Universidad de Alcalá

COURSE GUIDE

COURSE

Architectural Constructions III

Undergraduate Degree in the Fundamentals of Architecture and Town Planning
University of Alcalá

Academic Year 2019/2020
Year 4º– First Semester

COURSE GUIDE

Course Name:	**ARCHITECTURAL CONSTRUCTIONS III**
Course Code:	**256030**
Degree to be obtained:	Undergraduate Degree in the Fundamentals of Architecture and Town Planning
Department and Knowledge Area:	ARCHITECTURE Department. Architectural Construction Field
Nature of Course:	Mandatory
ECTS Credits:	6 ECTS
Academic Year and Semester:	Year 4 / 1st Semester
Faculty:	Esperanza González Redondo. Ana Rodríguez García.
Tutorial Timetable:	1st Semester: Wednesdays, Thursdays, Fridays: 08:30-09:00 Wednesdays and Fridays: 13:00-15:30 2nd Semester: Thursdays: 8.30-11.00/13.00-14.00 Fridays: 9.00-11.00/13.00-14.00
Language of Instruction:	Spanish / English

1. INTRODUCTION

Architectural Constructions III in 4th year, together with Construction Workshop in 5th year, make up the module ***Construction Analysis, Pathology and Intervention Techniques.*** Given the wide range of topics to be covered on this course, we expect students to start with construction analysis and the evaluation of building heritage, as part of the knowledge and analysis of the possible damage that a building can suffer. Students must be able to analyse the cause of the damage in each case, this being a pre-design step in the restoration process. These intervention techniques will be developed in the Construction Workshop course in 5th year.

Building Pathology is the science of studying constructional defects that appear in a building (or in one of its sections) after it has been built. Nowadays, the conservation and restoration of buildings make up an essential part of the professional architect´s job. This course aims to give students the necessary knowledge to practise their profession in fields related to the restoration and refurbishment of buildings, pathological analysis, technical inspection, conservation and maintenance, and the evaluation of building heritage. The learning process for the different pathological processes aims to achieve an accurate diagnosis that will allow us to understand, as accurately as possible, the combination of causes that have affected the construction in question. This course will be taught both through the development of theoretical classroom discussion, as well as practical work.

Prerequisites and Recommendations

In order to be able to adequately tackle the different aspects of this course, students must have sufficient knowledge of construction materials, construction processes and structural system analysis, as well as being able to suitably represent the graphic aspects of each topic. It is recommended that students have passed the following courses: Construction Materials, Introduction to Construction, Construction I, Construction II, Structures I.

2. LEARNING OUTCOMES

Specific Learning Outcomes

1. Structural analysis of buildings with visible damage (generally more than 100 years old). Master different building construction systems and be able to represent them graphically, from more general scales of 1:100/1:200 to scales that convey more structural detail.
2. Identify the pathological processes of each material and structural system and represent them graphically.
3. Analyse different pathological processes and their cause and effect relationship based on collected data.
4. Quantify the degree of deterioration of a building prior to intervention. Evaluate the scope of the damages.
5. Deliver a Diagnostic that will determine the causes that triggered the pathological processes. Create a technical report determining the origin of the damages, prior to intervention. The topic of intervention will be developed in the Construction Workshop course in 5th year.

3. COURSE CONTENT

MODULE I. STRUCTURAL ANALYSIS OF BUILDINGS WITH VISIBLE DAMAGE

1. Introduction to structural analysis and structural pathology

2. Building deterioration. Construction and the construction environment. Introduction to pathological processes. Movement of buildings. Data collection, analysis and diagnosis.

3. Maintenance and conservation. Definitions and legal obligations. Technical inspection of buildings. Comprehensive maintenance. Technical reports.

MODULE II. PATHOLOGICAL PROCESSES: IDENTIFICATION, REPRESENTATION AND ANALYSIS. ASSESSMENT OF CAUSE AND EFFECT RELATIONSHIP

4. Pathological processes in building foundations. Building typology and behaviour. Causes of most common damages. Impact on the rest of the building.

5. Pathological processes in masonry structures
Structural pathology. Mechanical requirements: stability, resistance and rigidity.
Structural elements: walls, pillars, lintels, arches, domes and cupolas.
Structures made of earth: Degradation of the material: Pathology and diagnosis.
Structures made of brick: Brick as a structural material. Pathology and diagnosis.
Structures made of stone: Disrupting agents and mechanisms. Pathology and diagnosis.
Exterior cladding. Cement, lime and plaster: Pathology and diagnosis.

6. Pathological processes in wooden structures. Wooden structures: Carpentry and joinery. Wood-destroying agents. Inspection techniques. Pathology and diagnosis.

7. Humidity. Water and construction materials. Water and buildings. Types of humidity. Inspection techniques. Pathology and diagnosis.

8. Pathological processes in metallic structures. Steel. Structural elements: Supports, Beams and joints, Triangle structures, Braces. Inspection techniques. Pathology and diagnosis.

9. Pathological processes in reinforced concrete. Materials, manufacturing and installation. Plan, calculation and monitoring. Inspection techniques. Pathology and diagnosis.

MODULE III. WRITING A TECHNICAL REPORT. REPRESENTATION, QUANTIFICATION AND EVALUATION OF THE NEED FOR INTERVENTION

10. The technical report. Essay. Graphical representation of the damages, quantification of the damages and evaluation of the need for intervention.

Theoretical modules (3 ECTS)	Total number of classes, credits or hours
MODULE I: Structural Analysis of Buildings with Visual Damage Graphical Representation	• Weeks 1-4
MODULE II: Pathological Processes. Cause and Effect Relationship. Graphical Representation.	• Weeks 5-13
MODULE III: Technical Report: quantification and evaluation of the need for intervention.	• Week 14
Course practical-theoretical exercise	• Publication of marks

PRACTICAL MODULE OR PROGRAM (3 credits).

Students are expected to undertake an inquiry process having selected a specific historic building that displays visible damages that will allow them to: a) reflect upon the structural typology of these structures that are more than 100 years old, b) evaluate the structural heritage and the possibility of restoration, c) identify the pathological processes, d) analyse the reason for these pathological processes and their cause and effect relationship, e) evaluate and quantify the scope of the visible, calculated and represented damages and f) write up a technical report prior to future intervention. The student will begin with the knowledge of existing inspection techniques that will allow us to understand the state of the building.

The starting point of this learning process is a constructed physical reality, of which we have hardly any graphic data. Students must undertake data collection *in situ,* paying attention to historic and structural elements, from a scale of historic planimetry to detailed depictions of the most specific construction elements. This exhaustive study involves the collection and analysis of general data about a selected building and the creation of a historic, descriptive and structural memory. The second phase, which will derive from the previous research process, involves the pathological study: identification of the existing damages, graphical representation (damage mapping) and the analysis of previous pathological processes in the creation of a final diagnostic.

Hand-in Timetable:

a. First hand-in (5 weeks: 1-5)
b. Second or final hand-in (6-14 weeks)

Practical Content Modules (3ECTS)	Total number of classes, credits or hours
MODULE I: Selection of building, data collection, drafting of plans, structural analysis and graphical representation of the damages	• Weeks 1-5
MODULE II: Study of the pathological processes and determination of the cause and effect relationship	• Weeks 6-13
MODULE III: Technical report: representation, quantification and evaluation of the need for intervention	• Week 14
FINAL HAND-IN	• Publication of Grades

In-class methodological strategies: Three types of practical activities or exercises will be carried out over the course of the semester.

1. Short, individual, in-class practical activities, on each topic, to be undertaken in a short space of time, in the class, including the exchange of opinions and debate.
2. Individual practical activities over a longer length of time, which do not take place in the classroom, including specific case analyses: pathological data sheets.
3. Practical activity to be undertaken as a group over the course of the semester. The group will carry out all of the outlined methods on a historic building, to be chosen by each group, within a designated zone, within which obvious pathological processes can be observed.

4. TEACHING-LEARNING METHODS. - FORMATIVE ACTIVITIES

4.1. Distribution of credits (specify in hours)

Number of contact hours: (6 ECTS: 50 hours)	• In-class theoretical content module (3 credits). • Practical program (3 credits).
Number of student self-study hours: (100 hours)	• Practical group task: selection of building, data collection, graphical representation, structural analysis and diagnosis • Information search and individual practices • Study hours. Exam preparation
Total de horas	• 150 hours

4.2. Methodological Strategies, Materials and Teaching Resources

Encourage building interpretation, reflection, understanding and investigation of the different pathological processes, to not only ´look´, but to ´see with the eyes of an architect´. This entails asking questions about how a building was constructed (data collection), understanding it (drawing it), investigating the causes of its deterioration (analysing it) and production (final diagnosis). Evaluate the previous structural heritage prior to interventional processes.

Integrate the related theory with the understanding of the different pathological processes and the study and analysis of practical cases, connecting the course content with existing buildings that are suffering from real pathological processes and be capable of evaluating the scope of the intervention to be undertaken.

Encourage dialogue and student participation in distinct phases of learning, both through individual and group work.

5. EVALUATION: Procedures, Evaluation and Grading Criteria

Evaluation Criteria

1. Understanding of the basic ideas covered on the course
   a. Structural analysis of buildings with visible damages. Master the different building construction systems and represent them graphically, from a general scale of 1:100/1:200 to a constructional detail scale.
   b. Identify the pathological processes of each material and construction system and represent them graphically. Analyse the different pathological processes and their cause and effect relationship based on collected data.
   c. Quantify the degree of deterioration of a building, prior to intervention. Evaluate the scope of the damages. Produce a Diagnostic that determines the causes.
2. Integrate the related theory with the understanding of the different pathological processes and the study and analysis of practical cases, connecting the course content with existing buildings that are suffering from real pathological processes and be capable of evaluating the scope of the intervention to be undertaken.
3. Go into detail about the analysis and understanding of practical cases, showing meticulous use of consulted bibliographic references.
4. Show correct graphical development, clarity of writing and professional care in the presentation of proposed projects.

Grading Criteria

1. In order to evaluate students´ learning processes, they may be evaluated **throughout the course** or **by continual evaluation of their learning**, through the evaluation of the practical elements of the course, both the individual and group work, together with an exam taken before the end of the class timetable. Obtaining a minimum of 5 in the group project is an essential requirement. The course grade of each student will be calculated as follows:
   Group course project: 50% (made up of 2 exercises, each worth 25%)
   Individual exercises: 10%
   Individual practical theoretical exercise: 40%

Those students who do not complete these course exercises for whatever reason, or who refuse the continual evaluation process, will present themselves at the corresponding final course evaluation, the dates of which are shown on the official exam timetable for the different exam sessions. This will consist of the completion of theoretical exercises (40%) and practical exercises (60%: hand-in of the individual practical course assignment 30%, practical exam 30%). In order to pass the subject, students must obtain a minimum grade of 4.0.

Evaluation Procedures

Ordinary round of examinations: continual evaluation for those students following the course and who hand in the proposed exercises. Final evaluation for those students who justify the fact that they are not able to do this.

Resit examinations (July): those students who have not completed the ordinary round of examinations. The evaluation conditions are the same as the final evaluation of the ordinary examinations.

6. BIBLIOGRAPHY

Basic Bibliography

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8. Collado López, Luis. Ruinas en construcciones antiguas.
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Supplementary Bibliography

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2. Pardo Suárez, J. A. Peritaciones arquitectónicas, 25 casos prácticos. 2013.
3. Castellano González, I. Inspección técnica de edificios. Monografías de la construcción. 2007.
4. Orozco Sánchez, Teresa. Experto en inspección técnica de edificios. 2014.
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Supplementary Bibliography (Practical groups in English)

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