240AU035 - Car Safety Systems

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2017
Degree: MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2012). (Teaching unit Compulsory)
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Spanish

Teaching staff
Coordinator: M. ANTONIA DE LOS SANTOS LOPEZ
Others: DAVID GALLEGOS DIEZ

Prior skills
Knowledge in the vehicle dynamics and the car's bodywork

Degree competences to which the subject contributes

Specific:
1. Apply knowledge of mathematics, physics and technology obtained through study, experience and practice, using critical reasoning to establish economically viable solutions to technical problems in the automotive sector
2. Conceptualize engineering models, apply innovative methods in problem solving and applications suitable for the design, simulation, optimization and control of processes and systems
3. Perform, present and defend an original exercise performed individually before a university tribunal, consisting of a comprehensive project of Automotive Engineering professional nature which synthesize the skills acquired in the teachings

General:
4. Ability to apply appropriate knowledge of mathematical aspects, analytical, scientific, instrumental, technological and management, the resolution of the problems of the automotive
5. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

Teaching methodology
Lectures.
Autonomous guided learning process.
Cooperative learning process.

Learning objectives of the subject
General objectives:
- Provide a generic knowledge about safety in the automobile.
Specific objective:
- Know the main active safety systems and the development trends in the following years.
- Analyse the passive safety systems
- Know the basics in the reconstruction of the road accidents
### Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time: 75h</td>
<td>Hours medium group:</td>
<td>18h</td>
<td>24.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>9h</td>
<td>12.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>48h</td>
<td>64.00%</td>
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</tbody>
</table>
# Content

## Introduction

**Description:**
General characteristics of the safety systems applied to the automobile.

**Related activities:**
Interactive lessons, exercise resolution and applied examples.

**Specific objectives:**
- Know the differences between active and passive safety systems.
- Know the specific issues to consider in active and passive safety.

<table>
<thead>
<tr>
<th>Learning time: 5h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Self study: 2h</td>
</tr>
</tbody>
</table>

## Active safety

**Description:**
Know the influence of the chassis systems in the active safety. Application and description of the advanced driver assistance systems.

**Related activities:**
Interactive lessons, exercise resolution and applied examples.

**Specific objectives:**
- Analyse the influence of the steering, suspension and brake systems in the active safety.
- Know the main trends in the development of the advanced driver assistance systems.

<table>
<thead>
<tr>
<th>Learning time: 25h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td>Practical classes: 4h</td>
</tr>
<tr>
<td>Self study: 11h</td>
</tr>
</tbody>
</table>
# Passive safety

**Description:**
Passive safety systems. 
Crash tests. 
Pedestrian protection.

**Related activities:**
Interactive lessons, exercise resolution and applied examples.

**Specific objectives:**
- Know the body structures and their function in the passive safety. 
- Know the main passive safety systems. 
- Know how to analyse the results obtained in a crash test. 
- Learn the pedestrian protection fundamentals.

## Accident reconstruction

**Description:**
Know the main techniques used in the reconstruction of traffic accidents.

**Related activities:**
Interactive lessons, exercise resolution and applied examples.

**Specific objectives:**
- Know the concepts used in the reconstruction of traffic accidents: 
  - principle of energy conservation applied to the traffic accident.
## Planning of activities

### INTERACTIVE CLASSES

**Description:**
Exposition by the professor of the indicated contents in the section "content", with the active participation of the students.

**Support materials:**
- Notes of the subject.
- Bibliographic references of the subject
- Notes taken in class by the expositions carried out by the professor

**Specific objectives:**
The same as indicated in the section "contents"

<table>
<thead>
<tr>
<th>Hours</th>
<th>Theory classes: 26h</th>
<th>Self study: 14h</th>
</tr>
</thead>
</table>

### RESOLUTION OF PROBLEMS AND PRACTICAL EXAMPLES

**Description:**
Exercises to be solved by the students, both in class and at home

**Support materials:**
- Notes of the course
- Formulation of the problems
- Notes taken in class from the expositions carried out by the Professor.

**Descriptions of the assignments due and their relation to the assessment:**
Resolution in class or a delivery in a maximum of 15 days from the proposed date.

**Specific objectives:**
The same as indicated in the section "contents"

<table>
<thead>
<tr>
<th>Hours</th>
<th>Laboratory classes: 3h</th>
<th>Self study: 10h</th>
</tr>
</thead>
</table>

### MONOGRAPHIC WORK

**Description:**
Development of a monographic work of a topic proposed by the Professor of the course

**Support materials:**
- Notes of the course.
- Bibliographic references of the course.

**Descriptions of the assignments due and their relation to the assessment:**
Proposed date

**Specific objectives:**
The same as indicated in the section "contents"

<table>
<thead>
<tr>
<th>Hours</th>
<th>Self study: 15h</th>
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<tbody>
<tr>
<td></td>
<td>15h</td>
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EXAMS

<table>
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<tr>
<th>Hours: 7h</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Self study: 3h</td>
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Description:
Two written exams will be carried out, one at mid-semester and the other by the end of the course, with the aim of evaluating individually the level of understanding of the specific objectives of the course and the acquired knowledge in the lectures and the activities developed in the course.

Support materials:
Formulation of the exam

Descriptions of the assignments due and their relation to the assessment:
Answer sheet of the exam.

Specific objectives:
Individual evaluation of the level of understanding and the acquired knowledge

Qualification system

Written exams: 60%
Deliveries: 20%
Monographic work: 20%

Regulations for carrying out activities

Exams: general theory part and a practical part. In the theoretical part any material will be allowed to be used. The practical part the use of a crib sheet will be allowed.
The exercises will be delivered within 15 days from the date they have been proposed.
To carry out the monographic work, different thematic options will be proposed by the tutor. It will be carried out in groups and a written report must be handed in (of no more than 25 pages and under the rules of the Department of Mechanical Engineering). Finally, the work will be defended by a 15-minute oral presentation.

Bibliography

Basic: