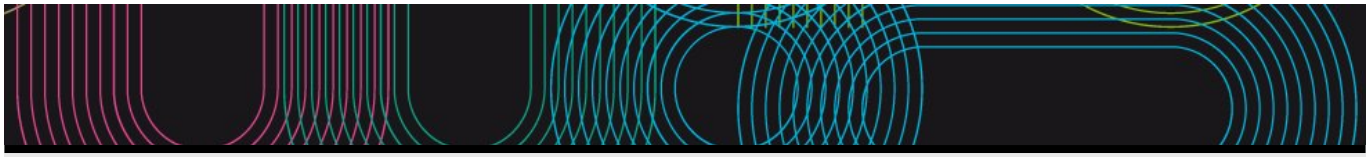

IDENTIFYING DATA				
Heat Engines				
Subject	Heat Engines			
Code	V04M141V01341			
Study programme	(*)Máster Universitario en Enxeñaría Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	2nd	1st
Teaching language	English			
Department	Mechanical Engineering, Heat Engines & Machines, and Fluids			
Coordinator	Porteiro Fresco, Jacobo			
Lecturers	Porteiro Fresco, Jacobo			
E-mail	porteiro@uvigo.es			
Web				
General description				

Competencies	
Code	
A4	Students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.
A5	Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
C1	CET1. Project, calculate and design products, processes, facilities and plants.
C9	CET9. Knowing how to communicate the conclusions -and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.
C10	CET10. Possess learning skills that will allow further study of a self-directed or autonomous mode.
C16	CTI5. Knowledge and skills for the design and analysis of thermal machines and engines, hydraulic machines and facilities for heat and industrial refrigeration
D1	ABET-a. An ability to apply knowledge of mathematics, science, and engineering.
D3	ABET-c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
D5	ABET-e. An ability to identify, formulate, and solve engineering problems.
D11	ABET-k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
- Know the technological base on which support the most recent progresses in thermal engines	A4	C1	D1
- Know the types, the operation and the applications of machines and engines and thermal	A5	C9	D3
- Capacity to realise the resolution of inherent problems to thermal machines, so much mechanical, as of broadcasts *contaminantes		C10	D5
		C16	D11
- Capacity for the realisation of experimental analyses to evaluate the characteristic curves of operation of thermal engines in the different states of load.			
- Know realise designs, calculations and essays justifying his results, extracting conclusions			

Contents	
Topic	
1. Introduction to the *motopropulsores systems	1.1 Definition
	1.2 Classification

2. Theoretical cycles	2.1 Introduction 2.2 Cold air cycle 2.3 SI cycle 2.4 CI cycle 2.5 Air-fuel cycle
3. Real cycle	3.1 Differences of the real cycle front the theoretical cycle 3.2 Peculiarities of the SI 3.3 Peculiarities of the CI
4. Gas exchange process in the 4 stroke engine	4.1 Introduction 4.2 volumetric Performance 4.3 Factors that affect to the volumetric performance 4.4 Technology of the renewal of the load of the 4S 4.5 State of the art and tendencies
5. Gas exchange process in the 2 stroke engine	5.1 Introduction 5.2 Definitions 5.3 Technology of the renewal of the load of the 2S 5.4 State of the art and tendencies
6. Supercharging	6.1 Introduction 6.2 Types 6.3 Advantages and problems 6.4 mechanical Supercharging 6.5 Turbocharging 6.6 State of the art and tendencies
7. Requirements of the mixture	7.1 Introduction 7.2 Optimum mixture 7.3 Systems of dosage 7.4 State of the art and tendencies
8. SI combustion	8.1 Introduction to the combustion 8.2 Stages of the combustion 8.3 Spark advance 8.4 Pathologies of the combustion 8.5 GDI 8.6 New trends
9. CI Combustion	9.1 Introduction to the combustion by diffusion 9.2 Stages of the combustion 9.3 DI vs IDI 9.4 Injection systems 9.5 New trends
10. Losses of heat and system of refrigeration	10.1 Introduction 10.2 Losses of heat 10.3 Components of the system of refrigeration
11. Mechanical losses and oil system	11.1 Introduction 11.2 Lubrication regimes 11.3 Mechanical losses 11.4 Components of the system

Planning

	Class hours	Hours outside the classroom	Total hours
Computer practices	6	0	6
Laboratory practices	6	0	6
Lecturing	24	0	24
Essay questions exam	0	36.5	36.5
Essay	0	40	40

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

Methodologies

	Description
Computer practices	Practical classes in groups of 20 students
Laboratory practices	Practical classes in groups of 20 students
Lecturing	Lesson in classroom

Personalized attention

Methodologies	Description
Lecturing	

Computer practices	
Laboratory practices	

Assessment

	Description	Qualification	Training and Learning Results		
Essay questions exam	Proof written that it will be able to consist of: theoretical questions, practical questions, resolution of exercises/problems, subject to develop, etc.	70-90	A4 A5	C1 C9 C10 C16	D1 D3 D5 D11
Essay	Works in which the student will employ the knowledges and tools purchased during the course.	30-10	A4 A5	C1 C9 C10 C16	D1 D3 D5 D11

Other comments on the Evaluation

By agreement of the Standing committee of the School of Industrial Engineering, celebrated on 12 June 2015:

Ethical Commitment:
It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

Sources of information

Basic Bibliography

Payri, F. y Desantes, J.M., **MOTORES DE COMBUSTIÓN INTERNA ALTERNATIVOS**,

Complementary Bibliography

Heywood, John B, **INTERNAL COMBUSTION ENGINES FUNDAMENTALS**, Ed. Mc Graw Hill,

Muñoz, Manuel, **TURBOMÁQUINAS TÉRMICAS: Fundamentos de diseño termodinámico**, Universidad Politécnica de Madrid,

Charles F. Taylor, **THE INTERNAL COMBUSTION ENGINE IN THEORY AND PRACTICE**,

Recommendations