

Course guide

310788 - 310788 - Architectural Lighting and Acoustics

Last modified: 29/06/2026

Unit in charge: Barcelona School of Building Construction
Teaching unit: 748 - FIS - Department of Physics.

Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2019).
(Optional subject).

Academic year: 2026 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Julián Álvarez Chaia

Others: Julián Álvarez Chaia
Laureano Ramírez de la Piscina

TEACHING METHODOLOGY

The course is structured in group lessons where the theory will be presented together with exercises, as well as laboratory and field lectures with both software and acoustic and light measurement equipment.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of the subject is to train students in the most important aspects that must be taken into account when building in relation to acoustics and lighting. The training is balanced between scientific content, knowledge of the most important regulations and design criteria, as well as the application of these sciences and criteria in field practices, laboratory, and in projects through calculation and simulation with professional software. The subject prepares the student to have the tools and principles to face new problems in these two fields, giving a solid foundation in both theory and practice for designing or, alternatively, to be able to dialogue effectively with the specialists who develop these activities.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	10,0	13.33
Hours large group	20,0	26.67
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

Architectural Acoustics

Description:

Module 1. Introduction to sound. (4 h)

Basic theory of sound. Noise propagation in open spaces. Sources and types of noise. Assessment of the annoyance caused by environmental noise. Instruments for measuring sound and vibrations. Legislation on environmental noise.

Module 2 . Acoustical conditioning (8h)

Acoustic quality of interior spaces. Reverberation time (Sabine, Eyring, Arau). Acoustic absorbent materials and systems. Porous materials, resonators, combined systems. Standards for measuring acoustic parameters of rooms. Design criteria: DBHR (Basic Document on Noise Reduction) and acoustic dimensioning. Geometry and acoustics. Development of an acoustic conditioning project.

Module 3 - Sound insulation (4h)

Airborne and impact noise. Insulation of building elements. Single walls, mass law and coincidence phenomenon. Double walls and resonance frequency. Indirect transmissions. Calculation of the insulation of a building assembly.

Specific objectives:

Understanding the physical principles of acoustics and the main criteria and standards to be applied in the built environment.

Design of spaces for speech and/or music, analysis and determination of the acoustic comfort of a room. Estimation of the sound insulation of building elements. Encourage observation and analysis of built solutions.

Related activities:

Measurements of outdoor sound levels and calculations of outdoor noise

Measurement and calculation of reverberation time. Measurement and calculation of acoustic insulation.

Acoustic conditioning project for a space

Full-or-part-time: 18h

Theory classes: 12h

Practical classes: 6h

Architectural Lighting

Description:

Module 4 - Photometric magnitudes and artificial lighting(6h)

Electromagnetic radiation. Visible spectrum. Photopic and scotopic vision.

Luminous flux. Luminous intensity: spatial distribution of luminous intensity, photometric solid and photometric curves.

Illuminance. Luminance. Fundamental law of illumination (inverse square law). Lighting comfort. Glare UGR. Color temperature of luminaires. Color rendering index.

Materials: Reflection, transmission, and refraction. Specular, diffuse, and mixed reflection. Regular, diffuse, and mixed transmission.

Lab sessions with Dialux

Module 5 - Natural lighting (6h)

Solar radiation according to location , orientation, architectural data, activity data. ISO standards. Types of natural light collection and distribution. Daylight factor. Elements for collection, distribution, and protection. Elements for control and redistribution of natural light.

Lab sessions with Dialux

DBHE and energy saving

Specific objectives:

Understand the physical principles of lighting and the main ISO standards applied to interiors and exteriors. Simulation with Dialux software of a work case. Encourage observation and analysis of built solutions.

Related activities:

Dialux Project

Catalog of Luminic solutions

Full-or-part-time: 12h

Theory classes: 8h

Practical classes: 4h

GRADING SYSTEM

Assignments of Architectural Acoustics - 60%

Assignments of Architectural Lighting - 40%

BIBLIOGRAPHY

Basic:

- Egan, M. David; Olgyay, Victor. Architectural lighting . 2nd ed. Boston [etc.] : McGraw-Hill, cop. 2002. ISBN 9780070205871.
- Arau, Higiní. ABC de la acústica arquitectónica . Barcelona : CEAC, DL 1999. ISBN 978-84-329-2017-2.
- Kuttruff, Heinrich; Vorländer, Michael. Room Acoustics . Seventh edition. ©2025. ISBN 9781003389873.
- Código Técnico de la Edificación, Documento Básico HE 3 Condiciones de las instalaciones de iluminación. (2019).
- Código Técnico de la Edificación, Documento Básico HR - Protección contra el ruido. (2019).

Complementary:

- Boubekri, Mohamed. Daylighting design : planning strategies and best practice solutions . Basel : Birkhäuser , 2014. ISBN 978-3-7643-7728-1.
- Guía técnica para el aprovechamiento de la luz natural en la iluminación de edificios. [en línea]. Madrid : IDAE Madrid 2005., 2005 Disponible a: https://www.idae.es/uploads/documentos/documentos_10055_GT_aprovechamiento_luz_natural_05_ff12ae5a.pdf.

RESOURCES



Other resources:

Manual DIALux Evo https://www.dial.de/fileadmin/documents/dialux/DIALux_downloads/DIALux%20evo%20manual.pdf />Tutorials para principiantes https://www.youtube.com/watch?v=07YBwuBVPso&list=PLKzUB7xP_t4_Yi3qIDWDy5oCZn1R_6z5z />
<https://www.youtube.com/user/TheDIALux/videos>