# CONSTRUCTION SYSTEMS AND APPLICATIONS 3

**Bachelor in Architectural Studies BAS SEP-2023 CS3-AS.3.S.A**

Area Architecture and Design

Number of sessions: 30

Academic year: 23-24

Degree course: THIRD

Number of credits: 6.0

Semester: 2º

Category: COMPULSORY

Language: English

Professor: **NOA GONZÁLEZ**

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Noa González is an architect and building engineer. She has worked in both new and existing buildings, and in her daily practice carries out project design as well as site construction supervision and Safe & Healty coordination. Her professional practice is based in Valladolid, alongside Primitivo and Ara González. Together they strive to build high quality architecture in four distinct fields: educational, sanitary, office spaces and residential projects. The common denominator, however, is to build flexible and resilient buildings, linked to the place and the people that inhabit them.

Together they have won the first prize in competitions such as the Salem City Hall in Germany (Castilla y León Architecture Prize and Finalist in the BEAU 2021), the "Brick Pavilion in Two Stages" in Alcalá de Henares (COAM Award), the School of Arts in Valladolid (FAD award Selected 2023) or Martorell Courthouse, among others; as well as private projects such as Casa de la Sevillana (Selected in the BEAU 2023, COAM Emerging Award 2023). They have been invited to present their work at several Universities including Zaragoza University or ETSA Madrid.

### Office Hours

Office hours will be on request. Please contact at:

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## SUBJECT DESCRIPTION

Construction Systems 3 will complement the learnings from earlier modules. In this subject, focus is placed on the existing constructions, as well as in different strategies and methodologies for understanding, assessing, reusing and upgrading existing constructions.

Along the course, building construction will be studied through its different elements with a special focus in the envelope of the building and its façades. Simultaneously, it will be implemented the understanding of the impact of factors such as sustainability, regulations or cost, as part of the constructive design process.

The study will begin with theoretical aspects and it will include the analysis of case studies of interventions on existing constructions. In parallel students will explore the detailing of systems and the integration of building parts/components into a coherent and coordinated whole with a personal assignmet, where to understand the importance of construction to define Architecture.

## LEARNING OBJECTIVES

??(per Ministerial Decree EDU/2075/2010, 29 of July; and the official accreditation request for the Bachelor in Architectural Studies, July 2015; see BOCYL, 14 March p. 10477-10481.)

?2.1-BASIC AND GENERAL OBJECTIVES?

CB1: Students have demonstrated knowledge and an understanding of a given area of study, building upon the foundation of secondary education, supported by advanced texts, and including aspects that engage the latest advances in their area of study.
?CB2: Students know how to apply their knowledge professionally to their work or vocation and possess the competencies that are often demonstrated through elaboration and defense of arguments and the resolution of problems within their area of study.
?CB3: Students can gather and interpret relevant facts (usually within their area of study) in order to make judgments that include reflection on relevant social, scientific, and ethical topics.
?CB4: Students can transmit information, ideas, problems, and solutions to both specialized and non-specialized audiences.
?CB5: Students have developed the necessary learning skills to continue their studies with a high degree of autonomy.
?CG4: An understanding of the fundamental issues in structural design, construction, and engineering as related to building projects, as well as the techniques used to address these issues.
?CG5: Knowledge of the issues related to building physics, technologies, and programmatic uses, in order to create buildings that provide internal comfort and protection from the elements.
?CG6: Knowledge of the industries, organizations, regulations, and procedures needed in order to transform projects into buildings, and to integrate drawings into the planning process.?

2.2-SPECIFIC COMPETENCIES

Module: Technical Subject: Construction
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CE18: Capacity to develop, calculate, design, and execute interior partitions, carpentry, stairs and other finished work, and to integrate them into buildings and urban complexes (Workshop Format).
?CE19: Capacity to develop, calculate, design, and execute enclosure systems, roofs/coverings, and other structural work, and to integrate them into buildings and urban complexes (Workshop Format).
?CE26: Adequate knowledge of the physical and chemical characteristics of the production process, building pathology, and use of building materials.
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2.3-TRANSVERSE COMPETENCIES OF THE UNIVERSITY
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CT2: Ability to exercise professional behavior in accordance with constitutional principles and ethical values of the respective profession.
?CT4: Use disciplinary knowledge to analyze and evaluate current situations.
?CT5: Integrate oneself into interdisciplinary and multicultural teams to achieve common goals in a context of diversity.

## TEACHING METHODOLOGY

The course is delivered through a combination of lectures and practical exercises aimed at putting into practice key learnings. There are several short practical exercises to be carried in class, related to a previous lecture, as well as a practical exercise to be developed through the semestre. This exercise will allow students to apply the knowledge acquired related to interventions in existing buildings, in a practical real case.

| **Learning Activity** | **Weighting** | **Estimated time a student should dedicate to prepare for and participate in** |
|---|---|---|
| Lectures | 20.0 % | 30.0 hours |
| Discussions | 4.0 % | 6.0 hours |
| Exercises in class, Asynchronous sessions, Field Work | 20.0 % | 30.0 hours |
| Group work | 26.67 % | 40.0 hours |
| Individual studying | 29.33 % | 44.0 hours |
| TOTAL | 100.0 % | 150.0 hours |

## PROGRAM

## SESSIONS 1 - 2 (LIVE IN-PERSON)

**Introduction to the course.**

General overview of the contents of the course, aims and objectives. Explanation of the evaluation method and assignments.

**Working with the existing in the built environment.**

This session will approach the different ways of working with the existing in the built environment, as well as its challenges and opportunities. Additionally, the session aims to offer a comprehensive understanding of the building lifecycle. The topic of heritage conservation will be introduced, covering various approaches to preservation

## SESSIONS 3 - 4 (LIVE IN-PERSON)

**Introduction to pathologies.**

This session will introduce general concepts to help understand what constitutes a pathology, its associated risks, and strategies for intervention

**The existing: masonry and timber**

This session will address the traditional construction technologies, specifically masonry and timber construction. The discussion will center on the pathologies associated with these materials and the interventions for addressing them.

## SESSIONS 5 - 6 (LIVE IN-PERSON)

**The existing: concrete and steel**

This session focuses on the 20th century construction technologies, and specially in concrete and steel structures. The discussion will address the pathologies associated with these materials and examine methods for strengthening these structures.

## SESSIONS 7 - 8 (LIVE IN-PERSON)

**Building envelope: pitched and flat roofs. Pathologies, interventions and energy upgrades**

This session explores the pathologies affecting both pitched and flat roofs, examining their causes and pathologies within the various roof components. It also discusses the different interventions aimed at addressing these issues and explores strategies for energy upgrading roofs, considering health and and energy-saving conditions (CTE-HE and CTE-HS standards).

## SESSIONS 9 - 10 (LIVE IN-PERSON)

SITE VISIT

## SESSIONS 11 - 12 (LIVE IN-PERSON)

**Building envelope, façades. General design principles.**

These sessions will concentrate on the general design principles of façades, encompassing an understanding its functions, typologies and elements. The sessions will also approach how the building code influences their design.

## SESSIONS 13 - 14 (LIVE IN-PERSON)

**Building envelope: façade materials part 1**

Following the previous sessions, focus will be placed on how materials such as stone, clay, timber, concrete or ETICS respond to the needs of a façade and how they are applied in this use. Attention will be placed on the specific details of each material in the façade, but also on the specific encounters.

## SESSIONS 15 - 16 (LIVE IN-PERSON)

**Building envelope: façade materials part 2**

Following the session regarding the different typologies of façades, these sessions will focus on how materials such as metal, plastics or glass are used in façades. Attention will be placed on the specific details of each solutions, as well as on the definition of the specific encounters of each solution.

## SESSIONS 17 - 18 (LIVE IN-PERSON)

**Façade apertures: windows, doors**

Once there is a general understanding of façades and the different solutions, these sessions will explore various façade apertures, including their types, materials and integration within the façade address issues such us waterproofing or sealing correctly. Focus will also be placed on the detailing the different solutions to comply.

## SESSIONS 19 - 20 (LIVE IN-PERSON)

**Building envelope: Pathologies, interventions on existing façades and energy upgrades**

This session explores the pathologies affecting façades, examining their causes. It also discusses the different interventions aimed at addressing these issues and explores strategies for energy upgrading, considering health and and energy-saving conditions (CTE-HE and CTE-HS standards).

**Partitions: load-bearing walls, non-bearing partitions, mobile partitions**

This session will explore inner partitions for interventions in existing buildings. Various typologies and materials will be examined, with a particular emphasis on .

## SESSIONS 21 - 22 (LIVE IN-PERSON)

**Accesibility in existing buildings.**

This session offers an overwiew of the building code CTE-SUA and the concepts of Universal Design, emphasizing the scope of its application in interventions on existing buildings. It will also focus on the incorporation in existing buildings of vertical communication elements, encompassing both stairs and elevators.

**Installations and their integration in existing buildings.**

When intervening in existing buildings, it is common to have to address their facilities by renovating, adapting or even introducing new installations in accordance with regulations. This session focuses on the integration of these facilities into existing buildings, considering the broader context of construction and compliance.

## SESSIONS 23 - 24 (LIVE IN-PERSON)

**Flooring, ceilings, finishings.**

These sessions will explore the inner finishes for interventions in existing buildings, taking into account the demands of restoration, renovation or substitution. Various typologies and materials will be examined, with a particular emphasis on functional and comfort qualities, including aspects such as acoustics, air quality or fire reaction.

## SESSIONS 25 - 26 (LIVE IN-PERSON)

**Urbanization of the plot and urban space.**

Interventions on the existing extend beyond buildings, including the urbanization of the plot or interventions in existing urban spaces. This session will examine various elements, typologies and materials will be examined, including their detailing.

## SESSIONS 27 - 28 (LIVE IN-PERSON)

**Introduction to cost estimation.**

The journey through the different elements of construction in existing buildings is completed with an approach to cost estimation. The aim is to understand the impact of costs on intervention processes in order to gain a complete understanding of construction projects.

**Quality in construction and building conservation.**

Having explored various pathologies throughout the course, this session aims to introduce the relevance of control quality during construction to prevent future pathologies. In addition it will introduce the significance of conservation, as well as the role of the maintenance plan an technical inspections (ITE) in ensuring the long-term preservation of buildings.

## SESSIONS 29 - 30 (LIVE IN-PERSON)

Final review session. Presentation and discussion of the developed projects.

## EVALUATION CRITERIA

Students will be assessed through five individual assignments, to develop in class hours, and one collaborative practical exercises that they will carry out throughout the course:

| criteria | percentage | Learning Objectives | Comments |
|---|---|---|---|
| Group Presentation | 10 % | | |
| Individual work | 30 % | | |
| Group Work | 60 % | | |

**RE-SIT / RE-TAKE POLICY**

## BIBLIOGRAPHY

### Recommended


- Ching, Francis D.K... (2014). *Building Construction Illustrated.* ISBN 1118458341 (Printed)
- H Arquitectes. *.2G 74 HARQUITECTES.* ISBN 97838633593-8 (Printed)

  Organizing Matter and The Behavior of Things
- Andrea Deplazes. *Constructing Architecture: Materials, Processes, Structures..* 5th edition. Birkhäuser Architecture.. ISBN 9783035626650 (Printed)


## BEHAVIOR RULES

Please, check the University's Code of Conduct here. The Program Director may provide further indications.

## ATTENDANCE POLICY

Please, check the University's Attendance Policy here. The Program Director may

provide further indications.

## ETHICAL POLICY

Please, check the University's Ethics Code here. The Program Director may provide further indications.