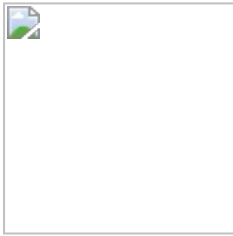


## FICHA TÉCNICA DE LA ASIGNATURA

<b>Datos de la asignatura</b>	
<b>Nombre completo</b>	Optativa Complementaria. Sistemas de retención y seguridad integrados
<b>Código</b>	DIM-M2S-519
<b>Impartido en</b>	Máster Universitario en Ingeniería Industrial + Máster en Ingeniería para la Movilidad y Seguridad [Segundo Curso] Máster Universitario en Ingeniería Industrial + Máster en Ingeniería para la Movilidad y Seguridad [Segundo Curso] Máster en Ingeniería para la Movilidad y Seguridad/Master of Engineering in Mobility and Safety [Primer Curso]
<b>Nivel</b>	Master
<b>Cuatrimestre</b>	Semestral
<b>Créditos</b>	4,5 ECTS
<b>Carácter</b>	Obligatoria
<b>Departamento / Área</b>	Departamento de Ingeniería Mecánica
<b>Responsable</b>	Francisco José López Valdés

<b>Datos del profesorado</b>	
<b>Profesor</b>	
<b>Nombre</b>	Francisco José López Valdés
<b>Departamento / Área</b>	Departamento de Ingeniería Mecánica
<b>Despacho</b>	Alberto Aguilera 25 [D-317]
<b>Correo electrónico</b>	fjlvaldes@icai.comillas.edu
<b>Profesor</b>	
<b>Nombre</b>	Bengt Pipkorn
<b>Departamento / Área</b>	Departamento de Ingeniería Mecánica
<b>Despacho</b>	Email alternativo: bengt.pipkorn@autoliv.com
<b>Correo electrónico</b>	bpipkorn@icai.comillas.edu
<b>Profesor</b>	
<b>Nombre</b>	Damien, Laurent Subit
<b>Departamento / Área</b>	Escuela Técnica Superior de Ingeniería (ICAI)
<b>Correo electrónico</b>	dlaurent@icai.comillas.edu
<b>Profesor</b>	
<b>Nombre</b>	Jaime Espinosa de los Monteros García-Frías
<b>Departamento / Área</b>	Departamento de Ingeniería Mecánica



## DATOS ESPECÍFICOS DE LA ASIGNATURA

### Contextualización de la asignatura

### Aportación al perfil profesional de la titulación

The course will review the main concepts associated to restraint systems, including the basic mechanics behind their development and current developments integrating pre-crash features.

New restraint concepts will be discussed and illustrated with examples.

### Prerequisitos

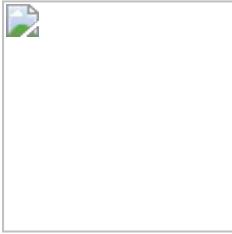
Knowledge of basic courses of materials science, strength of materials and injury biomechanics.

### Competencias - Objetivos

## BLOQUES TEMÁTICOS Y CONTENIDOS

### Contenidos – Bloques Temáticos

1. Definition of active and passive safety. Integrated safety.
  - Haddon/Safe Systems approach to injury prevention
  - Injury prevention effectiveness of seat belts and airbags
  - Relationship to autonomous/automated vehicles
2. Desirable kinematics of the adult occupant attending to its biomechanical characteristics
  - Horsch, Adomeit papers
3. Seat belt and airbags: introduction, types, components, regulation, desired performance.
  - Front seat vs. Rear seat
  - Standards and regulation (ECE-R16)
  - Types of airbags: passenger/occupant, curtain, knee, ...
4. The THOR dummy and the Hybrid III
  - Chest instrumentation
  - Associated injury criteria related to restraint systems performance
5. Application of human body models to the development of restraint systems



- THUMS and other human body models
  - Challenges in the use of human body models in the design of restraint systems
6. Advanced restraint systems and pre-crash activation
- Combined activation of restraint and pre-crash systems
  - The use of human body models in the development and optimization of restraint systems.
7. Influence of occupant position and characteristics in restraint performance
- Out of position
  - Optimization of position of anchoring systems
  - Challenges in protecting extreme size/age occupants
8. Child restraint systems and the particularities of pediatric passengers
9. Other passive safety systems: helmets, infrastructure

## **METODOLOGÍA DOCENTE**

### **Aspectos metodológicos generales de la asignatura**

#### **69% In-person class teaching**

Seminars discussing the content of the course

Article reviews

#### **11% Testing lab**

#### **20% Computational lab (Ls-Dyna)**

## **EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN**

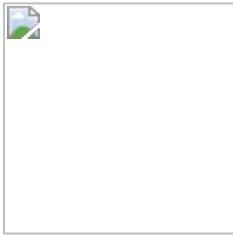
Standard evaluation at the end of the term:

- 15% class quizzes
- 25% lab project
- 10% simulation homework
- 20% simulation final project
- 30% paper critique/exam

Attendance to a minimum of 85% of the classes will be required to be graded in January.

Additional evaluation during July (Retake):

- 25% lab project
- 35% simulation study



## GUÍA DOCENTE 2020 - 2021

- 40% paper critique

### BIBLIOGRAFÍA Y RECURSOS

#### Bibliografía Básica

Yoganandan N, Nahum AM, Melvin JW, Accidental Injury. Biomechanics and Prevention. 3rd edition. Springer, 2015.

Arregui C, Luzón J, López-Valdés FJ, Del Pozo de Dios E, Seguí-Gómez M, Fundamentos de Biomecánica en las Lesiones por Accidente de Tráfico 2ª edición, ETRASA Madrid, 2010 ISBN: 978-84-92625-40-6