

Course guide 210747 - IEALM - Innovation in Mixed and Laminated Steel Structures

Last modified: 15/07/2024

Teaching unit:	753 - TA - Department of Architectural Technology.	
Degree:	MASTER'S DEGREE IN ADVANCED STUDIES IN ARCHITECTURE-BARCELONA (Syllabus 2015). (Optional subject).	
Academic year: 2024	ECTS Credits: 5.0	Languages: Spanish, English

LECTORER	
Coordinating lecturer:	ALBERT ALBAREDA VALLS
Others:	Segon quadrimestre: ALBERT ALBAREDA VALLS - ITA2

TEACHING METHODOLOGY

Lectures Own work Case studies Tutories

LECTUDED

Unit in charge:

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.

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-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 thses structures in order to design

-To implement structures in the architectural design process from the first instant.

STUDY LOAD

Туре	Hours	Percentage
Hours large group	37,5	30.00
Self study	87,5	70.00

Total learning time: 125 h



CONTENTS

DESIGN OF STRUCTURES IN STEEL AND COMPOSITE
Description:
1. Steel and derived products
Presentation and historical revew
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 Turce of isiste a welding, helte, etc. Deletionship between design and structured behavior.
Types of joints : weiding, boits, etc. Relationship between design and structural behavior.
Dase piales Wolded joints
Welded joints
bolled 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 developping 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

GRADING SYSTEM

Go to Spanish or Catalan version.

BIBLIOGRAPHY

Basic:

- Argüelles, R. La estructura metálica hoy. 2ª ed. Madrid: Bellisco, 1975-1993. ISBN 8460056724.
- Martínez, J. Estructuras mixtas: teoría y práctica. Madrid: Instituto Eduardo Torroja de la Construcción y del Cemento, 1966.
- Timoshenko, S. Resistencia de materiales. 15ª ed. Madrid: Espasa-Calpe, 1984. ISBN 8423963152.

- Buxadé, C. Margarit, J.. Cálculo de estructuras metálicas [on line]. Barcelona: Escuela Técnica Superior de Arquitectura de Barcelona, 1980 [Consultation: 11/05/2020]. Available on: <u>http://hdl.handle.net/2117/90676</u>.

- Eurocódigo 3: proyecto de estructuras de acero. Madrid: AENOR, 1996.
- Eurocódigo 4: proyecto de estructuras mixtas de hormigón y acero. Madrid: AENOR, 1996.

Complementary:

- Cudós, V. Cálculo de estructuras de acero. Madrid: Blume, 1978. ISBN 8472141284.

- Buxadé, C.; Margarit, J. Cálculo de estructuras con pórticos y pantallas [on line]. Barcelona: Blume, 1977 [Consultation:

14/10/2022]. Available on: https://discovery.upc.edu/permalink/34CSUC_UPC/rdgucl/alma991000469389706711.

- Obiol, A. Diseño y cálculo plástico de estructuras porticadas espaciales de perfiles metálicos. Barcelona: Escola Tècnica Superior d'Arquitectura de Barcelona, 1977.

- Torroja, E. Razón y ser de los tipos estructurales. 3ª ed. rev. Madrid: Consejo Superior de Investigaciones Científicas, 2007.