210747 - IEALM - Innovation in Mixed and Laminated Steel Structures

Coordinating unit: 210 - ETSAB - Barcelona School of Architecture
Teaching unit: 753 - TA - Department of Architectural Technology
Academic year: 2018
Degree: MASTER'S DEGREE IN ADVANCED STUDIES IN ARCHITECTURE-BARCELONA (Syllabus 2015). (Teaching unit Optional)
MASTER'S DEGREE IN ARCHITECTURAL TECHNOLOGY (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 5  Teaching languages: Spanish, English

Teaching staff
Coordinator: ALBERT ALBAREDA VALLS
Others: Segon quadrimestre:
ALBERT ALBAREDA VALLS - ITA2

Teaching methodology
Lectures
Own work
Case studies
Tutories

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 a 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.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>15h</th>
<th>12.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>30h</td>
<td>24.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>80h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
### 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:**

**Learning time:** 125h
- Theory classes: 15h
- Laboratory classes: 30h
- Self study: 80h
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.

**Qualification system**

Go to Spanish or Catalan version.

**Bibliography**

**Basic:**

**Complementary:**