Course guide
280831 - 280831 - Simulation of Vessel's Engine Room

Last modified: 27/05/2025

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

Degree: MASTER'S DEGREE IN NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Optional subject).

Academic year: 2025 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: CLARA BOREN ALTES

Others: Segon quadrimestre:
CLARA BOREN ALTES - MUENO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
MUENO_CE4. Ability to analyze alternative solutions for the definition and optimization of power plants and ship propulsion

Generical:
MUENO_CG1. Ability to solve complex problems and to make responsible decisions based on the scientific and technological knowledge acquired in basic and technological subjects applicable in naval and ocean engineering, and in management methods
MUENO_CG8. Ability to analyze and interpret measurements, calculations, evaluations, appraisals, studies, reports, work plans and other similar works

Transversal:
CT3. TEAMWORK: Ability to work as a member of an interdisciplinary team, either as a member or performing management tasks, with the aim of contributing to projects pragmatically and sense of responsibility, assuming commitments considering the resources available.
CT5. THIRD LANGUAGE Learning a third language, preferably English, with adequate oral and written and in line with the future needs of the graduates.

Basic:
CB7. That the students can apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their study area.
CB10. Students must possess the learning skills that enable them continue studying in a way that will be largely self-directed or autonomous.

TEACHING METHODOLOGY

Participatory lectures
Cooperative learning
Learning based in engine room simulation sessions

LEARNING OBJECTIVES OF THE SUBJECT

The main objective is that the student integrates the skills acquired in his/her studies, in propulsion and services of the ship, in a totally practical way by means of the use of an engine room simulator.

The specific objectives are the followng:

- To deepen knowledge on propulsion machinery, power plant and auxiliary systems of the vessel.
- To know different machinery and tanks disposition on board depending on vessels' type.
- To analyze the effect on power and fuel consumption of the increase in ship's total resistance.
- To undersand how to manage the power plant based on the number of consumers connected and the working condition of the vessel.
- To know how to optimize operationally the power plant and ship propulsion.
- To deepen in the knowledge of tankers, LNG and Ro-Pax specific systems.
- To deepen in the knowledge of fire-fighting systems lay out on board.
- To deepen in the knowledge of water treatment equipment (i.e. oily, sewage and ballast waters) and its regulatory policies.
- To deepen in the knowledge of the environmental impact, monitoring and treatment of exhaust gases from engines, boilers and incinerators.
- To deepen in the knowledge of machinery control and monitoring systems.
- To know the existing internal communication systems, the different possibilities of controlling machinery in emergency conditions and learning how the plant is restored after a "black out" condition.
- Teamwork: being able to work as a member of a team collaboratively and/or taking decisions.
- Third language: knowing the technical nomenclature used on board merchant vessels in reference to propulsion machinery and auxiliary systems.

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours large group	45,0	36.00

Total learning time: 125 h

CONTENTS

Getting acquainted with the engine room simulation

Description:
The structure of the simulator and the different commands will be explained.
How to select a mimic, how to access local panels, system diagrams and the control and monitoring system.
How to activate different elements (valves, pumps, etc.) and the legend of their state in the system.
How to move around the 3D simulation using the joystick.

Full-or-part-time: 3h
Guided activities: 3h

Vessel's propulsion plant

Description:
Main engine (2- and 4-stroke diesel engine) and its systems: fuel system, lubrication system, seawater system, high and low temperature freshwater system, exhaust gas system and compressed air system.
Remote supervision of the systems.
Combustion diagnosis.

Full-or-part-time: 29h
Laboratory classes: 4h
Guided activities: 5h
Self study : 20h

Steam plant

Description:
System components, mission and control of the steam plant.
Boilers, turbines, condensers, economizers, burners.
Turbo-generator
Cargo oil turbo-pumps
Ballast water turbo-pump

Full-or-part-time: 24h
Laboratory classes: 4h
Guided activities: 5h
Self study : 15h

Electric power plant

Description:
Diesel generators, turbo-generator, shaft generator, emergency generator, shore connection, batteries, power distribution, consumers.
Generator synchronization and load distribution.
Black out.

Full-or-part-time: 29h
Laboratory classes: 4h
Guided activities: 5h
Self study : 20h

Types of fuel and oils on board: storage, treatment and transfer systems.

Description:
Types of fuels and lubricants used on board. Types of tanks. Autonomy. Purifiers. Viscometers and PID.

Full-or-part-time: 8h
Laboratory classes: 1h
Guided activities: 2h
Self study : 5h

Vessel's auxiliary systems

Description:
Steering gear, fresh water generator, oily water separator, sewage treatment plant, water ballast system, incinerator, provision cooling system and air conditioning.
Firefighting system.
Inert gas system.
Estabilizwers, intering, controlable pitch propeller hydraulic system.

Full-or-part-time: 32h
Laboratory classes: 7h
Guided activities: 5h
Self study : 20h

GRADING SYSTEM

The final score is the sum of the following partial grades:
Nfinal = 0.55Npf + 3x(0.15Nep)

Nfinal: Final Score
Npf: score of final exam
Npp: score of assessment exercices

The final exam consists of simulation excercises associated to the course learning objectives, concerning knowledge or comprehension and they are fully carried out in an Engine Room Simulator.
The assessment exercises are carried out in class and they can be individual or cooperative activities.

EXAMINATION RULES.

If the student does not carry out any of the scoring exercises, the exercise/s will be considered as non qualified.
The student who does not carry out the 80% of the evaluation activities of the course, will be considered "Not presented".

BIBLIOGRAPHY

Complementary:
- International Maritime Organization. Engine-room simulator. IMO model course 2.07. London: IMO, 2017. ISBN 9789280116762.

RESOURCES

Computer material:
- Simulador de cambra de màquines Wärtsilä Transas Techsim 5000. Software