240223 - 240AU063 - Automotive Safety Systems

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2019
Degree: MASTER’S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2019). (Teaching unit Compulsory)
ECTS credits: 4.5  Teaching languages: Spanish

Teaching staff

Coordinator: Santos Lopez, M. Antonia De Los
Others: Ferrer Abad, Adrià
Parera Sallent, Núria

Opening hours

Timetable: Marked each course according to the timetable of the subject

Prior skills

Knowledge of vehicle dynamics and bodywork

Degree competences to which the subject contributes

Specific:
CEAU 1. (ENG) Realitzar models d’enginyeria, aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, per al disseny, simulació, optimització i control de processos i sistemes.

Generical:
CGAU11. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

Teaching methodology

• Lectures
• Guided autonomous learning
• Cooperative learning

Learning objectives of the subject

General objectives:
- Provide generic knowledge about car safety.
Specific objectives:
- Understand the basics of road accident reconstruction.
- Analyze passive security systems.
- Understand the main active security systems and development trends in the coming years.
- Know the main trends in the safety of automated vehicles
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### Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours medium group:</th>
<th></th>
<th>Hours small group:</th>
<th></th>
<th>Self study:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>112h 30m</td>
<td>27h</td>
<td>13h 30m</td>
<td>12.00%</td>
<td>72h</td>
<td>64.00%</td>
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</tbody>
</table>
# Content

## Introduction

**Learning time:** 8h  
Theory classes: 3h  
Self study: 5h

**Description:**  
General characteristics of the security systems applied to the car

**Related activities:**  
- Interactive classes and practical examples.

**Specific objectives:**  
- Know the differentiation between active and passive security systems.  
- Know the specifics in the fields of active and passive security.

## Reconstruction of accidents

**Learning time:** 16h  
Theory classes: 6h  
Self study: 10h

**Description:**  
Main techniques used in road accident reconstruction

**Related activities:**  
- Interactive classes, problem solving and practical examples.

**Specific objectives:**  
- Understand the concepts used in road accident reconstruction: the principle of energy conservation applied to a traffic accident.

## Passive security

**Learning time:** 29h  
Theory classes: 12h  
Self study: 17h

**Description:**  
- Passive security systems.  
- Shock test.  
- Pedestrian protection.

**Related activities:**  
- Interactive classes, problem solving and practical examples.

**Specific objectives:**  
- Understand the body structures and their role in passive safety.  
- Understand the main passive security systems.  
- Interpret the results obtained in the main shock tests.  
- Understand the basics of pedestrian protection.
### 16/ 5000 Active security

**Learning time:** 33h  
Theory classes: 12h  
Self study: 21h

**Description:**  
- Influence of chassis systems on active safety.  
- Application and description of advanced driving assistance systems.

**Related activities:**  
- Interactive classes, problem solving and practical examples

**Specific objectives:**  
- Analyze the influence of steering, suspension and brake systems on active safety systems.  
- Understand the main development trends in advanced driving assistance systems.

### Automated vehicle safety

**Learning time:** 26h 30m  
Theory classes: 7h 30m  
Self study: 19h

**Description:**  
- Use cases and taxonomy of the automated vehicle  
- Automated vehicle safety: challenges and benefits

**Related activities:**  
- Interactive classes, problem solving and practical examples.

**Specific objectives:**  
- Understand the main areas of application of automation technologies  
- Understand the concept of verification and validation and the challenges of these processes with the introduction of automated vehicles.

### Qualification system

NEP: mark of the Partial exam  
NEF: mark of the Final Exam  
NT: mark of the Work  
NF: Final mark

\[
NF = \text{Max} (0.2 \times \text{NEP} + 0.6 \times \text{NEF}; 0.8 \times \text{NEF}) + 0.2 \times \text{NT}
\]

The reassessment mark replaces the exam grade.  
During the spring semester of the 2019-2020 academic year, and as a result of the health crisis due to Covid19, the qualification method will be:  
\[
NF = 0.2 \times NT1 + 0.2 \times NT2 + 0.6 \times \text{NEF}
\]

### Bibliography

- Active security
- Automated vehicle safety
- Influence of chassis systems on active safety.
- Application and description of advanced driving assistance systems.
- Use cases and taxonomy of the automated vehicle
- Automated vehicle safety: challenges and benefits
- Interactive classes, problem solving and practical examples
- Analyze the influence of steering, suspension and brake systems on active safety systems.
- Understand the main development trends in advanced driving assistance systems.
- Understand the main areas of application of automation technologies
- Understand the concept of verification and validation and the challenges of these processes with the introduction of automated vehicles.