

# Course guide 480602 - ETCE - Construction and Building Construction Engineering and Technologies

		Last modified: 30/06/2023	
Unit in charge:	Barcelona School of Civil Engineering	g	
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering.		
Degree:	MASTER'S DEGREE IN TECHNOLOGY FOR HUMAN DEVELOPMENT AND COOPERATION (Syllabus 2012). (Optional subject). MASTER'S DEGREE IN SUSTAINABILITY SCIENCE AND TECHNOLOGY (Syllabus 2013). (Optional subject).		
Academic year: 2023	ECTS Credits: 5.0 Languag	<b>jes:</b> English	
LECTURER			
Coordinating lecturer:	MIREN ETXEBERRIA LARRAÑAGA		

Others:	Primer quadrimestre:
	JESÚS MIGUEL BAIRÁN GARCÍA - 10Q1
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# **DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

## Specific:

1. The ability to apply the most suitable technologies that are available in the spheres of water; energy; habitat; infrastructure; ICTs; agriculture, livestock and forestry production; and environmental conservation to development cooperation.



# **TEACHING METHODOLOGY**

The following teaching methods will be used in the development of the course:

Lecture or conference (EXP): Sharing knowledge through professors' or external guest speakers' lectures.

Problem-solving and case studies (RP): group decision exercises, debates and group dynamics with the teacher and students in the classroom; class presentation of an activity carried out individually or in small groups.

Tutorials of practical or theoretical works (TD): to perform an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the teacher's advice.

Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, a homework assignment of reduced complexity or scope, applying knowledge and presenting results.

Extensive project (PA): learning based on the design, planning and realisation in groups of a complex or extensive project or piece of work, applying and extending knowledge and writing a report on this approach and the results and conclusions.

Training activities:

The following training activities will be used in the development of the course:

## Face-to-face

Theoretical classes and conferences (CTC): knowledge, understanding and synthesis of contents presented by the lecturer (professor) or guest speakers.

Practical classes (CP): participation in group exercises, as well as discussions and group dynamics, with the teacher and other students in the classroom.

Presentations (PS): class presentations of an activity carried out individually or in small groups.

Theoretical/practical work tutorials (TD): carry out in the class an activity or exercise, theoretical or practical, individually or in small groups, with the professor's advice.

## Remote

Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, a homework assignment of reduced complexity or scope, applying knowledge and presenting results.

Carry out an extensive project or piece of work (PA): design, plan and conduct, individually or in groups, a complex or extensive project or part of work, applying and extending knowledge and writing a report on this approach and the results and conclusions. Autonomous study (EA): study or development of the subject individually or in groups, understanding, assimilating, analysing and synthesising knowledge.



# LEARNING OBJECTIVES OF THE SUBJECT

To understand the role of construction in development programs, its transversal implications and the impact of technology within a social, local and global context.

To know, understand and be able to apply the specific construction technologies acquired in the context of development and international cooperatives.

To have the necessary analytical ability analysis and knowledge to carry out an infrastructure Project in the context of cooperation for development on a local scale.

To know the production processes and basic properties of low-cost construction materials.

To know the employment of construction and demolition waste as well as industrial by-products for the production of sustainable construction materials.

To know alternative products and technologies in order to build low-cost housing, as well as to understand the essential characteristics of the most used construction materials

To be able to detect the most important aspects related to the quality and durability of buildings and infrastructures, bind to permanent, semipermanent and temporary constructions.

Know the effects of seismic actions on buildings and their behaviour. Know some methodologies for the improvement of the resistant system. Examples of earth construction buildings

## **STUDY LOAD**

Туре	Hours	Percentage
Hours large group	24,0	19.20
Self study	80,0	64.00
Hours medium group	12,0	9.60
Hours small group	9,0	7.20

Total learning time: 125 h

# CONTENTS

#### **1. Introduction. The construction activity on developing countries**

#### **Description:**

Construction in development programs. Analysis of construction involvement in economic development. Housing construction policies in urban and rural areas.

## **Related activities:**

Activity 1: Life cycle of a semi-permanent building planned for 5 years

**Full-or-part-time:** 3h Theory classes: 2h Practical classes: 1h



#### 2. Projects and construction processes

#### **Description:**

Define the parts of a construction project. The implementation of the logical framework will be defined in construction projects. A talk given by an external professional on construction works direction/managment in a developing country.

## **Related activities:**

Activity 2: Analysis of the composition of Construction Projects

**Full-or-part-time:** 3h Theory classes: 2h Guided activities: 1h

#### 3. Sustanaible and low cost technologies

## **Description:**

Description of alternative products and technologies to build social housing. They can be characterized by: low consumption of energy and materials in the production process, use of local or national resources, allow self-construction, decentralization of production, etc. An expert in the subject will impart a conference.

## **Related activities:**

Activity 3: reading and presentation of a scientific paper.

**Full-or-part-time:** 3h Theory classes: 2h Practical classes: 1h

#### 4. Construction Materials

#### **Description:**

Construction materials used in developing countries are described: stone, wood, bamboo, cementitious materials (mortar, concrete, ferrocement), earth (rammed and blocks), and ceramic. A specialist in earth construction and bamboo will give a talk.

#### **Related activities:**

Activity 4: Analysis of a construction material and two case studies

**Full-or-part-time:** 5h 30m Theory classes: 3h Practical classes: 2h 30m

## 5. Eco-materials (recycling)

#### **Description:**

The use of recycled aggregates and industrial by-products in the manufacture of new sustainable materials will be described.

#### **Related activities:**

Activity 5: Visit the recycling plant. Use of recycled aggregates. Laboratory work Activity 6: Use of industrial by-products in the manufacture of new materials

**Full-or-part-time:** 4h 30m Theory classes: 2h Laboratory classes: 1h 30m Guided activities: 1h



#### 6. Design criteria and specifications in buildings and small infraestructures. Permanent constructions

#### **Description:**

The conditions and parameters to design, build and maintain durable housing, health facilities, educational facilities, and productive facilities shall be described.

**Full-or-part-time:** 4h Theory classes: 2h

Practical classes: 2h

## 7. Earthquake-resistant buildings. Buildings and infraestructure

#### **Description:**

Basic knowledge of the earthquake actions and characterization of the seismic loads. Types of seismic risks in terms as function of site and mitigation. Effects of earthquakes on buildings and infrastructures and structural behavior. Basis of earthquake resistance design of buildings and structural arrangements. Earthquake resistance systems for low cost housings and use of alternative materials.

#### Related activities:

Activity 7: Design of seismic resistant constructions.

**Full-or-part-time:** 5h Theory classes: 3h Practical classes: 2h

## ACTIVITIES

## A1. LIFE CYCLE ANALYSIS OF A SEMI-PERMANENT CONSTRUCTION BUILT FOR FIVE YEARS

#### **Description:**

It is proposed to build a temporary house using different materials. A life cycle assessment of construction will be carried out (simply) according to adequate technologies and materials.

Full-or-part-time: 1h

Theory classes: 1h

## A2. ANALYSIS OF THE COMPOSITION OF CONSTRUCTION PROJECTS

## **Description:**

Several construction projects will be facilitated, and the composition of the project will be discussed: report, plans and budget. The following points will be analyzed:

- If the project has all the documents required.

- if the project's report is well described and has all necessary annexes. Some essential annexes are the logical framework analysis, environmental impact and health and safety document, etc. If the project's report is considered incomplete, its minimum requirements must be defined and described, and the report must be finished.

- if the specification sheet is oriented to that country.

- According to these plans, check for details.

Students will select and research for themselves a construction project carried out in a developing country and evaluate if it is completed or not.

## Full-or-part-time: 2h

Theory classes: 2h



## **A3. READING AND PRESENTATION OF A SCIENTIFIC PAPER**

#### **Description:**

A scientific paper published in an international journal will be proposed to be read and analysed. The paper will be based on the policy of self-construction, housing needs, etc. The students must do a presentation of approx. 15 minutes based on the paper. It is recommended to develop a presentation based on the same order as the paper: a) introduction; b) results; c) discussion, and d) conclusion. And finally, a personal analysis must be required.

#### **Delivery:**

A class presentation will be conducted and a brief document was handed to the staff analysis and critique that speaks or raises in the article.

#### Full-or-part-time: 2h

Theory classes: 2h

## A4. ANALYSIS OF A CONSTRUCTION MATERIAL AND TWO CASE STUDIES

#### **Description:**

Choose a construction material applicable to developing countries and define its most important properties with respect to physical, chemical and mechanical properties. Describe two real cases in which this construction material has been used.

## Full-or-part-time: 2h

Theory classes: 2h

#### A5: Visit recycling plant. Work laboratory

## **Description:**

On the one hand, an existing recycling plant in Barcelona will be visited, and the recycled material produced will be analyzed. On the other hand, we will visit The structural and materials laboratory of the Department of Civil and Environmental Engineering works to see different research work that is developing.

## Full-or-part-time: 2h

Theory classes: 2h

## A6. READING AND PRESENTATION OF A SCIENTIFIC PAPER OR TECHNICAL REPORT

## **Description:**

A scientific paper published in an international journal will be proposed to be read and analysed. The paper will be based on the applicability of different types of industrial by-products applied to construction materials. The students must do a presentation of approx. 15 minutes based on the paper.

It is recommended to develop a presentation based on the same order as the paper: a) introduction; b) results; c) discussion, and d) conclusion. And finally, a personal analysis must be required.

Delivery: Individual work.

#### Full-or-part-time: 2h Theory classes: 2h

## A7: Design of seismic resistant constructions.

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



## **A8. CONTROL WRITTEN TEST OF KNOWLEDGE**

Full-or-part-time: 1h Theory classes: 1h

## **GRADING SYSTEM**

Each activity is worth between 0.75 and 1.75, reaching 9 points. In addition, assistance is worth 1 point. At least 80% of the activities must be delivered.

## **EXAMINATION RULES.**

At least 80% of the activity should be done and delivered. In addition, attendance at all seminars is mandatory to be evaluated the subject.

## BIBLIOGRAPHY

#### **Basic:**

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#### RESOURCES

## **Other resources:**

Further bibliography:

Each theme and chapter will have its supplementary material. They will be published on the digital campus.