

## 30150 - Ballistics

### Información del Plan Docente

<b>Academic Year</b>	2016/17
<b>Academic center</b>	179 - Centro Universitario de la Defensa - Zaragoza
<b>Degree</b>	563 - Bachelor's Degree in Industrial Organisational Engineering 457 - Bachelor's Degree in Industrial Organisational Engineering
<b>ECTS</b>	6.0
<b>Course</b>	4
<b>Period</b>	First semester
<b>Subject Type</b>	Optional
<b>Module</b>	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

There are two kind of activities in the course. The class activities are:

- Lectures
- Problem solving classes
- Computer lab sessions
- Essay presentations

Homework:

- Group activities and essays
- Practical assesments
- Self-study

Key dates (exams and deadlines) will be announced by the teacher in class and in the moodle platform.

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

#### 3. Context and competences

##### 3.1. Goals

##### 3.2. Context and meaning of the subject in the degree

##### 3.3. Competences

##### 3.4. Importance of learning outcomes

## **4.Evaluation**

## **5.Activities and resources**

### **5.1.General methodological presentation**

The learning process designed for course is based on the following items:

- Lectures
- Theoretical essays and practical assessments, complemented by real experiments
- Computer lab sessions where students should show their knowledge of the theoretical bases of the course
- Active learning: solving problems and studying topics posed by the teacher

### **5.2.Learning activities**

The learning activities are detailed in the section 1.2

### **5.3.Program**

Interior Ballistic

1. Interior ballistic elements.
2. Fuzes, bombs and multipliers.
3. Interior ballistic in ordnance.

Exterior Ballistic

1. Vacuum ballistic.
2. Projectile equation in atmosphere.
3. Aerodynamic drag.
4. Point mass model and point mass modified model.
5. Ballistics corrections.
6. Rigid body model.
7. Dispersion Measures.
8. Initial velocities.
9. Shooting table.

Terminal Ballistic

1. HE projectile effects
2. AP projectile effects
3. Special projectile effects
4. Nato Indirect Fire Appreciation Kernel

### **5.4.Planning and scheduling**

The schedule of lectures and assessment tasks and essays submission deadlines will be announced by the professor in class and on the moodle platform.

### **5.5.Bibliography and recommended resources**

- ACART- MT-074. Balística interior, municiones, explosivos y normativa. Tomo I
- Fundamentos técnicos del tiro de Artillería M-3-3-6
- Cucharero, F. Balística exterior. Ministerio de Defensa, Madrid, 1992
- ACART- MT-074. Balística interior, municiones, explosivos y normativa. Tomo II
- ACART-FM-002. Bocas de fuego
- ACART-VA-046
- Manual Técnico MT7-311
- Proceedings of the 27th International Symposium on Ballistics. Freiburg, Germany, 2013
- [Proceedings of the 23rd International Symposium on Ballistics](#) . Tarragona, Spain, 2007
- McCoy, Robert. Modern exterior ballistics: The launch and flight dynamics of symmetric projectiles / Robert McCoy.

## **30150 - Ballistics**

Atglen, Pennsylvania : Schiffer Publishing, 1999