



Teaching Guide				
Identifying Data				2021/22
Subject (*)	Combustion	Code	631480208	
Study programme	Mestrado Universitario en Enxeñaría Mariña			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Navegación e Enxeñaría Mariña			
Coordinador	Garcia-Bustelo Garcia, Enrique Juan	E-mail	enrique.garcia-bustelo@udc.es	
Lecturers	Garcia-Bustelo Garcia, Enrique Juan	E-mail	enrique.garcia-bustelo@udc.es	
Web				
General description				
Contingency plan	<p>1. Modifications to the contents</p> <p>- No modifications are made</p> <p>2. Methodologies</p> <p>The teaching methodologies are maintained.</p> <p>* Teaching methodologies that are modified</p> <p>3. Mechanisms for personalized attention to students</p> <p>They will be the same.</p> <p>When due to unforeseen causes they cannot be carried out in the classroom or in the teacher's office, they will be carried out remotely by any of the means that the UDC makes available to teachers and students, such as email, Moodle, Teams, etc.</p> <p>4. Changes in the evaluation</p> <p>No modification</p> <p>* Evaluation observations:</p> <p>When due to unforeseen causes they cannot be carried out in person in the classroom, they will be carried out remotely by any of the means that the UDC makes available to teachers and students, such as email, Moodle, Teams, etc.</p> <p>5. Modifications to the bibliography or webgraphy</p> <p>No modifications</p>			

Study programme competences	
Code	Study programme competences
A2	Detectar e definir a causa dos defectos de funcionamento das máquinas e reparalas, a nivel de xestión.
A8	Facer funcionar a máquina, controlar, vixiar e avaliar o seu rendemento e capacidade, a nivel de xestión.
A9	Manter a seguridade dos equipos, sistemas e servizos da maquinaria, a nivel de xestión.
A16	Vixiar e controlar o cumprimento das prescricións lexislativas e das medidas para garantir a seguridade da vida humana no mar e a protección do medio mariño, a nivel de xestión.
A19	Regular, controlar, diagnosticar e supervisar sistemas, procesos e máquinas para a toma de decisións en condución e operación.
A20	Capacidade para desenrolar tarefas de análise e síntese de problemas teórico-prácticos en base a conceptos adquiridos noutras disciplinas do ámbito marítimo, mediante fundamentos físico-matemáticos.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Comunicarse de maneira efectiva nun entorno de traballo.



B4	Traballar de forma autónoma con iniciativa.
B5	Traballar de forma colaborativa.
B6	Comportarse con ética e responsabilidade social como cidadán e como profesional.
B7	Capacidade para interpretar, seleccionar e valorar conceptos adquiridos noutras disciplinas do ámbito marítimo, mediante fundamentos físico-matemáticos.
B10	Comunicar por escrito e oralmente os coñecementos procedentes da linguaxe científica.
B11	Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e de comunicar e transmitir coñecementos, habilidades e destrezas.
B12	Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación
B13	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo
B14	Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partires dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vencelladas á aplicación dos seus coñecementos e xuízos
B15	Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun xeito claro e sin ambigüidades
B16	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que haberá de ser en grande medida autodirixido ou autónomo.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C4	Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C7	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.
C9	Falar ben en público

## Learning outcomes

Learning outcomes	Study programme competences		
Knowledge of basic combustion processes, which are key to the proper management of propulsion equipment and auxiliary services.	AC2	BC1	CC1
	AC8	BC2	CC2
	AC9	BC3	CC4
	AC16	BC5	CC9
	AC19	BC12	
	AC20	BC13	
		BC14	
		BC15	
	BC16		



Be able to evaluate the operation of combustion equipment, respond to technological advances in this field and provide solutions in a multidisciplinary field such as Marine Engineering.	AC9	BC4	CC6
	AC19	BC6	CC7
	AC20	BC7	CC8
		BC10	CC9
		BC11	
		BC12	
		BC13	
		BC14	
		BC15	
		BC16	

Contents	
Topic	Sub-topic
Combustión	1. Introduction to combustion 2. Classification of combustion processes. General approach to the problem. 3. Stoichiometry of the combustion of solid, liquid and gaseous fuels. 4. Composition of polluting gases. Polluting load. 5. Combustion modes. Premix, diffusion. 6. Atomization and combustion of drops. 7. Formation of polluting emissions.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Document analysis	B1 B4 B7 C2 C6 C8	1	1	2
Case study	A2 A20 B1 B2 B3 B4 B5 B7 C7	5	15	20
Objective test	A8 A9 A16 A19 A20 B2 B10 B11 C1	3	0	3
Problem solving	A2 A9 A16 A20 B2 B3 B4 B5 B6 B7 B10 B11 B12 B13 B14 C4 C6 C8	6	18	24
Oral presentation	B15 B16 C9	4	4	8
Guest lecture / keynote speech	A2 A8 A9 A16 A19 C8	7	7	14
Personalized attention		4	0	4

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Document analysis	An analysis and selection of the most up-to-date documentation sources will be carried out, with the help of new technologies, to achieve the proposed objectives.
Case study	Proposal of practical cases, resolution and criticism.
Objective test	Oral and/or written tests will be carried out that will consist of theoretical and practical questions.
Problem solving	Solve problems in terms of design and real behavior.
Oral presentation	Presentación oral na aula dos casos prácticos para discusión e avaliación cos compañeiros
Guest lecture / keynote speech	The detailed explanation of the contents of the subject will be made. The student will have bibliographic material of the subject to be treated in each master session. Student participation in class will be encouraged, through comments that try to relate the theoretical contents with real experience.



## Personalized attention

Methodologies	Description
Guest lecture / keynote speech	ANALYSIS OF DOCUMENTARY SOURCES. Personal attention will be given to the selection of bibliographic sources and specialized publications.
Document analysis	STUDY OF CASES. Preferably, cases for which there is inefficient exploitation documentation will be chosen for analysis, making a follow-up of the development of them individually.
Case study	OBJECTIVE PROOF Oral and / or written tests will be carried out that will consist of theoretical and practical questions.
Objective test	PROBLEM SOLVING. The proposed problems will be solved by the student, making a permanent follow-up.
Problem solving	MASTER SESSION. The detailed explanation of the contents of the subject will be made. The student will have bibliographic material of the subject to be treated in each master session. Student participation in class will be encouraged, through comments that try to relate the theoretical contents with real experience.
Oral presentation	PERSONAL ATTENTION. They will be carried out during tutorials established at the beginning of the course and on the board of the office. This personalized attention is essential for sel the work done by the student eminently oriented to research.

## Assessment

Methodologies	Competencies	Description	Qualification
Guest lecture / keynote speech	A2 A8 A9 A16 A19 C8	With the participative attendance to the expository classes.	10
Document analysis	B1 B4 B7 C2 C6 C8	An analysis and selection of the most updated sources of documentation will be carried out, with the help of new technologies, to achieve the objectives set.	5
Case study	A2 A20 B1 B2 B3 B4 B5 B7 C7	Proposal of practical cases, analysis, resolution, validation and criticism.	15
Objective test	A8 A9 A16 A19 A20 B2 B10 B11 C1	Resolution of theoretical and practical proposals.	50
Problem solving	A2 A9 A16 A20 B2 B3 B4 B5 B6 B7 B10 B11 B12 B13 B14 C4 C6 C8	Solve problems in terms of design and real behavior.	15
Oral presentation	B15 B16 C9	Presentación oral na aula dos casos prácticos para discusión e avaliación cos compañeiros	5

## Assessment comments

<p>Evaluation criteria contemplated in tables A-III/1 and A-III/2 of the STCW Code and its amendments related to this matter will be taken into account when designing and carrying out its evaluation.</p> <p>Students with recognition of part-time dedication and academic exemption of attendance exemption, according to the "NORM THAT REGULATES THE REGIME OF DEDICATION TO THE STUDY OF GRADUATE STUDENTS IN THE UDC (Arts 2.3, 3.b; 4.3 e 7.5 ) (04/05/2017):</p> <ul style="list-style-type: none"> <li>- Attendance / participation in the minimum class activities: 80% to be considered by the teacher, considering that in these cases it can be compensated with specific jobs, assistance to tutorials ... For example, in some subjects this 80% could be the corresponding to the hours of practices in laboratory / workshop, and allow the exemption to attend the lectures.</li> <li>- Qualification:               <ul style="list-style-type: none"> <li>a) Elaboration of works: up to 80%</li> <li>c) Problem solving: up to 80%</li> <li>b) Written exam on the contents of the subject: up to 100%</li> <li>d) Other methodologies considered: up to 100%</li> </ul> </li> </ul>
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## Sources of information



<b>Basic</b>	<ul style="list-style-type: none"><li>- Ernest J. Henley (2002). Cálculo de Balances de Materia y Energía . Barcelona: Edit. Reverté. S.A.</li><li>- Manuel Marquez (2005). Combustión y Quemadores. España. Marcombo</li><li>- David M. Himmelblau (2002). Principios básicos y cálculos en ingeniería química. México. Pearson Educación</li><li>- Sánchez Naranjo, Consuelo (2008). Teoría de la combustión. UNED</li></ul>
<b>Complementary</b>	<ul style="list-style-type: none"><li>- J. L. Gómez Ribelles (2002). Termodinámica técnica. Valencia. UPV</li><li>- M. J. Moran; H. N. Shapiro (1999). Fundamentos de termodinámica técnica. Barcelona. Ed. Reverte, S.A</li><li>- Yunus A. Çengel; Michael A. Boles (2002). Termodinámica. México. McGraw-Hill</li><li>- D. B. Spalding (1979). Combustion and Mass Transfer. Pergamon</li><li>- TURNS, S. R. (2000). An Introduction to Combustions: Concepts and Applications. Ed. McGraw-Hill</li></ul>

### Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

### Other comments

Because it is an optional Master's subject, which implies having completed a Degree, no additional prerequisite is required.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.