Course guides
310736 - 310736 - Conservation and Maintenance

Unit in charge: Barcelona School of Building Construction
Teaching unit: 753 - TA - Department of Architectural Technology.
Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2019). (Compulsory subject).
Academic year: 2021  ECTS Credits: 4.5  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Gibert Armengol, Vicente
Others: Gibert Armengol, Vicente  Royano García, Verónica

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. FE-11 Ability to write manuals and maintenance plans and manage its implementation in the building.

Transversal:
2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student should be able to:
- Understand and analyze the life cycle of the construction elements and subsystems which form the buildings.
- Identify and understand the legislation related with the maintenance field.
- Analyze and deduce/distinguish the most suitable intervention types for the preservation of the new property heritage from the design/project phases and the built.
- Develop use manuals, plan maintenance plans and manage its implementation in a building.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>18,0</td>
<td>16.00</td>
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<tr>
<td>Hours large group</td>
<td>27,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>67,5</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 112.5 h
## CONTENTS

### UNIT 1: INTRODUCTION

**Description:**
This unit works on:
- Introduction to conservation and maintenance: discussion on the building process; global vision of conservation and maintenance; conservation concept; maintenance concept; building aging process; legislative framework; opportunities in the sector.
- Classification and Identification of Buildings: main uses of a building and the importance of spaces; Structuring the information of a building; Fragmentation and organization of spaces.

**Specific objectives:**
- Be aware of the need for conservation and maintenance in buildings and assess the benefits of planning.
- Identify and interpret legislation related to the areas of conservation and maintenance.
- Classify the spaces of a building according to its using.
- Identify, analyze and deduce/distinguish the more adequate typologies of intervention for the patrimonial real state conservation of new construction, from phases of design/project, to the construction.

**Related activities:**
- Theoretical classes.
- Evaluation 1. Individual partial test of continuous evaluation (units 1 and 2).
- Evaluation 2. Individual final test of continuous evaluation (units 1, 2 and 3).
- Practice 1. Test in groups about the recognition, classification and description of the building.

**Related competencies:**
- 02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

**Full-or-part-time:** 25h 40m
- Theory classes: 6h
- Practical classes: 3h
- Self study: 16h 40m
UNIT 2: CONSERVATION

Description:
This unit works on:
· Conservation Strategies: introduction to building conservation; CTE contributions to conservation; application of sustainability criteria.
· Study of the Life Cycle of the building: stages of the life cycle; Life cycle cost concepts, lifespan and substitutions; Methodology to estimate the useful life (ESL) and the reference values (RSL); Definition and application of modifying factors.
· Product Availability Building: concepts of durability, reliability, maintainability and availability; Identification of major degradation agents; Concept of failure and analysis of its consequences (fault); Evolution of the failure rate over time.

Specific objectives:
Be aware of the need for the conservation of buildings.
Identify the critical elements of a building from the point of view of durability and reliability.
Identify the threats that favor the degradation of buildings.
Interpret and analyze the life cycle of the elements and the different construction subsystems that make up the buildings.
Calculate the estimated useful life of the elements that make up a building and the number of times they must be replaced over time.

Related activities:
Theoretical classes.
Evaluation 1. Individual partial test of continuous evaluation (units 1 and 2).
Evaluation 2. Individual final test of continuous evaluation (units 1,2 and 3).
Practice 2. Test in groups about the estimation of the useful life of the constructive elements that make up the buildings.

Related competencies:
02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Full-or-part-time: 43h
Theory classes: 12h
Practical classes: 6h
Self study : 25h
UNIT 3: MAINTENANCE

Description:
This unit works on:
· Maintenance Strategies: introduction to the maintenance of buildings, types and activities; Contributions of the CTE to the maintenance; Application of sustainability criteria.
· Design of the Maintenance Plan: concepts of the Building Book and Maintenance Plan; Structure of the Book of the Building; Documents for Use and Maintenance; Development of the Maintenance Plan and tools for its development.
· Maintenance Management: Introduction to Information Systems; Concept of CMMS and modular structure; Operational management and supervision of the maintenance service; Background data; Examples of CMMS and other management tools; BIM integration; Management models.

Specific objectives:
Identify the types of maintenance applicable to the building and its related activities. Develop manuals of use, programme maintenance plans and manage its implantation in a building. Create and evaluate work orders in monitoring a maintenance plan.

Related activities:
Theoretical classes.
Evaluation 2. Individual final test of continuous evaluation (units 1,2 and 3).
Practice 3. Test in groups about the Plan of Maintenance and the Book of the Building.

Related competencies:
FE-11. FE-11 Ability to write manuals and maintenance plans and manage its implementation in the building.
02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Full-or-part-time: 43h
Theory classes: 12h
Practical classes: 6h
Self study : 25h
**ACTIVITIES**

<table>
<thead>
<tr>
<th>PRACTICE 1. IDENTIFICATION OF THE BUILDING</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>The practice consists in the analysis of the cycle of life of a subsystem or constructive element that will choose the teacher, from the point of view of durability and functionality. At the beginning of the practice the wording is shown and, the development and the ending are done in the class, in groups from 3 to 5 students and in the class. Once is evaluated the practice can be discussed with the teacher, if the students want and at the hours of permanence.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
</tr>
<tr>
<td>At the end of the activity, the students must be capable of:</td>
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<tr>
<td>- Descompose a constructive subsystem, installation or element, identifying the different components that have.</td>
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<td>- Identify and value the grade of criticism of each element or piece, from the point of view of durability and functionality.</td>
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<tr>
<td><strong>Material:</strong></td>
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<tr>
<td>Wording of the practice, script of the exercise and presentation of the topic (PowerPoint - PDF) available in ATENEA.</td>
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<tr>
<td><strong>Delivery:</strong></td>
</tr>
<tr>
<td>Resolution of the exercise by the group of students. The practice represents a part of the continuous evaluation (10% of the final mark).</td>
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<tr>
<td><strong>Related competencies:</strong></td>
</tr>
<tr>
<td>02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.</td>
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<tr>
<td><strong>Full-or-part-time:</strong> 3h</td>
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<td>Practical classes: 3h</td>
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<tr>
<th>PRACTICE 2. DURABILITY ASPECTS IN THE BUILDING</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>The practice consists in the analysis of the cycle of life of a subsystem or constructive element that will choose the teacher. At the beginning of the practice the wording is shown and, the development and the ending are done in the class, in groups from 3 to 5 students and in the class. Once is evaluated the practice can be discussed with the teacher, if the students want and at the hours of permanence.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
</tr>
<tr>
<td>At the end of the activity, the students must be capable of:</td>
</tr>
<tr>
<td>- Analyze the cycle of life of a subsystem or constructive element.</td>
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<tr>
<td>- Apply the regulations to estimate the util life of the constructive elements and the number of substitutions for a temporal horizon.</td>
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<tr>
<td>- Interpret and value the results.</td>
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<tr>
<td><strong>Material:</strong></td>
</tr>
<tr>
<td>Wording of the practice, script of the exercise and presentation of the topic (PowerPoint - PDF) available in ATENEA.</td>
</tr>
<tr>
<td><strong>Delivery:</strong></td>
</tr>
<tr>
<td>Resolution of the exercise by the group of students. The practice represents a part of the continuous evaluation (20% of the final mark).</td>
</tr>
<tr>
<td><strong>Related competencies:</strong></td>
</tr>
<tr>
<td>02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.</td>
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<tr>
<td><strong>Full-or-part-time:</strong> 6h</td>
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<tr>
<td>Practical classes: 6h</td>
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PRACTICE 3. MAINTENANCE PLAN AND BOOK OF THE BUILDING

Description:
The practice consists in write the maintenance plan of a building, or of a part of it, in order to elaborate the Book of the Building. At the beginning of the practice the wording is shown and, the development and the finalization are done in class, in groups between 3 and 5 students and in a session destined to this effect. Once is evaluated the practice can be discussed with the teacher, if the students want and at the hours of permanence.

Specific objectives:
At the end of the activity, the students must be capable of:
- Identify the parts of the building that require maintenance.
- Connect the parts of the building with the necessary maintenance activities to guarantee an optimus durability.
- Generate calendar of maintenance, distributing the maintenance activities in an iterative way according to a frequency.
- Estimate the economic valuation of the maintenance activities planned.
- Elaborate the using and maintenance manual of the building and the flats.
- Identify the necessary documents to complete the Book of the Building.

Material:
Wording of the practice, script of the exercise and presentation of the topic (PowerPoint - PDF) available in ATENEA.

Delivery:
Resolution of the exercise by the group of students.
The practice represents a part of the continuous evaluation (20% of the final mark).

Related competencies:
FE-11. FE-11 Ability to write manuals and maintenance plans and manage its implementation in the building.
02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Full-or-part-time: 6h
Practical classes: 6h
EVALUATION 1: INDIVIDUAL PARTIAL TEST OF CONTINUOUS EVALUATION (UNITS 1 AND 2)

Description:
Individual realization in the class of the test with part of the basic concepts of the units 1 and 2, that covers the specific goals of learning of the contents treated. Correction by the teacher.

Specific objectives:
At the end of the activity, the students must be capable of:
- Identify and use correctly the terminology and applicable techniques to the conservation and the maintenance of buildings.
- Identify the legal regulations about maintenance.
- Define criteria of conservation, maintenance and reliability applicable to the real-estate environment.
- Interpret the particularities of the use typologies in buildings and associated services of its maintenance.

Material:
Wording of the test.

Delivery:
Resolution of the exercise by the student.
In case that the students asks for the revision of the test, the teacher will ease the correction to the student to compare with the evaluation criteria. The students will have 20 days, from the date of publication of the qualifications to ask for the revision of the test.
The practice represents a part of the continuous evaluation (10% of the final mark).

Related competencies:
02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Full-or-part-time: 34h
Theory classes: 3h
Self study: 31h
EVALUATION 2: INDIVIDUAL FINAL TEST OF CONTINUOUS EVALUATION (UNITS 1, 2 AND 3).

Description:
Individual realization in the class of the test with part of the basic concepts of the units 1, 2 and 3, that covers the specific goals of learning of the contents treated through all the course. Correction by the teacher.

Specific objectives:
At the end of the activity, the students must be capable of:
- All the content mentioned for the Evaluation 1.
- Elaborate Books of the Building.
- Write an manage maintenance plans.
- Analyze buildings for the optimization of its maintenance.
- Evaluate, evaluate and criticize in basis to maintenance criteria.
- Identify and interpret conflicts in projects or existence buildings from the gradient of maintenance.
- Identify typologies of maintenance and define activities.

Material:
Wording of the exam.

Delivery:
Resolution of the exercise by the student.
In case that the students asks for the revision of the the test, the teacher will ease the correction to the student to compare with the evaluation criteria. At the end of the course it will be known the date for the revision of the test following the teaching calendars and the indications of the School's Direction.
The practice represents a part of the continuous evaluation, 40% of the final mark.

Related competencies:
FE-11. FE-11 Ability to write manuals and maintenance plans and manage its implementation in the building.
02 SCS N3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Full-or-part-time: 36h 30m
Theory classes: 3h
Self study: 33h 30m

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

Complementary:
RESOURCES

Other resources:
Catalunya. Decreto 67/2015, de 5 de maig, per al foment del deure de conservació, manteniment i rehabilitació dels edificis d'habitatges, mitjançant les inspeccions tècniques i el llibre de l'edifici. Catalunya: DOGC, 7 de maig de 2015, núm. 6866.