Course guide
240223 - 240AU063 - Automotive Safety Systems

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2019). (Compulsory subject).
Academic year: 2022 ECTS Credits: 4.5 Languages: Spanish

LECTURER
Coordinating lecturer: Santos Lopez, M. Antonia De Los
Others: Ferrer Abad, Adrià Nuria Pareda

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.
CEAU 3. (ENG) Explicar l'arquitectura d'un vehicle d'automoció, el seu comportament, les seves parts i els sistemes que l'integren.

TEACHING METHODOLOGY
Master classes
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
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>13.5</td>
<td>12.00</td>
</tr>
<tr>
<td>Self study</td>
<td>27.0</td>
<td>24.00</td>
</tr>
<tr>
<td>Total learning time</td>
<td>112.5 h</td>
<td></td>
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</tbody>
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CONTENTS

**Introduction**

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

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

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

**Full-or-part-time:** 8h
Theory classes: 3h
Self study: 5h

**Reconstruction of accidents**

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

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

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

**Related competencies:**
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.

**Full-or-part-time:** 16h
Theory classes: 6h
Self study: 10h
### Passive safety

**Description:**
Passive security systems.  
Shock essay.  
Pedestrian protection.

**Specific objectives:**
- Know the main passive security systems.  
- Interpret the results obtained in the main shock tests.  
- Know the basics of pedestrian protection.

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

**Related competencies:**
- CEAU 3. (ENG) Explicar l’arquitectura d’un vehicle d’automoció, el seu comportament, les seves parts i els sistemes que l’integren.  
- 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.

**Full-or-part-time:** 33h  
Theory classes: 12h  
Self study : 21h

### Automated vehicle safety

**Description:**
Automated vehicle taxonomy and use cases  
Automated Vehicle Safety: Challenges and Benefits

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

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

**Related competencies:**
- CEAU 3. (ENG) Explicar l’arquitectura d’un vehicle d’automoció, el seu comportament, les seves parts i els sistemes que l’integren.

**Full-or-part-time:** 26h 30m  
Theory classes: 7h 30m  
Self study : 19h

### GRADING SYSTEM

The evaluation system is based on three evaluation acts: partial test, final examination and presentation and defense of a work. Both the partial and final exams evaluate theoretical and practical lessons. The work evaluates the theoretical and practical contents as well as the ability to solve real problems and competences such as teamwork, written presentation and oral presentation.

The final grade calculation algorithm is: \( N_{\text{final}} = 0.2 NEP + \text{Max} \left[ 0.8 \text{NEF}; 0.6 \text{NEF} + 0.2 \text{NPP} \right] \) with:  
- NEP: work note;  
- NEF: Final Exam Note;  
- NPP: Partial test grade

The mark of the reevaluation exam will replace the grade of the final exam and the partial exam. The final grade is: \( N_{\text{final}} = 0.2 \text{NEP} + 0.8 \text{NER} \) with \( \text{NER} \): reassessment exam note.