Course guide
310425 - 310425 - Timber Construction in the 21st Century

Unit in charge: Barcelona School of Building Construction
Teaching unit: 753 - TA - Department of Architectural Technology.

Degree: MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Optional subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: EDGAR SEGUÉS AGUASCA

Others: Haurie Ibarra, Laia
Blasco Miguel, Jorge
Giraldo Forero, Maria Del Pilar
Hormias Laperal, Emilio

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE1. Capacity of innovation: identify the reasons and the mechanisms of the technologic and technical changes.
CE9. Make a model of structures of buildings and evaluate the load they can support.
CE12. Define the characteristics of the sismic action and apply the present regulations to the sismic calculation of structures in building construction.

Generical:
CG4. Develop and/or apply ideas with originality in a context of investigation, identifying and formulating hypothesis or innovative ideas and submit them to a objectivity, coherence, and viability test.
CG5. Analyse, evaluate and synthesise critically, new and difficult ideas of promotion, in academic and professional contexts, scientific advances, technologic, socials or culturals in the society of knowledge.

Transversal:
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Basic:
CB6. Possess and understand knowledge which provide a basis or opportunity to be original in the development and/or application of ideas, usually in a context of research.
CB9. The students must be able to comunicate their conclusions and the knowledges and ultimate reasons which support to specialised and non-specialised audiences in a clear mode and without ambiguities.

TEACHING METHODOLOGY

The course will be based on theory classes, problem classes, practices in the materials laboratory and in the fire laboratory, and basic calculation exercises for structures and individual and team work.
LEARNING OBJECTIVES OF THE SUBJECT

In this subject individual and group work will be promoted. The face-to-face classes will be distributed as follows:
- Theoretical classes in which the teacher will present the contents of the subject and present practical cases to motivate the students.
- Laboratory practices.
- Exercises for calculating wooden structures.
- Guided activities (mainly conferences and technical visits to wooden buildings under construction or already finished, Passive House, etc.)

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>72.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>5,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>5,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>10,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>12.00</td>
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</tbody>
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Total learning time: 125 h

CONTENTS

The wood in construction throughout history. China, Japan, Nordic Countries, Southern Europe, etc.

Description:
This section will study the evolution of wood construction techniques, unique buildings. Chinese and Japanese pagodas and temples, Nordic churches, wooden Roman bridges and other buildings that stood out for the evolution of their technology and knowledge of the material.

Full-or-part-time: 4h 30m
Theory classes: 2h
Self study: 2h 30m

Wood as a construction material. Solid wood, structural sawn wood and processed wood products (Engineered wood)

Description:
Study of the characteristics and properties of wood. Brief introduction to solid wood as a construction material to make way for the evolution of transformed wood products for construction that have allowed wood to evolve into the products used today: Plywood, Laminated veneer lumber (LVL), laminated wood, Cross laminated timber (CLT), etc.

Full-or-part-time: 4h 30m
Theory classes: 2h
Self study: 2h 30m
Wood decay. Retrofit techniques and treatments in existing buildings.

Description:
In this part of the subject we will study the wood decay types. Then we will analyze retrofiting techniques and treatment methods to be applied in existing buildings.

Specific objectives:
To Know the decay wood types.
Get knowledges about retrofit and refurbishment techniques in existing buildings.
know treatments to apply in products to protect it.

Related activities:
Lecture 3

Full-or-part-time: 3h
Theory classes: 2h
Self study: 1h

Introduction to the calculation of structures.

Description:
In these classes the student will be introduced to the calculation of wooden structures and their peculiarities. Some structure calculation program will be used.

Related activities:
In this section, theoretical classes will be held to learn or refresh the knowledge of calculating structures. Some computing application will be used.
Individual work and team work will be carried out.

Full-or-part-time: 9h 50m
Theory classes: 2h
Practical classes: 1h
Guided activities: 1h
Self study: 5h 50m

Connections and construction systems

Description:
We will study the connections systems in the field of timber construction, how they work and structural analyzing methods. Also we will see the existing timber construction systems in the world.

Full-or-part-time: 3h
Theory classes: 2h
Self study: 1h
State of the art of wood construction in the world in 2020

Description:
Current state of wood construction in the world. Technically more advanced buildings due to their difficulty or dimensions in the world to this day.
The Mjøsa tower (Mjøstårnet) in Norway 85.4 meters high, Brock Commons Tower in Vancouver 53 meters, The treet in Bergen, Norway, 49 meters and in Spain The borda in Barcelona PB + 6 the highest wooden when it was built, or the promotion of 65 homes in Hondarribia, the largest timber development in southern Europe at the time of its construction, 2019.

Full-or-part-time: 7h 20m
Theory classes: 3h
Guided activities: 1h
Self study: 3h 20m

Construction typologies used in the most advanced wooden buildings in the world.

Description:
In this class, the constructive typologies that have allowed the construction of the buildings studied in the previous chapter will be studied.
Pannel Syetems Puukuokka Houssing Block, Jyväskylä, Finland
Frame systems: Wood Innovation and Design Center, Prince George, Canada
Hybrid Systems LCT ONE Voralberg, Dornbirn, Austria

Full-or-part-time: 6h 40m
Theory classes: 2h
Guided activities: 1h
Self study: 3h 40m

Wood and fire, advantages and limitations

Description:
In this section we will study the behavior of wood against fire. The predictability of its behavior, The limitations of typologies and heights due to its combustibility.
Knowledge of the behavior of tall buildings in the event of fires.
Treatments and protections that can be made to wood to make it safer in case of fire
Related regulations.

Related activities:
Theoretical classes.
Simulation exercise classes.
Tests in the EPSEB fire laboratory

Full-or-part-time: 12h
Theory classes: 2h
Practical classes: 1h
Laboratory classes: 2h
Self study: 7h
Wooden buildings and their behavior against earthquakes

Description:
This section will study the behavior of wooden structures in the face of the earthquake. The advantages and disadvantages of wooden buildings and techniques to improve their behavior.

Full-or-part-time: 9h
Theory classes: 2h
Practical classes: 2h
Self study: 5h

ACTIVITIES

Laboratory practice to perform mechanical tests on various wooden elements

Full-or-part-time: 2h
Laboratory classes: 2h

Fire laboratory practices to understand the behavior of wood and ways to improve it in case of fire.

Full-or-part-time: 2h
Laboratory classes: 2h

GRADING SYSTEM

Team work 35%, exercises and laboratory 30%, exam 35%

BIBLIOGRAPHY

Basic: