280722 - Propulsion Systems and Electrical Plant

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2018
Degree: MASTER'S DEGREE IN THE MANAGEMENT AND OPERATION OF MARINE ENERGY FACILITIES (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: PABLO CASALS TORRENS

Prior skills
Knowing circuit theory and have the ability to do calculations in DC and AC circuits (single and three phase). Ability to compute and solve problems of electrical machines.

Degree competences to which the subject contributes

Specific:
CE12MEM. Manage the operation of electrical control equipment and electronic
CE13MEM. Manage the location and correction of equipment failures, electrical and electronic control.
CE6MEM. Analyze alternative solutions for the definition and optimization power plants and ship propulsion.
CE2MEM. Apply the principles of renewable energy in marine installations.
CE4MEM. Identify and apply the principles of generation, transmission and distribution of energy.

Generical:
CG1MEM. Identify marine facilities. Influencing design activities, redesign, planning, management and operation thereof.
CG2MEM. Design and redesign facilities and marine equipment. Apply the guidelines defined by rules, regulations and procedures.
CG3MEM. Apply the acquired knowledge and problem solving environments new or unfamiliar environments within broader contexts and multidisciplinary being able to integrate this knowledge

Teaching methodology
Analysis of real applications.
Development of attitudes and skills sistemes electrical operation of the vessel.
Case studies and articles on the subject.
Perform work individually.

Learning objectives of the subject
Understanding the drawing and connections of different types of machines and electrical applications.
Know the regulatory systems of V, f, P, Q in synchronous generators.
Know the regulatory systems and control of start and variation of speed of electric motors.
Having the ability to perform calculations and solve problems of machines and electrical systems, using the corresponding equivalent circuits.

On the other hand, one of the objectives of this course is to provide knowledge, understanding and skills of the STCW of electrical systems at the management level:
- Management and operation of electrical control equipment, including systems of more than 1,000 V (STCW A-III / 2).
- Knowledge to test electrical equipment to detect faults and keep them in working order or repair. (STCW A-III / 2).
- Knowledge of the use and safe operation of electrical equipment. (STCW A-III / 5).

"This course will evaluate the following STCW competences:
Manage operation of electrical and electronic control equipment
Manage trouble-shooting, restoration of electrical and electronic control equipment to operating condition

Study load

| Total learning time: 45h | Hours large group: | 45h | 100.00% |
## Content

<table>
<thead>
<tr>
<th>Topic 1</th>
<th>Introduction to marine electrical technology.</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Theory classes: 4h</td>
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<td></td>
<td>Laboratory classes: 1h</td>
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</tbody>
</table>

**Description:**
- Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
- KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
- KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
  - 1 main engine
  - 2 generator and distribution system
  - 3 steam boiler
- Design features and system configurations of operational control equipment for electrical motors

<table>
<thead>
<tr>
<th>Topic 2</th>
<th>Propulsion systems and power plant.</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
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**Description:**
- Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
- KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
- KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
  - 1 main engine
  - 2 generator and distribution system
  - 3 steam boiler
- Design features and system configurations of operational control equipment for electrical motors
### Topic 3 Converters system for the regulation of electric motors.

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**Description:**

Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
1. main engine
2. generator and distribution system
3. steam boiler
Design features and system configurations of operational control equipment for electrical motors

**Specific objectives:**
Give knowledge, understanding and aptitude of the competence: Management and operation of electrical control equipment (STCW A-III / 2).
Design features and system configurations of operational control equipment for electrical motors.

### Topic 4 Control and regulation of electrical generation parameters.

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<thead>
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</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
</tbody>
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**Description:**
Control frequency / active power (P) and voltage / reactive power (Q). Influence of the transitory regime: Start, reverse, cycle of waves in bad weather.

Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
1. main engine
2. generator and distribution system
3. steam boiler
Design features and system configurations of operational control equipment for electrical motors

**Specific objectives:**
Give knowledge, understanding and aptitude of the competence: Management and operation of electrical control equipment (STCW A-III / 2).
### Topic 5 Limits of operation of a generator. Curves P-Q. Selection of generators.

**Description:**
Types of regulators, their feeder. Types of response and feedback V, I, P, Q.

Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
1. main engine
2. generator and distribution system
3. steam boiler
Design features and system configurations of operational control equipment for electrical motors

**Learning time:** 4h 30m
- Theory classes: 3h 30m
- Laboratory classes: 1h

### Topic 6 Operation of high voltage installations.

**Description:**

Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.
KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.
KUP: Design features and system configurations of automatic control equipment and safety devices for the following:
1. main engine
2. generator and distribution system
3. steam boiler
Design features and system configurations of operational control equipment for electrical motors
Design features of high voltage installations

**Specific objectives:**
Give knowledge, understanding and aptitude of the competence: Management and operation of electrical control equipment, including those with a voltage higher than 1000 V (STCW A-III / 2).
Knowledge on the use and safe operation of electrical equipment (STCW A-III / 5).
280722 - Propulsion Systems and Electrical Plant

### Topic 7 Performance tests of electrical control and safety equipment.

**Learning time:** 5h  
**Theory classes:** 4h  
**Laboratory classes:** 1h

**Description:**  

Competences in accordance with STCW Code Section A-III/2: Manage operation of electrical and electronic control equipment.

KUP: Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices.

KUP: Design features and system configurations of automatic control equipment and safety devices for the following:

1. Main engine  
2. Generator and distribution system  
3. Steam boiler  

Design features and system configurations of operational control equipment for electrical motors.

**Specific objectives:**  
Give the knowledge, understanding and aptitude of the competence: Knowledge on the use and safe operation of electrical equipment. (STCW A-III / 5).

### Topic 8 Diagnosis of failures. Troubleshooting.

**Learning time:** 6h  
**Theory classes:** 5h  
**Laboratory classes:** 1h

**Description:**  
Detection, location and correction of faults in electrical equipment and control systems.

Competences in accordance with STCW Code Section A-III/2: Manage trouble-shooting, restoration of electrical and electronic control equipment to operating condition.


**Specific objectives:**  
Give knowledge, understanding and aptitude of the competence: Knowledge to test electrical equipment, detect faults and keep them in working condition or repair them (STCW A-III / 2).

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### Qualification system

During the course there will be continuous evaluations, according to the following percentages:

- Continuous assessment 40% (Exams, Practices, Works, Expositions)
- Partial Tests 30%
- Final Exam 30%
Regulations for carrying out activities

Attendance and completion of the hands-on labs, is a compulsory requirement.

Bibliography

Basic:

Others resources:
- Tips and technical articles provided by teachers in ATENEA.
- Marine Rules of Classifications Societies.