Course guide

**210747 - IEALM - Innovation in Mixed and Laminated Steel Structures**

**Unit in charge:** Barcelona School of Architecture

**Teaching unit:** 753 - TA - Department of Architectural Technology.

**Degree:** MASTER’S DEGREE IN ADVANCED STUDIES IN ARCHITECTURE-BARCELONA (Syllabus 2015). (Optional subject).

**Academic year:** 2022  
**ECTS Credits:** 5.0  
**Languages:** Spanish, English

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**LECTURER**

**Coordinating lecturer:** ALBERT ALBAREDA VALLS

**Others:**  
Segon quadrimestre:  
ALBERT ALBAREDA VALLS - ITA2  
CARLOS MUÑOZ BLANC - ITA2

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**TEACHING METHODOLOGY**

Lectures  
Own work  
Case studies  
Tutories

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**LEARNING OBJECTIVES OF THE SUBJECT**

The general objectives of the course are:

- To introduce and explain how steel behaves as a structural material for buildings.  
- To introduce and explain how composite structures work as an improved structural typology  
- To explain how to analyze these structural typologies by using specific software  
- To explain how important is to know the behaviour of these structures in order to design  
- To implement structures in the architectural design process from the first instant.

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**STUDY LOAD**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
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**Total learning time:** 125 h

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**CONTENTS**

**DESIGN OF STRUCTURES IN STEEL AND COMPOSITE**

**Description:**  
1. Steel and derived products
Presentation and historical review
Steel materials and laminated steel
Physical and mechanical properties of steel
Products
Types of steel and values of the yield limit according to Standards
Normalized profiles, plates, bolts and others.
2. Design of structures and principles of analysis
Design of light structures
Models of structural behavior: bars and joints
Methodologies of analysis depending on sections
Global stability
3. Structural Elements: tension and torsion
4. Structural Elements: Compression
Columns in buildings
5. Structural Elements: Bending
Conformed beams, Boyd beams, and others.
Trusses and large span roofs.
Design of large span buildings
6. Definition of composite structure
Features of the materials
Connection. Study of the phenomenon in terms of bar and section
7. Composite columns
Applications
Variations and typologies depending on mechanical behavior and durability
Special situations for design
8. Composite beams
Applications
Special situations of design
Composite slabs
Versatility of composite structures in the construction process.
9. Joints
Types of joints: welding, bolts, etc. Relationship between design and structural behavior.
Base plates
Welded joints
Bolted joints

**Specific objectives:**
To give the basic and theoretical concepts and practical applications to design and analyze steel and composite structures of buildings, and to put in practice by designing a specific light-span roof.
The course is oriented to present the possibilities of using steel as a structural material, by explaining the theory and practical questions.
The first part of the course is focused on the material, manufactured elements, typologies and types of sections, as well as theoretical basis to proceed an analysis and determine the validity in terms of strength and deformation.
The second part of the course is focused on the analysis of different elements of a steel structure: columns, beams, etc., by studying the internal forces that are acting at the same time.
The third part of the course is based on the study of composite structures of buildings, by explaining a theoretical base as well as all of the specific elements that constitute a composite structure.
All these objectives will be achieved by developing a practical real exercise which will force the student to design a light steel or composite structure, according to European Standards.
The basic competences of the course are:
1. To know how steel and composite structures work
2. To know how to analyze these structures in order to design.
3. To know how to use specific software to analyze these structures.

**Full-or-part-time:** 125h
Theory classes: 15h
Laboratory classes: 30h
Self study: 80h
BIBLIOGRAPHY

Basic:

Complementary: