CONSTRUCTION SYSTEMS AND APPLICATIONS 2

Bachelor in Architectural Studies BAS SEP-2023 CS2-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: 1º

Category: COMPULSORY

Language: English

Professor: **RUTH VEGA CLEMENTE**

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Professor Ruth Vega holds a Ph.D. Cum Laude in Architecture from the Polytechnic University of Madrid and obtained her architectural degree from the same University. She combines her teaching, professional and research experience, all of them in the field of architecture, trying to surpass the borders of conventional architectural practices motivated by the research of new and more open working methods conceived from interdisciplinarity. Her research projects include several publications and collaborations, most notably in the field of Construction Technology and Sustainability.

In 2004 she co-founded Cuartoymitad Arquitectura, a flexible structure based in continuous exchange and collaborative work with professionals coming from multiple fields of knowledge. The work of Cuartoymitad has been exhibited at the XI Venice Biennale, at the IVAM Museum in Valencia and at the Museum of Contemporary Art in Badajoz (among others). Their designs and articles have also been published in magazines, books and catalogues related to the fields of art and architecture.

She now works in her own architectural practice Rehark Arquitectura y Diseño, based in Gipuzkoa, recently founded to offer a more local service of architecture and design projects, with a more personal and careful approach.

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SUBJECT DESCRIPTION

The course introduces a conceptual framework for the design of building assemblies. The basis of construction systems will be presented theoretically first, and afterwards, will be analysed through the dissection and drawing of case studies, in order to understand their materials and materials attributes, their detailing, their logics of manufacture and assembly, and their performance throughout their whole life cycle.

Assignments will explore the detailing of systems and the integration of building parts/components into a coherent and coordinated whole. Emphasis will be placed on the interrelationship between the technical detail and the overall building expression. For that purpose, some common activities will be carried out in coordination with Design Studio.

The students' practical training will take place both in the university's own facilities as well as in external facilities, including visits to construction sites and to the Eduardo Torroja Institute for Construction Science.

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

- 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.

?2.3-TRANSVERSE COMPETENCIES OF THE UNIVERSITY

- ?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

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	20.0 %	30.0 hours
Discussions	20.0 %	30.0 hours
Exercises in class, Asynchronous sessions, Field Work	20.0 %	30.0 hours
Group work	20.0 %	30.0 hours
Individual studying	20.0 %	30.0 hours
TOTAL	100.0 %	150.0 hours

PROGRAM

SESSIONS 1 - 2 (LIVE IN-PERSON)

Introduction

An overview of the subject content and the basic concepts, definitions and methods of analysis and instruction. Explanation of the competencies and learning outcomes that the student must acquire. General structure of the course.

Lecture: Introduction to current building code: CTE

Core Project: Introduction.

Assignment #1: Introduction.

MODULE 1. FOUNDATION SYSTEMS

SESSIONS 3 - 4 (LIVE IN-PERSON)

Lecture: Foundation systems

Physical characteristics of soil as it relates to building design and the requirements for soil testing and a geotechnical report. Planning and design considerations related to site excavation and the structural principles and methods for constructing deep and shallow foundations.

Soils. Site drainage. Foundation: Loads, Schemes, Materials, Types. Basement construction. CTE-SE.

Core Project: Introduction

Presentation and critical session.

MODULE 2. WALL SYSTEMS

SESSIONS 5 - 6 (LIVE IN-PERSON)

Lecture: Foundation systems - Case studies

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

Assignment #1: Review.

SESSIONS 7 - 8 (LIVE IN-PERSON)

Lecture: Wall systems

Core Project: Projection

Loadbearing structures of homogeneous or composite construction. Interior and exterior walls.

Wall system types. Masonry walls. Concrete walls. Ballon framing. Platform framing. Stud wall sheathing. Light-gauge steel studs. CTE-SE.

Presentation and critical session.

MODULE 3. FRAME SYSTEMS

SESSIONS 9 - 10 (LIVE IN-PERSON)

Lecture: Wall systems - Case studies

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

Assignment #1: Due.

Assignment #2: Introduction.

MODULE 4. FLOOR SYSTEMS

SESSIONS 11 - 12 (LIVE IN-PERSON)

Lecture: Frame Systems

Frame systems types. Concrete systems. Masonry systems. Steel systems. Wood systems. CTE-SE.

Core Project: Projection.

Presentation and critical session.

SESSIONS 13 - 14 (LIVE IN-PERSON)

Lecture: Frame systems - Case studies

Assignment #2: Review.

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

MODULE 5. ROOFING SYSTEMS

SESSIONS 15 - 16 (LIVE IN-PERSON)

Lecture: Floor systems.

Core Project: Projection.

Presentation and critical session.

Linear beams and joists overland with a plane of sheathing or decking: wood and steel. Homogeneous slabs of reinforced concrete.

Concrete slabs - Concrete formwork and shoring. Metal decking. Wood floor systems. CTE-SE.

SESSIONS 17 - 18 (LIVE IN-PERSON)

Lecture: Floor systems - Case studies

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

Core Project: Detail.

Assignment #2: Due.

Assignment #3: Introduction.

SESSIONS 19 - 20 (LIVE IN-PERSON)

Lecture: Roofing systems

Flat and pitched roofs. Concrete systems. Structural steel roof framing. Rafter framing. CTE-SE, CTE-HS.

Core Project: Detail.

SESSIONS 21 - 22 (LIVE IN-PERSON)

Lecture: Roofing systems - Case studies

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

Assignment #3: Review.

MODULE 6. MOISTURE AND THERMAL PROTECTION

SESSIONS 23 - 24 (LIVE IN-PERSON)

SITE VISIT

SESSIONS 25 - 26 (LIVE IN-PERSON)

Lecture: **Moisture and Thermal Protection**

Thermal insulation: Insulating materials; Insulating foofs and floors; insulating walls.

Moisture control: Vapor retarders; Ventilation.

Waterproofing: Pitched roofs; Flat roofs; Flashing. CTE-HS.

Core Project: Detail.

SESSIONS 27 - 28 (LIVE IN-PERSON)

Lecture: Moisture and Thermal Protection - Case Studies

Presentation and discussion on several case studies, focusing on the analysis of the topic of the module.

Core Project: Model.

FINAL PRESENTATION

SESSIONS 29 - 30 (LIVE IN-PERSON)

Final Review

EVALUATION CRITERIA

Assignments for this course will include 3 (short) assignments and 1 project. Coursework will focus on built case studies and will include both analytical and design exercises corresponding with content taught in class. Additionally, weekly case studies will be discussed. Student groups will be assigned with presenting each case study and leading a discussion in which all attending students are expected to participate. The course will culminate in several individual and group deliverables including drawings, physical models and prototypes, as well as a final review.

ASSESSMENT TOOLS

According to the University's concept of comprehensive education, the assessment will consider not only the student's level of knowledge, but also the perception of those general or particular skills for each area.

The instructor will use the following assessment models or a combination thereof:

Assignments: The students will complete all the assignments proposed during the course. Failure to complete any one of them without a justifiable cause will result in the failure of the course. The final deadlines for these assignments are non-negotiable. This can only be postponed due to extraordinary circumstances which must be properly justified. Non-justified delays will imply the dismissal of the given assignments as evaluation materials, resulting in an assignment score of 0.0.

Presentation: Individual and group presentations of practical work and research.

Participation: Assessment of student's active participation in their own learning process and in the practical workshop.

In order to give the students an insight into their level of fulfilment of the course requirements, a provisional grade will be assigned individually by the instructor upon reaching the end of the 15th session. This grade will be used for orientation purposes only, and will not necessarily be related with the final course grade.

Final Exam: Due to the specific organization of the course (continuous evaluation), a final exam does not provide enough information regarding the fulfilment of the course requirements in those students whose work has not been positively evaluated.

For this reason, those students with a course score between 4.0 and 4.9 will be given the opportunity to improve their coursework. The instructor will determine individually whether the student should improve an assignment handed in during the course or work on a new assignment.

This coursework improvement will be handed in on the day of the final exam. If the result of this improvement, combined with the existing coursework, is satisfactory, the student will pass the subject.

The same procedure will be followed for the students interested in improving his/her overall grade.

criteria	percentage	Learning Objectives	Comments
Individual Presentation	15 %		
Individual assignment	35 %		
Group assignment	40 %		
Class Participation	10 %		

RE-SIT / RE-TAKE POLICY

GRADING AND ATTENDANCE NOTES:

1. Students have access to a total of four enrolments, in two consecutive academic years.

2. Students must attend at least 70% of all class sessions. Students who do not meet this minimum percentage automatically fail both first and second enrolments, and pass directly to the third enrolment. *Within the new Liquid Learning environment this policy remains the same, considering equally synchronous and asynchronous sessions. The attendance to asynchronous sessions will be specifically determined by each activity produced in that particular format and it will be explained for each specific session.*

It is highly recommended that students who are in Madrid/Segovia attend the synchronous sessions on Campus. It is at the student's discretion to attend classes on campus or remotely. It is very important that students remain consistent in their decision of on campus or remote learning, so that the professor and students benefit from the possibility to plan activities in advance, knowing which students will be available in each type of session. Whether a student decides to follow their classes either on campus or remotely, they must commit to that mode, except for exceptional circumstances in which the change is for justified reasons. The behavior of the students during the sessions must comply with IE University's standards on education, respect for peers and professors, and commitment to joint learning. Students who connect remotely must keep their cameras on, and they must demonstrate the courtesy and online respect necessary in the digital environment.

3. Grading of students in the extraordinary enrolments will follow the following guidelines: Students that have failed the subject in first enrolment pass to the second enrolment, except those who do not meet the minimum attendance percentage, and that therefore pass directly to the third enrolment.

4. The maximum grade that a student may achieve in second enrolment is an 8.

BIBLIOGRAPHY

Compulsory

- Andrea Desplazes. (2022). *Constructing Architecture. Materials, Processes, Structures.* 5th edition. Birkhäuser. ISBN 9783035626650 (Printed)

Recommended

- Edward R. Ford. *The Architectural Detail.* Chronicle Books. ISBN 1568989784 (Digital)
- Madan Mehta, Walter Scarborough, Diane Armpriest. *Building Construction Illustrated.* Pearson/Prentice Hall. ISBN 0130494216 (Digital)
- Edward Allen, Joseph Iano. *Fundamentals of Building Construction: Materials and Methods.* John Wiley & Sons,. ISBN 1118174194 (Digital)
- Cecil Balmond with Jannuzzi Smith. *Informal.* Preste. ISBN 3791324004 (Digital)

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.