Course guide
240229 - 240AU103 - Internal Combustion Engines and Fuels I

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 724 - MMT - Department of Heat Engines.

Degree: MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2019). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Spanish

LECTURER

Coordinating lecturer: De Medina Iglesias, Vicente César

Others: Gonzalo Tarragó, David
De Medina Iglesias, Vicente César

PRIOR SKILLS

Previous knowledge or having taken subjects of:
thermodynamics
mechanics
Machine theory
Fluid mechanics
Thermotechnics (heat transfer)
Electrical / Electronics

REQUIREMENTS

Not described

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEAU13. (ENG) Avaluar el comportament d'un vehicle mitjançant l'aplicació de sistemes motrius i de transmissió i establir solucions viables econòmicament en el sector de l'automoció (competència específica de l'especialitat Motors i Mecànica).

Generical:
CGAU 4. Be able to conduct research, development and innovation in relation to automotive technology.
CGAU 7. Integrate knowledge and handle complexity, making judgments and decisions, from incomplete or limited information, including reflections on the social and ethical responsibilities of professional practice
CGAU 9. Communicate and discuss proposals and conclusions in forums multilingual, skilled and unskilled, in a clear and unambiguous
CGAU 1. Ability to apply appropriate knowledge of mathematical aspects, analytical, scientific, instrumental, technological and management, the resolution of the problems of the automotive

Transversal:
CTAU3. (ENG) TREBALL EN EQUIP: Ser capaç de treballar com a membre d'un equip interdisciplinar, ja sigui com un membre més, o realitzant tasques de direcció, amb la finalitat de contribuir a desenvolupar projectes amb pragmatisme i sentit de la responsabilitat, assumint compromisos tenint en compte els recursos disponibles.

Basic:
CB 7. (ENG) Que els estudiants sàpiguen aplicar els coneixements adquirits i la seva capacitat de resolució de problemes en entorns nous o poc coneguts dintre de contextos més amplis (o multidisciplinars) relacionats amb la seva àrea d'estudi.
CB10. (ENG) Que els estudiants poseeixin les habilitats d'aprenentatge qur els permetin continuar estudiant d'una manera d'una forma que haurà de ser en gran mesura autodirigit o autonònom
CB 9. (ENG) Que els estudiants sàpiguen comunicar les seves conclusions i coneixements (i darrers raonaments que els sostentin), a públics especialitzats i no especialitzats de manera clara i sense ambigüitats.

TEACHING METHODOLOGY

The course consists of 3 hours a week of semi-face-to-face classes, six sessions of 3 hours each of practices in the laboratory face-to-face and the rest will be of telematic form.
Four individual problems must be submitted, three of which are associated with the work done in the internship of laboratories.
Students must follow the directions and deadlines described through the ATENEA digital campus.

LEARNING OBJECTIVES OF THE SUBJECT

Solvent use and deep understanding of the technical scientific information of the sector and discipline.
Understanding, through experimentation, the operation of the MCIs applied to the automobile and its auxiliary systems.
Understanding the influence of the different design parameters of the MCI
Understanding the influence of the different MCI regulation and control parameters
The general treatment will be eminently practical, with analysis of real cases. The student will develop problem solving skills, interpretation of tables and diagrams, as well as use of application software. It will also take contact with the real value of simulations of case studies and the use of numerical approximations.

STUDY LOAD

Type	Hours	Percentage
Self study	72,0	64.00
Hours large group	27,0	24.00
Hours small group	13,5	12.00

Total learning time: 112.5 h

CONTENTS

Topic 1: Thermal motors

Description:
The subject presents the most important contents related to thermal engines for vehicle propulsion, especially considering that there may be Master students who are not familiar with them.

Specific objectives:
Know the operating principles of the M.A.C.I.
Analyze the thermal and mechanical processes of the engines and their influence on performance and polluting emissions.
Construction elements.
Characteristic parameters
Work cycles
Similarity criteria.
Characteristic curves, tests and benefits.

Full-or-part-time: 10h
Theory classes: 2h
Laboratory classes: 1h
Self study : 7h

Topic 2: Principles of operation of internal combustion engines

Description:
Theoretical Otto and Diesel reference power cycles, 4T and 2T
Characteristic parameters of the MCI

Full-or-part-time: 22h 30m
Theory classes: 5h
Laboratory classes: 2h 30m
Self study : 15h

Topic 3: Architecture and technology of the MCI

Description:
Fixed, structural elements.
Mobile elements, alternative train.
4Q distribution.

Full-or-part-time: 27h
Theory classes: 5h
Laboratory classes: 7h
Self study : 15h

Topic 4: Phase closed to MEP and MEC

Description:
Combustion of homogeneous mixtures (Otto)
Combustion of stratified mixtures (Otto)
Combustion of heterogeneous mixtures (Diesel)

Full-or-part-time: 21h
Theory classes: 4h
Laboratory classes: 2h
Self study : 15h

Topic 5: Open Phase

Description:
Renewal of the load in 4T reciprocating engines
Renewal of the load in 2T reciprocating engines

Full-or-part-time: 13h
Theory classes: 5h
Self study : 8h

Topic 6: Fuels for MCIs

Description:
Petroleum products and fossil origin
New fuels

Full-or-part-time: 12h
Theory classes: 4h
Self study : 8h

Topic 7: Pollutant emissions, regulations

Description:
Thermal pollution
Noise pollution
Pollution from gas emission

Full-or-part-time: 7h
Theory classes: 2h
Laboratory classes: 1h
Self study : 4h

GRADING SYSTEM

Evaluation system
The final grade for the course "Note" is calculated from:
Conducting a test (Final Exam "Nf") of minimum knowledge.
Evaluation of the reports and presentations made in class concerning the "Ninf" practices, with a weight 60% in the Note.
The self-evaluation exercises of the reports submitted and the participation in forums on the ATENEA digital campus regarding the "Npr" practices, with a weight of 10% in the Note.
Note = (0.3Nf + 0.6Ninf + 0.1Npr).

EXAMINATION RULES.

It is an indispensable condition to have carried out the practices adequately.
In order to carry out the internships, the corresponding questionnaires must have been made, which have been made through the ATENEA digital campus.

BIBLIOGRAPHY

Basic:
- Álvares Flórez, J.A ; Callejón i Agramunt, I. ; Forns Farrús, S.. Motores alternativos de combustión interna [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 26/02/2020]. Available on: http://hdl.handle.net/2099.3/36805. ISBN 9788483018187.
- Payri González... [et al.]. Motores de combustión interna alternativos. Valencia : Barcelona: Editorial UPV ; Reverté, cop. 2011. ISBN 9788483637050.