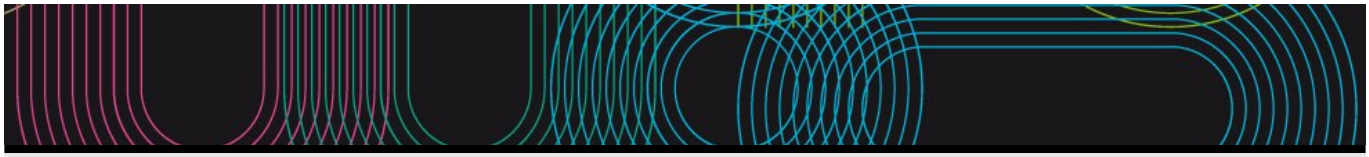

IDENTIFYING DATA				
(*)Motores e turbomáquinas térmicas				
Subject	(*)Motores e turbomáquinas térmicas			
Code	V09G290V01608			
Study programme	(*)Grao en Enxeñaría da Enerxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Patiño Vilas, David			
Lecturers	Patiño Vilas, David			
E-mail	patinho@uvigo.es			
Web				
General description	(*)Profundizar nos coñecementos termodinámicos e termotécnicos aplicados ao funcionamento dos motores de combustión interna alternativos e turbomáquinas térmicas			

Competencies	
Code	
A21	(*)CEE15 Conocimiento aplicado de los fundamentos de los sistemas y máquinas fluidomecánicas
A23	(*)CEE17 Capacidad para el diseño de centrales eléctricas
A29	(*)CEE24 Conocimiento aplicado sobre energías renovables
A34	(*)CEE29 Capacidad para aplicar los conocimientos de motores y máquinas térmicas a los problemas que puedan plantearse en la Ingeniería
A35	(*)CEE30 Capacidad para aplicar las Tecnologías Medioambientales a los problemas que puedan plantearse en la Ingeniería Térmica
B1	(*)CG1 Capacidad de interrelacionar todos los conocimientos adquiridos, interpretándolos como componentes de un cuerpo del saber con una estructura clara y una fuerte coherencia interna.
B3	(*)CG3 Proponer y desarrollar soluciones prácticas, utilizando los conocimientos teóricos, a fenómenos y situaciones-problema de la realidad cotidiana propios de la ingeniería, desarrollando las estrategias adecuadas.
B5	(*)CG5 Conocer las fuentes necesarias para disponer de una actualización permanente y continua de toda la información precisa para desarrollar su labor, accediendo a todas las herramientas, actuales y futuras, de búsqueda de información y adaptándose a los cambios tecnológicos y sociales.
B6	(*)CG6 Conocer y manejar la legislación aplicable al sector, conocer el entorno social y empresarial y saber relacionarse con la administración competente integrando este conocimiento en la elaboración de proyectos de ingeniería y en el desarrollo de cualquiera de los aspectos de su labor profesional.
B7	(*)CG7 Capacidad para organizar, interpretar, asimilar, elaborar y gestionar toda la información necesaria para desarrollar su labor, manejando las herramientas informáticas, matemáticas, físicas, etc. necesarias para ello.
B8	(*)CG8 Concebir la ingeniería en un marco de desarrollo sostenible con sensibilidad hacia temas medioambientales.

Learning aims		
Expected results from this subject	Training and Learning Results	
(*)	A21	
(*)	A29	
(*)A28	A23	
(*)	A34	
(*)	A35	
(*)		B1
(*)		B3
(*)		B5

(*)	B6
(*)	B7
(*)	B8

Contents	
Topic	
1. Introduction to Thermal Engines	1.1 Presentation of the subject 1.2 Basic definitions
2. Characteristics of the Internal Combustion Engines (ICE)	2.1 Classification of the thermal engines 2.2 Fundamentals of the Internal Combustion Engines (ICE) 2.3 Parts of the ICEs 2.4 Nomenclature and basic parameters
3. Air Cycle	3.1 Thermodynamic Cycle 3.2 The Otto Cycle 3.3 The Limited Pressure Cycle 3.4 The Diesel Cycle
4. The Real Cycle	4.1 The mixture of real gas 4.2 Evolution of the adiabatic coefficient 4.3 Pumping Loss 4.4 Combustion Loss 4.5 Expansion Loss 4.6 Quality Factor of the Cycle
5. Gas exchange processes in 4 Stroke Engines	5.1 The Valve Train 5.2 The Volumetric Efficiency 5.3 Pump loss 5.4 Timing 5.5 Variable Distribution Systems 5.6 Dynamic Air admition systems
6. Scavenging in 2 Stroke Engines	6.1 Ideal Scavenging 6.2 Scavenging proccess 6.3 Admision systems 6.4 Acoustic wave enhancement
7. Supercharging	7.1 Advantages of the supercharging in ICE 7.2 Volumetric superchargers 7.3 Turbochargers 7.4 Intercooler 7.5 Dynamic Systems (Comprex)
8. Combustion in Spark Ignition Engines (SIE)	8.1 Stoichiometry of SIE 8.2 Characteristic Curves 8.3 The Carburettor 8.4 Injection System 8.5 Closed loop (lambda control) 8.6 Combustion phases in SI 8.7 Abnormal Combustion: knock 8.8 Abnormal Combustion: superficial ignition 8.9 Combustion chambers 8.10 Influential factors in SI combustion
9. Combustion in Compression Ignition Engines (CIE)	9.1 Introduction 9.2 Phases of CI combustion 9.3 Influential Factors 9.4 Types of injection 9.5 Systems of injection 9.6 Future tendencies
10. Thermal turbomachinery	10.1 Brayton Cycle 10.2 Parts of the Gas Turbine 10.3 Compressors 10.4 Combustion Chamber 10.5 Turbine 10.6 Architecture
11. Auxiliar Circuits	11.1 Refrigeration System 11.2 Lubricacion System
12. Pollution Emissions	12.1 SI Emissions 12.2 Diesel Emissiones 12.3 Regulations (EURO) 12.4 Catalytic converter 12.5 EGR systems 12.6 Lambda

13. Other thermal engines	13.1 Rotary Engine (Wankel) 13.2 Stirling Engine 13.3 Modern Tendencies (HCCI, hybrids...) 13.4 New Fuels

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	25	48	73
Laboratory practises	12	0	12
Tutored works	5	30	35
Troubleshooting and / or exercises	10	20	30

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

Methodologies

	Description
Master Session	Regular lessons of theoretical concepts in big groups
Laboratory practises	Practical experiences in laboratory
Tutored works	Supervision of a report related with the subject
Troubleshooting and / or exercises	Resolution of practical exercices

Personalized attention

Methodologies	Description
Master Session	The professor can personally help the doubts and queries at his office during the tutoring time . The student is informed about this schedule at the beginning of the course. Otherwise, the professor can be contacted at anytime by email or using the electronic platform (Faitic)
Laboratory practises	The professor can personally help the doubts and queries at his office during the tutoring time . The student is informed about this schedule at the beginning of the course. Otherwise, the professor can be contacted at anytime by email or using the electronic platform (Faitic)
Tutored works	The professor can personally help the doubts and queries at his office during the tutoring time . The student is informed about this schedule at the beginning of the course. Otherwise, the professor can be contacted at anytime by email or using the electronic platform (Faitic)
Troubleshooting and / or exercises	The professor can personally help the doubts and queries at his office during the tutoring time . The student is informed about this schedule at the beginning of the course. Otherwise, the professor can be contacted at anytime by email or using the electronic platform (Faitic)

Assessment

	Description	Qualification
Master Session	Short answer questions or test.	50
Tutored works	Reports with oral presentation	15
Troubleshooting and / or exercises	Resolution of (long/short) exercices	35

Other comments on the Evaluation

There final exam represents the **85% of the mark**. The tutorize report represents the other **15%**.

During the whole period, some mide-term exams will be made. If the student is able to pass all of them, the final exam won't be necessary.

The exams schedule is:

1st attempt: 19/05/2014 a las 16h Aula M-213

2nd attempr: 11/07/2014 a las 16h Aula M-213

The updated information can be checked on the webpage of the School:

http://webs.uvigo.es/etseminas/cms/index.php?id=181,0,0,1,0,0

Sources of information

Heywood, J.B., **Internal combustion engines fundamentals**, McGraw-Hill,

Payri F. and Desantes J.M., **Motores de combustión interna alternativos**, Reverté,

Muñoz M. y Payri F, **Motores de combustión interna alternativos**, Publicaciones de la UP Valencia,
Mollenhauer K. y Tschöke H, **Handbook of Diesel Engines.**, Ed. Springer,
Agüera Soriano J., **Termodinámica Lógica y Motores Térmicos**, Ed. Ciencia 3,
Gordon P. Blair, **Design and simulation of four-stroke engines**, Editado por SAE Internacional,
Taylor C.F., **The internal combustion engine in theory and practice: vol. 1. Thermodynamics, fluid flow, performance.**, Editorial MIT press,
Taylor C.F., **The internal combustion engine in theory and practice: vol. 2. Combustions, fuels, materials, design**, Editorial MIT press,

Recommendations

Subjects that it is recommended to have taken before

(*)Física: Sistemas térmicos/V09G290V01306
(*)Termodinámica e transmisión de calor/V09G290V01302
(*)Xeración e distribución de enerxía térmica convencional e renovable/V09G290V01503