

## Course guide

### 310736 - 310736 - Conservation and Maintenance

**Last modified:** 28/06/2023

**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:** 2023    **ECTS Credits:** 4.5    **Languages:** Catalan, Spanish

#### LECTURER

---

**Coordinating lecturer:** Gibert Armengol, Vicente

**Others:** Gibert Armengol, Vicente  
Royano García, Verónica  
Taltavull Fedelich, Antonio

#### 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

---

The directed learning hours consist of:

- Theoretical classes (large group) in which the teacher makes a presentation to introduce the general learning objectives related to the basic concepts of the subject. It also promotes the involvement of students in their learning, interspersing questions and / or practical exercises, motivating active participation in the classroom. Support material that is available to students through ATENEA is used: course programming, PDF presentations of the PowerPoint files projected in class and recommended bibliography.
- Practical classes (medium group) in which students work in groups of between 3 and 5 members by solving exercises related to the specific learning objectives of each of the contents of the subject. In these works, the transversal competence of Sustainability and Social Commitment is applied by incorporating these concepts into their subject matter.
- Autonomous learning is limited to assimilating and internalizing the topics of theoretical classes and recommended readings, as well as research and the use of computer applications related to maintenance and its management.

#### 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

| Type               | Hours | Percentage |
|--------------------|-------|------------|
| Hours large group  | 27,0  | 24.00      |
| Hours medium group | 18,0  | 16.00      |
| Self study         | 67,5  | 60.00      |

**Total learning time:** 112.5 h

## CONTENTS

### UNIT 1: 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 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.

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 partial. Individual partial test of continuous evaluation (unit 1).

Evaluation final. Individual final test of continuous evaluation (units 1 and 2).

Practices. Test in groups (unit 1).

#### 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: 68h 30m

Theory classes: 9h

Practical classes: 18h

Self study : 41h 30m

## UNIT 2: 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 final. Individual final test of continuous evaluation (units 1 and 2).

Practices. Tests in groups (unit 2).

### 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: 6h

Practical classes: 12h

Self study : 25h

## GRADING SYSTEM

The final grade is the sum of the following partial grades:

$Q_f (100\%) = QAP (20\%) + Qpr (40\%) + QAF (40\%)$

Being:

Qf: final grade (100%)

QAP: partial assessment grade (20%)

Qpr: practical sessions grade (40%)

QAF: final assessment grade (40%)

## EXAMINATION RULES.

Continuous evaluation: If any of the training activities is not carried out, it will be considered as not scored and not recoverable.

In order to be eligible for the revaluation, the student must have been evaluated for the subject as a suspense (S) with a minimum grade of 3.5. In no case will a student who has passed the subject to raise grade or who has been evaluated or evaluated as Not Presented (NP) be allowed to present for the revaluation. In addition, the maximum mark that may be obtained in the revaluation shall be approved (5).

## BIBLIOGRAPHY

---

### Basic:

- Orozco Sánchez, Teresa. Mantenimiento de edificios aplicando nuevas tecnologías. Antequera, Málaga: IC Editorial, DL 2015. ISBN 9788415994206.
- Martín Ezama, Luis. Gestión del mantenimiento en edificación. Albacete: Tatemono project, 2015. ISBN 9788494383403.
- Gibert Armengol, V. ... [et al.]. Mantenimiento de edificios 1. Barcelona: Escola Politècnica Superior d'Edificació de Barcelona, 2009.
- Boucly, François. Gestión del mantenimiento. Madrid: AENOR, 1999. ISBN 8481431605.
- González Fernández, Francisco Javier. Teoría y práctica del mantenimiento industrial avanzado . 5a edición. Madrid : Fundación Confemetal, [2015]. ISBN 9788415781356.

### Complementary:

- International Organization for Standardization. ISO 11863:2011 Buildings and building-related facilities — Functional and user requirements and performance — Tools for assessment and comparison. 1. 2011.
- Crespo Márquez, A. ; Moreu de León, P. ; Sánchez Herguedas, A. J. Ingeniería de mantenimiento: técnicas y métodos de aplicación a la fase operativa de los equipos. Madrid: AENOR, 2004. ISBN 848143390X.
- García Garrido, Santiago. Organización y gestión integral de mantenimiento : manual práctico para la implantación de sistemas de gestión avanzados de mantenimiento industrial . Madrid : Díaz de Santos, cop. 2003. ISBN 8479785489.
- Barrett, Peter. Facilities management : toward best practice . Oxford : Blackwell Science, 1995. ISBN 0632039418.

## RESOURCES

---

### Other resources:

- AENOR. UNE-EN 13306:2018 Mantenimiento. Terminología del mantenimiento. Madrid: Asociación Española de Normalización y Certificación. 2018. Dipòsit legal: M 23316:2018.
- AENOR. UNE-EN 13460:2009 Mantenimiento. Documentos para el mantenimiento. Madrid: Asociación Española de Normalización y Certificación. 2009. Dipòsit legal: M 52853:2009.
- AENOR. UNE-EN 15221-4:2012 Gestión de Inmuebles y Servicios de Soporte. Parte 4: Taxonomía, clasificación y estructuras en la gestión de inmuebles y servicios de soporte. Madrid: Asociación Española de Normalización y Certificación. 2012. Dipòsit legal: M 17865:2012.
- AENOR. UNE-EN 15331:2012 Criterios para el diseño, la gestión y el control de servicios de mantenimiento de edificios. Madrid: Asociación Española de Normalización y Certificación. 2012. Dipòsit legal: M 7399:2012.
- AENOR. UNE-EN 15978:2012 Sostenibilidad en la construcción. Evaluación del comportamiento ambiental de los edificios. Métodos de cálculo. Madrid: Asociación Española de Normalización y Certificación. 2012. Dipòsit legal: M 19528:2012.
- AENOR. UNE-EN 60706-2:2009 Mantenibilidad. Parte 2: Requisitos y estudios de mantenibilidad durante la fase de diseño y desarrollo. Madrid: Asociación Española de Normalización y Certificación. 2009. Dipòsit legal: M 24549:2009.
- AENOR. UNE-EN 15978:2012 Sostenibilidad en la construcción. Evaluación del comportamiento ambiental de los edificios. Métodos de cálculo. Madrid: Asociación Española de Normalización y Certificación. 2012. Dipòsit legal: M 19528:2012.
- ISO. ISO 15686-1:2000 Buildings and constructed assets - Service life planning - Part 1: General principles. Suiza: International Organization for Standardization.
- ISO. ISO 15686-5:2008 Buildings and constructed assets - Service life planning - Part 5: Life-cycle costing. Suiza: International Organization for Standardization.
- Espanya. Ley 38/1999, de 5 de noviembre, de Ordenación de la Edificación. Boletín Oficial del Estado. Madrid: BOE, 6 de noviembre de 1999, núm. 266, pp. 38925-38934.
- Espanya. Real Decreto 314/2006, de 17 de marzo, por el que se aprueba el Código Técnico de la Edificación. Boletín Oficial del Estado. Madrid: BOE, 28 de marzo de 2006, núm. 74, pp. 11816-11831.
- Catalunya. Decret 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.
- IDAE. Guía Técnica de Mantenimiento de Instalaciones Térmicas. Madrid: Instituto para la Diversificación y el Ahorro de la Energía. 2007. Dipòsit Legal: M-8041-2007. ISBN: 978-84-96680-06-7.
- Institut Català d'Energia. Guia metodològica per a realitzar auditories energètiques. [en línia] Barcelona: Generalitat de Catalunya. [Consulta: 18 juny 2020]. Disponible a: [http://gencat.cat/icaen/publicacions/07\\_auditories\\_energetiques.pdf](http://gencat.cat/icaen/publicacions/07_auditories_energetiques.pdf)