



## Course guide

### 280668 - 280668 - Naval Engines

**Last modified:** 19/06/2023

**Unit in charge:** Barcelona School of Nautical Studies  
**Teaching unit:** 742 - CEN - Department of Nautical Sciences and Engineering.

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

**Academic year:** 2023    **ECTS Credits:** 9.0    **Languages:** Spanish

#### LECTURER

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**Coordinating lecturer:** MANUEL RODRIGUEZ CASTILLO

**Others:** Primer quadrimestre:  
GERMAN DE MELO RODRIGUEZ - GESTN  
ALICIA PICAZO CARREÑO - GESTN  
MANUEL RODRIGUEZ CASTILLO - GESTN

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

1. Knowledge of marine diesel engines, gas turbines and steam plants.

**General:**

2. ABILITY TO SHAPE, DESIGN AND IMPLEMENT COMPLEX SYSTEMS IN THE FIELD OF NAVAL ENGINEERING. Ability to conception, design and implementation of processes, systems and / or services in the field of naval technical engineering, including the drafting and development of projects in the field of specialization, knowledge of basic materials and technologies, decision making, managing the activities being projects within their specialty, conducting measurements, calculations and valuations, managing specifications, regulations and mandatory standards, assessment of the social and environmental impact of technical solutions adopted, economic, material and human resources involved in the project, with a systematic and comprehensive vision assessment.

## TEACHING METHODOLOGY

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### Internal Combustion Engines

Acquire, understand and synthesize knowledge.  
And solve problems.  
Prepare technical reports.  
Adopt solutions in practical cases.  
Perform the memory of a lab or work.  
Analyze results.  
Relate knowledge from different disciplines.  
Develop critical thinking and reasoning and defend it orally or in writing.

### Steam and gas turbines

Ability to learn new methods and theories to equip themselves with the versatility to adapt to new situations.  
Ability to solve problems with initiative, decision making, creativity, and critical thinking skills to communicate and transmit knowledge and skills.  
Ability to carry out inspections, measurements, evaluations, appraisals, surveys, studies, reports, work plans and on site certifications steam turbine and gas.  
Ability to analyze and assess the social and environmental impact of technical solutions.  
Ability to design and planning of marine facilities for gas and steam turbines

### Steam generators

Acquire, understand and synthesize knowledge.  
And solve problems.  
Prepare technical reports.  
Adopt solutions in practical cases.  
Perform the memory of a lab or work.  
Analyze results.  
Relate knowledge from different disciplines.  
Develop critical thinking and reasoning and defend it orally or in writing.

## LEARNING OBJECTIVES OF THE SUBJECT

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### Internal Combustion Engines (MCI)

Theoretical and practical understanding of the operation of internal combustion engines.  
Knowledge of various types and facilities on board. Marine engines.  
Knowledge of computing powers, jobs, income, consumption, etc..  
Use and apply the knowledge gained in the design and selection of marine diesel engines.

### Steam and gas turbines (TVG)

Cognitive analysis and understanding of the work cycles of steam turbines and gas  
Knowledge of the different parts of a steam turbine and gas.  
Knowledge of calculating speeds triangles tobero pallets and pallets.  
Knowledge of the calculation of the Powers, jobs, income, etc..  
Understanding various types of turbines and their installation on board.  
Using the knowledge gained to design and dimensioning of the turbines.

### Steam generators (GV)

In-depth knowledge of the steam generators.  
Use and apply knowledge gained in the design and selection of steam generators.



## STUDY LOAD

Type	Hours	Percentage
Hours medium group	25,0	11.11
Hours large group	60,0	26.67
Self study	135,0	60.00
Hours small group	5,0	2.22

**Total learning time:** 225 h

## CONTENTS

### Application and classification of internal combustion engines (MCI).

**Description:**

Study on the different applications of internal combustion engines and ranking.

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

Theory classes: 2h

### Fundamental concepts and general definitions of MCI.

**Description:**

Schematic and nomenclature of the reciprocating engine. The engine ignition. The compression ignition engine. Differences between MEch and MEC. Working fluid.

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

Theory classes: 2h

### Thermal cycles.

**Description:**

Analysis of a cycle and performance. Theoretical cycle and actual cycle. Theoretical Otto cycle. Theoretical Diesel cycle. Sabathé mixed cycle. Comparison cycles. Medium pressure cycle.

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

Theory classes: 2h

### Engine operating cycles two and four times.

**Description:**

Indicated cycle and mean pressure indicated. Differences between actual and theoretical cycles. Study diagram indicated. Pressure diagram.

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

Theory classes: 2h



### Organizational study of the engine.

**Description:**

Major Organs of the engines. Cylinders. Cylinder heads. Caucus. Pistons and segments. Biela. Crankshaft. Distribution mechanism. Valves. Subsidiary bodies. Construction characteristics.

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

Theory classes: 2h

### Calculation of powers, yields and consumptions.

**Description:**

Indicated power. Effective power. Power absorbed by passive resistance. Mean effective pressure. Yields.

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

Theory classes: 2h

### Engine performance and factors that influence it.

**Description:**

Characteristic curves. Influence on the opening times of the valves. Loss of power. Specific consumption cash. Relationship between power and atmospheric conditions. Variables affecting engine performance.

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

Theory classes: 2h

### Combustion and Fuels.

**Description:**

General. The fuel components. Power antiknock fuel. Additives. Properties of fuels. Marine Fuels.

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

Theory classes: 2h

### Lubrication.

**Description:**

Lubricants. Functions of lubrication. Lubrication Systems. Characteristics of motor oil. Properties. Classification.

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

Theory classes: 2h

### Forming the mixture.

**Description:**

Injection. Injection systems and elements.

The process combustión. Variables influencing ignition delay. Combustors. Direct and indirect injection. Functions of the injection system. Injection systems. Fuel metering.

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

Theory classes: 2h



### Refrigeration.

**Description:**

Refrigerants. Systems and cooling elements.

Refrigeración. Cálculo function of the amount of heat extracted. Cooling systems. Forced circulation. Thermosyphon circulation. Cooling regulation.

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

Theory classes: 2h

### Scavenging

**Description:**

General concepts. Scavenging systems. Cross scavenging . Uniflow scavenging. Tangential scanveiging. Back Scavenging.

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

Theory classes: 2h

### Motor starting.

**Description:**

Systems and startup items. Reversible motors.

Engine starting systems. Electric start. Pneumatic starter. Distributor boot.

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

Theory classes: 2h

### Supercharger.

**Description:**

Supercharging systems and components.

Supercharging systems. Types of compressors. Turbochargers. Multistage supercharging. EGR valve. Wastegate valve. Regulation.

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

Theory classes: 2h

### Rotary engines.

**Description:**

Wankel engine. Quasiturbine. Radmax. Ripalda. Round Engine. Application of rotary engines.

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

Theory classes: 2h

### (ENG) Cicles de treball de les turbines de vapor.

### (ENG) Classificació de les turbines.



(ENG) Parts de les turbines: paletes, toveres, directrius i tobero-paletes.

(ENG) Estudi dinàmic de les turbines de flux axial i radial.

(ENG) Estudi de les turbines d'acció.

(ENG) (CAST) Estudio de las turbinas de reacción.

(ENG) Estators de les turbines.

(ENG) Rotors de les turbines.

(ENG) Paletes o àleps de les turbines.

(ENG) Regulació de la potència de les turbines de vapor.

(ENG) Condensadors.

(ENG) Instal·lacions de vapor.

(ENG) Cicles de treball de les turbines de gas.

(ENG) Parts d'un grup motor de turbines de gas: compressor, cambra de combustió i turbina.

(ENG) Combustió i combustibles de les turbines de gas.

(ENG) Cicles combinats.

(ENG) Tipus de generadors de vapor i parts que els componen.



(ENG) Accessoris de calderes.

(ENG) Combustibles utilitzats en generadors de vapor.

(ENG) Combustió.

(ENG) Cremadors.

(ENG) Emissió de contaminants i la seva eliminació.

(ENG) Anàlisi i tractament d'aigües.

(ENG) Balanç tèrmic i rendiment de generadors de vapor.

(ENG) Càlcul tèrmic i hidràulic.

## GRADING SYSTEM

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$N_{\text{final Subject}} = 0.33 N_{\text{final MCI}} + 0.33 N_{\text{final TVG+}} + 0.33 N_{\text{final GV}}$

A final test of reevaluation students who meet the requirements of the regulations will be made center, consisting of a single test in which all of the matter that will be assessed during the course.

## EXAMINATION RULES.

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If you have not done laboratory activities, work or evaluation, is considered not scored.

It is considered not presented when not all of the tests are carried out.

## BIBLIOGRAPHY

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### Complementary:

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