

## 29753 - Industrial building

### Información del Plan Docente

<b>Academic Year</b>	2017/18
<b>Faculty / School</b>	110 - Escuela de Ingeniería y Arquitectura
<b>Degree</b>	434 - Bachelor's Degree in Mechanical Engineering
<b>ECTS</b>	6.0
<b>Year</b>	4
<b>Semester</b>	First semester
<b>Subject Type</b>	Optional
<b>Module</b>	---

### **1.General information**

#### **1.1.Introduction**

In the course, students learn the main features of industrial buildings, as well as the requirements considered for its design and construction to meet their manufacturing needs. The most important regulatory aspects will be developed, highlighting those related with the industrial layout, distribution on the plot and the business requirements.

The principles of the structural types commonly used in industrial buildings are also presented, along with its main operating conditions and design criteria.

Finally, some of the main construction technologies for industrial buildings are presented, as well as the properties and applications of materials used in these buildings.

#### **1.2.Recommendations to take this course**

This subject has no prerequisites.

#### **1.3.Context and importance of this course in the degree**

Within the optional module Design and Calculation of Structures, the subject of Industrial Buildings has 6 ECTS, representing one of the five possible subjects to be taken. Simultaneously, this course is also offered in the Engineering of Industrial Technologies degree, which favors the coexistence of different and complementary approaches for the resolution of the technical problems suggested, thus enriching the learning of the students of both degrees.

#### **1.4.Activities and key dates**

Practical works related to the practical sessions and the proposed works will be requested, thus developing the portfolio of the course. These works will be made after completion of each subject of the course. The portfolio assessment shall constitute the final mark of the subject (for the progressive assessment mode).

The student must check the dates for conducting practices and presentation of works. It shall be informed of these dates at the beginning of the course and by the *Anillo Digital Docente* application.

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The exams (for a non-progressive assessment of the subject), will be held on the dates established by the EINA.

### **2.Learning goals**

#### **2.1.Learning goals**

1. Knowledge of the construction technology principles and its regulatory codes.
2. Ability to identify materials and elements used in the prefabricated industrial buildings, its properties and applications.
3. Knowledge and understanding of the operation principles of different structures, their adaptation to industrial buildings, and its functional implementation for the business needs.
4. Knowledge of the criteria for selecting an industrial plot and for the arrangement on it, depending on the manufacturing and organizational requirements.
5. Knowledge and ability to design structures and industrial constructions.
6. Knowledge applied to the health and safety in construction and to the risk prevention due to fire on the industrial building.

#### **2.2.Importance of learning goals**

Within the practice of mechanical engineers, the industrial building sector has a significant influence. Therefore, it is necessary to provide students with general knowledge linked to industrial buildings, enabling the proper performance of their duties.

For this purpose, this course presents a compendium of contents that address from the knowledge and operation of the main technologies and structural types used in the construction of industrial buildings, to the study of the regulations and layout procedures for the manufacturing implementation.

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

The aim of the course is to learn general aspects of the industrial construction, its construction technology, its typological and constructive implementation, and the layout of facilities related to the manufacturing process within the building and the industrial plot.

To this end, it is analysed the historical evolution of industrial architecture, along with the development of the manufacturing processes, materials, and technologies available for construction. In turn, the main types of industrial activities are described, as well as the characteristics of its industrial buildings and auxiliary spaces.

The analyses of the business needs, the most important regulations for the plant layout, and the distribution of industrial plot, are also part of the themes. The course finishes with the presentation of various structural types of industrial buildings, analyzing its design and operating principles, the building materials used, and the major construction technologies.

### 3.2.Competences

### 4.Assessment (1st and 2nd call)

#### 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student will be assessed through a **progressive assessment mode** consisting of:

- Development and defense of a continuous work with portfolio format along the course. The work scope will range from the layout of an industrial business (considering the normative regulations for fire protection) to the selection of structural types and materials for its construction, by using the theoretical and practical contents of the subject.

- The critical and active participation in the class development and autonomous resolution of practical work related to the contents covered.

The final grade of the progressive assessment mode will be:

- Continuous work on the portfolio: 7 points

- Autonomous work: 3 points

#### **Non-progressive assessment mode:**

Students who choose not to perform the progressive assessment mode will be evaluated by a single global exam at the end of the course (a theoretical and practical test) to be performed on the date established by the academic calendar of the EINA.

### 5.Methodology, learning tasks, syllabus and resources

#### 5.1.Methodological overview

The course methodology tries to strengthen the continuous work of the student and focuses on the most fundamental design aspects of industrial buildings. For this purpose various teaching methodologies were developed:

- Theoretical knowledge through participatory lecture, given to the entire group in the weekly teaching hours allocated.

- Knowledge application by means of practical classes coordinated with the theoretical advance of the course and supervised by teachers of the subject. These sessions take place in smaller groups to enhance student learning, and develop various technical case studies.

- After each practice session, a practical work will be required. This practical work will become part of the student portfolio.

- The tutorials will serve to review both the acquisition of theoretical knowledge by the student and his practical work.

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To follow the theoretical and practical sessions, the students will have the teaching materials developed by the teachers of the subject.

### 5.2.Learning tasks

1. Description of industrial architecture and its historical evolution.
2. Description of the main characteristics of various types of industrial buildings and their auxiliary spaces in relation to the type of manufacturing.
3. Development of plant layouts based on need programs. Description of fire protection regulations to be considered in industrial buildings.
4. Description, requirements and operation conditions of structural types for industrial buildings and their adaptation to the manufacturing process.
5. Description of the selection criteria and main characteristics and properties associated with materials used for the construction of industrial buildings.
6. Introduction to the most representative construction technologies used in industrial buildings.

### 5.3.Syllabus

1. Description of industrial architecture and its historical evolution.
2. Description of the main characteristics of various types of industrial buildings and their auxiliary spaces in relation to the type of manufacturing.
3. Development of plant layouts based on need programs. Description of fire protection regulations to be considered in industrial buildings.
4. Description, requirements and operation conditions of structural types for industrial buildings and their adaptation to the manufacturing process.
5. Description of the selection criteria and main characteristics and properties associated with materials used for the construction of industrial buildings.
6. Introduction to the most representative construction technologies used in industrial buildings.

### 5.4.Course planning and calendar

The theoretical teaching of the subject will be developed through lectures. The theoretical teaching will be complemented by laboratory classroom practices (distributed along the course according to schedule established by the EINA) and tutored autonomous works. All these activities will be supported through the Moodle application, by using the *Anillo Digital Docente* of the University of Zaragoza.

The dates set for the practice classes and work presentations will be communicated to students at the beginning of the course, and by the Moodle application of the subject, considering the academic calendar for each course center. The non-progressive assessment exam will be held on the date indicated in the academic calendar of the EINA.

### 5.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Additional Bibliography]

- [BB] Addis, William. Building : 3000 years of design engineering and construction / Bill Addis London ; New York :

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- [BB] Chudley, Roy. Manual de construcción de edificios / Roy Chudley, Roger Greeno ; [versión castellana, Carlos Sáenz de Valicourt] . - 3ª ed. rev. y amp. Barcelona : GC, D.L. 2013
- [BB] Cuadernos de ingeniería de proyectos I : diseño básico (anteproyecto) de plantas industriales / Eliseo Gómez-Senent Martínez...[et al.] Valencia : Universidad Politécnica, Servicio de Publicaciones, D.L.1997
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- [BB] Heredia, Rafael de. Arquitectura y urbanismo industrial : diseño y construcción de plantas, edificios y polígonos industriales / Rafael de Heredia. - Madrid :[Universidad Politécnica de Madrid], Sección de Publicaciones,D.L. 1981
- [BB] Martín Rodríguez, Ángel. Tipología estructural en arquitectura industrial / por Ángel Martín Rodríguez, Francisco Suárez Domínguez, Juan José del Coz Díaz . - 1ª ed. Madrid : Bellisco, 2005
- [BB] Morales Palomino, Sisenando Carlos . Diseño de plantas industriales / Sisenando Carlos Morales Palomino Uned, 2011
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- [BB] Schmitt, Heinrich. Tratado de construcción / Heinrich Schmitt, Andreas Heene. - 8ª ed., rev. y amp. Barcelona : Gustavo Gili, D.L. 2009
- [BC] Gago, J. Ordenación de Áreas Industriales / Gago, J.; García, J.M. Junta de Castilla y León, 1993.