attenuation.
- Connection of a coaxial line.
- Insertion losses.
- Detection of reflections in a coaxial line.
- Measurement of standing waves in a coaxial line.
- Maintenance and repair of transmission lines.

### Specific objectives:
In this unit the following STCW competences are assessed: A-III/6 E.10 Maintenance and repair of bridge navigation equipment and ship communication Systems: E.10.1 Knowledge of the principles and maintenance procedures of navigation equipment, internal and external communication Systems, Theoretical knowledge: E.10.2 Electrical and electronic systems operating in flammable areas, Practical knowledge: E.10.3 Carrying out safe maintenance and repair procedures, E.10.4 Detection of machinery malfunction, location of faults and action to prevent damage.
Unit 3. Antennas

Learning time: 50h
- Theory classes: 10h
- Practical classes: 5h
- Laboratory classes: 5h
- Self study: 30h

Description:
- Electrical resonance in an antenna.
- Radiation from an antenna.
- Isotropic antenna.
- Unidirectional and omnidirectional antennas.
- Principle of reciprocity.
- Efficiency and gain of an antenna.
- Bandwidth.
- Input impedance.
- Isolation and tuning of an antenna.
- Main types of antennas used in maritime communications.
- Antennas of lambda / 2.
- Antennas of lambda / 4.
- Installation of an antenna.
- Antenna maintenance.

Specific objectives:
In this unit the following STCW competences are assessed: A-III/6 E.10 Maintenance and repair of bridge navigation equipment and ship communication systems: E.10.1 Knowledge of the principles and maintenance procedures of navigation equipment, internal and external communication systems, Theoretical knowledge: E.10.2 Electrical and electronic systems operating in flammable areas, Practical knowledge: E.10.3 Carrying out safe maintenance and repair procedures, E.10.4 Detection of machinery malfunction, location of faults and action to prevent damage.

Qualification system

The final grade (Nfinal) is the weighted sum of the following partial qualifications:

\[
N_{\text{final}} = 0.5 \cdot N_{\text{pf}} + 0.5 \cdot N_{\text{ac} \& L}
\]

where \(N_{\text{pf}}\) is the mark of the final test and \(N_{\text{ac} \& L}\) is the mark of the activities of continuous evaluation (exercises, works) and the mandatory laboratory practices.

Regulations for carrying out activities

- Students who do not take part in any of the continuous assessment activities will be considered as Not Presented (NP).
- Students who do not take the final test, even though they have fulfilled part or all of the remaining activities, will be considered Not Presented (NP).
- During the tests, only pens, pencils and calculator are allowed.
280687 - Maintenance and Repair of Radionavigation Equipment and Radio Communication Systems

Bibliography

Basic:

Navy Electricity and Electronics Training Series, vol. 10, Introduction to wave propagation, transmission lines, and antennas. NAVEDTRA 14182,