SUBJECT TEACHING GUIDE

1184 - Cogeneration and Renewable Energy

Master's Degree in Marine Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Marine Engineering			Type and Year	Compulsory. Year 1
Faculty	School of Maritime Engineering				
Discipline	Cogeneration and Renewable Energy				
Course unit title and code	1184 - Cogeneration and Renewable Energy				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Combination of face-to-face and online training

Department	DPTO. CIENCIAS Y TECNICAS DE LA NAVEGACION Y DE LA CONSTRUCCION NAVAL
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Other lecturers	MARIO CASTILLA ROYUELA

3.1 LEARNING OUTCOMES
- The student understands, knows and uses the principles of cogeneration in marine installations.
- The student understands, knows and uses the principles of renewable energies in marine installations.
- The student understands, knows and uses the basic principles of inspection in marine installations.
- Detect and define causes of machines malfunction. Repair and recondition.
- Planification and schedule the operations.
- Management the propulsion system operation.

4. OBJECTIVES

To know aplications of alternative gas combustion engines (low and high pressure) in cogeneration field to produce thermal and electrical energy. Marine sector application.
Determination of legal requirements and security aspects about LNG marine installations.
Legal and environment implications about use of LNG.
Analyze and compare renewable energy systems, alternative fuels and technologies with potential application in marine sector. Sustainability criteria.
Study the legal framework about inspection and certification of marine installations.
Detect and define causes of machine malfunctions and make reparations according to section A-III / 2 of amended STCW code.
Planning and scheduling the operations according to section A-III / 2 of amended STCW code.
Management the operation of propulsion system according to section A-III / 2 of amended STCW code.

6. COURSE ORGANIZATION

CONTENTS	
1	Marine and industrial gas engines. Classification. Termodinamic theory of gas engine. Otto, diesel and miller cycles. Stoichiometry. Combustion. Cogeneration applications. Auxiliary systems. Firing. Air and gas feeding. Cooling. Lubrication. Control elements. Types of engines. Logistic of LNG bunkering. IGF Code.
2	LNG fuel. Implications regarding energy efficiency and CO2 control emissions. Reduction of polluting emissions. Energy management. Indicators. Framework of International Maritime Organization. Chapter IV Annex VI MARPOL
3	Renewable marine energies. Alternative fuels. Sustainability and decarbonization of marine industries. Potential application in ships.
4	Inspection and certification of marine installations

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Online follow up activities (20%)	Activity evaluation with Virtual Media	No	Yes	25,00
Laboratory practices. (50%)	Activity evaluation with Virtual Media	No	No	25,00
Written/Online test exam. (30%)	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations

Continuous assessment of non-contact period, is monitored through the virtual classroom. During this period, it's student's responsibility checking communications and notices on virtual platform. During face-to-face classes, for getting evaluation, the student must attend at least 2/3 of the classes and submit 2/3 of the reports of the proposed activities. If this requirement is not met, the rating will be zero.
The activities developed during face-to-face classes are non-recoverable.
The criteria for evaluating competence are adapted to Rule AII/2 of STCW Convention (enmended form).

Observations for part-time students

Part-time students
1) On line follow-up activities. 20%
2) Laboratory practices. 30%. This part of the evaluation may alternate with the presentation of individual works on a content agreed with the responsible teacher.
3) Test exam (Written/Online).50%.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Otero González, Félix M. (2016). Apuntes de motores de gas y energías renovables. Sección de publicaciones de la E.T.S. de Náutica. Santander 2016.
Kees Kuiken (2016). Gas and dual fuel engines for ship propulsion power plants and cogeneration. Books I, II, III. Target Global Energy Training.
García Garrido, S., Fraile Chico D., Fraile Martín, J. (2010). Motores alternativos de gas. Fundación de energía de la Comunidad de Madrid. Madrid.
Payri F., Desantes J.M. Motores (2011). Motores de combustión interna alternativos. 5ª Edición. Barcelona.
Giacosa, Dante (1998). Motores endotérmicos. Ed. Omega S.A. 14ª Edición. Barcelona.
Woodyard, Doug (2004). Pounder´s marine diesels engine and gas turbines. Ed. Elsevier. 8ª Edition. London.
OMI (2017).Convenio internacional para prevenir la contaminación por los buques (MARPOL 73/78). Edición enmendada.
Carretero Peña, A., García Sánchez J.M., (2012). Gestión de la eficiencia energética: cálculo del consumo, indicadores y mejora. AENOR Ediciones.
Resolución MEPC.212(63). Directrices de 2012 sobre el método de cálculo del índice de eficiencia energética de proyecto (EEDI) obtenido para los buques nuevos.
MEPC.1/circ.683, 17 agosto 2009. Orientaciones para la elaboración de un plan de gestión de la eficiencia energética del buque (SEEMP).