

## SUBJECT TEACHING GUIDE

G880 - Electric and Hybrid Vehicles

Degree in Electrical Engineering

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Degree in Electrical Engineering			Type and Year	Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electrotechnology Optional Module: Electrical Engineering				
Course unit title and code	G880 - Electric and Hybrid Vehicles				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	<a href="https://aulavirtual.unican.es/">https://aulavirtual.unican.es/</a>				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA				
Name of lecturer	ALBERTO ARROYO GUTIERREZ				
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Other lecturers	MARIO MAÑANA CANTELI GERARDO DIEZ CAGIGAL JAVIER SANCHEZ ESPIGA				

### 3.1 LEARNING OUTCOMES

- The student will know the architecture of a vehicle and its mechanical and electrical characteristics.
- The student will be able to analyze and to design the generation and storage systems most widely used in electric and hybrid vehicles.
- The students will be able to analyze and to design the propulsión system in electrical and hybrid vehicles.

#### 4. OBJECTIVES

- To obtain a basic knowledge about the history of the electrical and hybrid vehicles.
- To be able to classify and to describe the architecture of electrical and hybrid vehicles.
- To provide the students with the basic skills related with the design of electrical and hybrid vehicles.
- To review the different sources of energy that can be found in electrical and hybrid vehicles.
- To study the propulsion systems in electrical and hybrid cars.
- To get a basic knowledge about the components and the dynamic behaviour of the vehicle.

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	Introduction. Energy, economy and social aspects related with the transport. History of the vehicle.
2	General concepts of mechanics of vehicles.
3	Generation and storage of energy in the vehicle.
4	Propulsión systems in the vehicle.
5	Ancillary supply systems in the vehicle.

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Contents of the Electrical Part (60%): work (90%) and assistance with use (10%). Obtain at least a score of 4 out of 10 on the exam to compensate this part in the final grade, which must be equal to or greater than 5 out of 10.	Work	No	Yes	60,00
Contents of the Mechanical Part (40%): Resolution of 2 problems (40%), 10 short questions, containing brief explanations and justifications for the answers (40%) and delivery of tasks, problems, etc. during the course (20%).	Written exam	Yes	Yes	40,00
<b>TOTAL</b>				<b>100,00</b>

### Observations

The ordinary exam can be scored on 100% of the grade for the course. Said ordinary examination shall have the following structure:

1. If the Partial Exam of the Electrical Part has been passed (grade greater than or equal to 4 out of 10), the student may appear only to the second part (Mechanical Part); a minimum grade of 5 must be obtained with it out of 10 to pass the course. Additionally, in the second part (Mechanical Part) a minimum grade of 4 out of 10 to pass the subject.
2. If the Partial Exam of the Electrical Part has not been passed (grade less than 4 out of 10), the student must carry out the ordinary examination in full, obtaining:
  - a. In both parts (Electrical Part and Mechanical Part) a minimum rating of 4 out of 10 for these parts to be consider compensable in the final grade and,
  - b. A minimum grade of 5 out of 10 to pass the course.

Students who have completed the continuous assessment and / or the ordinary exam and have failed to pass the subject, they will be able to recover 100% of the subject in the extraordinary official exam.

Only for duly justified causes (eg health restrictions) and whenever the academic authorities indicate so, the evaluation tests may be organized remotely. In this case, the teachers of the subject would evaluate the thematic blocks using various tools such as, email, videoconference software, Moodle, etc.

The remote evaluation of the works, practical laboratory exercises and written tests is foreseen, in the case of a new health alert by COVID-19 making it impossible to carry out the evaluation in person.

### Observations for part-time students

Partial-time students have the same assessment rules that full-time students.

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

J. Fullea et al. El vehículo eléctrico. Tecnología, desarrollo y perspectivas de futuro. McGraw Hill-EVE-Iberdrola, Serie Electro Tecnologías, Nº 15, 1997. ISBN 84-481-1201-6

Pablo Luque, Daniel Álvarez, Carlos Vera. Ingeniería del automóvil : sistemas y comportamiento dinámico. Editorial: Madrid : Thomson, [2004]

