

Course file

Study cycle	BACHELOR IN CIVIL ENGINEERING		
Course	Thermal and acoustics on Buildings	Mandatory	<input checked="" type="checkbox"/>
		Optional	<input type="checkbox"/>
Course scientific area	CIVIL ENGINEERING	Category	E

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 3rd	Semester: 5th	ECTS: 5,5		Total: 149
Contact time	T: 22	TP: 45	PL:	S: OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	Title	Position
João Manuel Barrento da Costa	Mestre	Professor Adjunto

Learning objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

01-Rational and critical selection of the constitution and organization of different building elements and finishes for walls, floors, roofs and glazings, in order to ensure confort housing requirements (thermal and air quality, acoustic). Design projects according to the following technical regulations:

02 - Regulation of the characteristics of the thermal performance of buildings;

03 - Regulation on noise and Regulation of the acoustic requirements of buildings.

Syllabus

(max. 1000 characters)

CP1. FUNCTIONAL PERFORMANCES IN BUILDINGS: Analysis of the functional performances/demands of the elements that make up the buildings, particularly those of the external envelope. Selection of materials and component of the buildings.

CP2. THERMAL IN BUILDINGS: Heat transfer processes, introduction to psychrometric, natural ventilation, influence of mass and solar exposure on the thermal behavior of buildings, thermal confort, insulation materials and technologies, thermal design of buildings.

CP3. ACOUSTICS OF BUILDINGS: Sound and hearing, airborne insulation, structural insulation, room acoustics, environmental noise, Soundproofing Products Materials and technologies, regulatory verifications, acoustic

design of buildings.

Demonstration of the consistency between the syllabus and the course objectives

(max. 1000 characters)

The syllabus CP1 includes a brief presentation of the evolution , in the last fifty years, of the necessary requirements for a healthy use of the houses . Several constructive solutions for possible implementation in terms of noise levels and climate zones are introduced. The syllabus of CP2 makes an introduction to the processes of heat transfer in psychometrics and ventilation in order to allow "thermal balance", based on the applied regulations. CP3 syllabus includes general notions regarding the transmission of airborne and structural sound and introduces the acoustics of enclosed spaces, namely auditoriums and classrooms of school buildings. It also introduces the noise produced by equipments, both the ones in the existing spaces, such as air conditioning systems, lifts, and others, and those installed outdoors, such as emergency generators, and AHU (Air Handling Unit).

Teaching methodology (evaluation included)

(max. 1000 characters)

The UC is taught through Theoretical (T) and Theoretical- Practical (TP) classes with aids such as Slides, Power Point, transparencies or the traditional blackboard, allowing a great inter-action lecturer-student. The theoretical basis is always consolidated with exercises in class, and proposals for exercises to be solved by the students, either individually or in groups. In the various group works, we aim to develop teamwork and planning of the several works. All proposed work at the beginning of each semester, are compulsory, and they consist of two works at least, a project on thermal insulation and other on acoustic conditioning, to be developed in order to obtain a "building permit".

The basic supporting elements for the students are the "Textbook of Thermal and Acoustic in Buildings" and those made available on the Moodle or on the Course Unit electronic address.

Demonstration of the consistency between teaching methodology and the course learning objectives

(max. 3000 characters)

The learning objectives of this unit are achieved through a careful planning which is gradually, and always with the need for a monitoring / continuous study of the theoretical and practical exercises proposed in class.

The teaching-learning process is dynamic and, in general, several exercises and works are proposed for discussion in class.

For the introduction one or two classes are reserved and it is suggested a workgroup to be presented in class in order to discuss the proposed solutions for the different elements of buildings (walls, floors, ceilings, roofs, doors and glazing).

The syllabus CP1, is developed through lectures to introduce the concepts that will allow functional formulation of materials and components.

The CP2 syllabus is developed with the theoretical and practical concepts that will enable the students to develop the "Thermal design " according to applied regulations and codes.

CP3 is taught identical to CP2 so, being developed through lectures and theoretical practices in order to introduce the concepts that will enable the students to develop the "Acoustic design" in accordance with the regulations and codes.

Main Bibliography

(max. 1000 characters)

1. Apontamentos de Térmica e Acústica de edifícios - Atualizada pelos docentes da UC
2. MIMOSO, J. – Transmissão de calor, ITE 14, LNEC;
3. HENRIQUES, F. - Humidade em paredes, LNEC;
4. SANTOS, C.; Matias, L. - Coeficientes de transmissão térmica, ITE 50;
5. SANTOS, C.; Rodrigues, R. - Coeficientes de transmissão térmica – soluções construtivas de edifícios antigos, ITE 54;
6. RODRIGUES, A. e all - Térmica de Edifícios, Edições Orion;
7. VIEGAS, J. - Ventilação natural de edifícios de habitação;
8. NP EN 1037-1:2002 - Ventilação e evacuação dos produtos da combustão dos locais com aparelhos a gás. Partes 1 e 2.
9. Seminário "Aplicação da ventilação natural e mista em edifícios", LNEC;
10. PATRÍCIO, J. - Isolamento sonoro a sons aéreos e de percussão, ITE 45;
11. PATRÍCIO, J. – Acústica nos Edifícios, Edições Orion;
12. DOMINGUES, O. – Pavimentos e revestimentos de pavimentos, isolamento a sons de percussão, LNEC;
13. DOMINGUES, O. – Materiais e sistemas absorventes sonoros, LNEC.



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