



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                 |        |                                                                        |           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                 |        |                                                                        | 2019/20   |
| Subject (*)              | Zero-Emission Buildings and Efficiency Rehabilitation Strategies                                                                                                                                |        | Code                                                                   | 770523008 |
| Study programme          | Mestrado Universitario en Eficiencia e Aproveitamento Enerxético                                                                                                                                |        |                                                                        |           |
| Descriptors              |                                                                                                                                                                                                 |        |                                                                        |           |
| Cycle                    | Period                                                                                                                                                                                          | Year   | Type                                                                   | Credits   |
| Official Master's Degree | 1st four-month period                                                                                                                                                                           | First  | Optional                                                               | 3         |
| Language                 | Spanish                                                                                                                                                                                         |        |                                                                        |           |
| Teaching method          | Face-to-face                                                                                                                                                                                    |        |                                                                        |           |
| Prerequisites            |                                                                                                                                                                                                 |        |                                                                        |           |
| Department               | Construcións e Estruturas Arquitectónicas, Cívís e Aeronáuticas                                                                                                                                 |        |                                                                        |           |
| Coordinador              | Raya de Blas, Antonio                                                                                                                                                                           | E-mail | antonio.raya@udc.es                                                    |           |
| Lecturers                | Pintos Pena, Santiago<br>Raya de Blas, Antonio<br>Redondo Porto, Alberto                                                                                                                        | E-mail | santiago.pintos.pena@udc.es<br>antonio.raya@udc.es<br>a.redondo@udc.es |           |
| Web                      |                                                                                                                                                                                                 |        |                                                                        |           |
| General description      | This subject exposes the new European conception of buildings of almost zero emissions from the view of demand and consumption. Different singular strategies are presented in built buildings. |        |                                                                        |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A2   | Análisis e implantación de medidas de ahorro y eficiencia energética en los sectores industrial, terciario y residencial.                                          |
| B6   | Buscar y seleccionar alternativas considerando las mejores soluciones posibles.                                                                                    |
| B11  | Adquirir nuevos conocimientos y capacidades relacionados con el ámbito profesional del máster.                                                                     |
| B18  | Plantear y resolver problemas, interpretar un conjunto de datos y analizar los resultados obtenidos; en el ámbito de la eficiencia energética y la sostenibilidad. |
| C2   | Fomentar la sensibilidad hacia temas medioambientales.                                                                                                             |
| C5   | Adquirir la capacidad para elaborar un trabajo multidisciplinar                                                                                                    |

## Learning outcomes

| Learning outcomes                                                                                                                                                                                                                   | Study programme competences |                     |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------|------------|
| The student must know the energy demands of architectural spaces, the applicable regulations and propose solutions. You must know how to prescribe the solution, repair and maintenance according to the architectural project.     | AJ2                         | BC6<br>BC11<br>BC18 | CC2<br>CC5 |
| The student must know the energy consumption of architectural spaces, the applicable regulations and propose solutions. You must know how to prescribe the solution, repair and maintenance according to the architectural project. | AJ2                         | BC6<br>BC11<br>BC18 | CC2<br>CC5 |

## Contents

| Topic           | Sub-topic                                                                                                                                                                |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. INTRODUCTION | Historical framework energy-housing.<br>Regulatory framework<br>Basic concepts<br>Real estate context<br>Ecological footprint<br>Environmental and energy certifications |



|                                        |                                                                                                                                                                                    |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.- CLIMATE                            | Climate and construction<br>The environment and the building<br>Hygrothermal comfort<br>Climogram                                                                                  |
| 3.- PASSIVHAUS                         | Zero demand: passive and bioclimatic design<br>Design criteria of the passive architecture                                                                                         |
| 4.- ENERGY EVALUATION IN BUILDING      | Regulatory framework<br>Thermal envelope evaluation: losses and gains<br>Valuation and optimization; computer tools for calculation<br>Applied software BIM solutions<br>Practices |
| 5.- ENERGY CERTIFICATION IN BUILDING   | Regulatory framework<br>Energetic certification<br>Applied software BIM solutions<br>Practices                                                                                     |
| 6.- REHABILITATION OF ZERO DEMAND      | Strategies<br>Building solutions and architectural examples in different climates<br>Practices                                                                                     |
| 7.- REHABILITATION OF ZERO CONSUMPTION | Strategies<br>Building solutions and architectural examples in different climates<br>Practices                                                                                     |

| Planning                                                                                                                        |                        |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies           | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech                                                                                                  | A2 B6 B11 B18 C2       | 10                   | 10                            | 20          |
| Case study                                                                                                                      | B6 B11 B18 C2 C5       | 6                    | 16                            | 22          |
| Workshop                                                                                                                        | A2 B6 B11 B18 C2<br>C5 | 8                    | 24                            | 32          |
| Personalized attention                                                                                                          |                        | 1                    | 0                             | 1           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                        |                      |                               |             |

| Methodologies                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Guest lecture / keynote speech | Exhibition sessions where knowledge related to zero-emission buildings is taught: historical framing, climate, typologies, materials, regulations, conception, design, safety, assessment, prescription, conservation, injuries and repair. All this based on the demands demanded and in accordance with the architectural project<br>Providing a reference documentation that allows the student to be provided with bibliographic resources with which it is handled with comfort, it is not sought a memorístico knowledge of the contents, but an intelligent knowledge of the matter. Knowledge in which the teaching of the injury and mistakes made in different works plays a fundamental aspect, especially when it is possible to accompany them with images that, due to their didactic value, allow the student to appreciate the transcendence of the decisions made. It is assessed through an objective test and several multiple answers |
| Case study                     | In the development of the classes buildings of zero emissions of contrasted architectural quality will be exhibited in which the materialization of the architectural ideas is appreciated, their technical and documentary development, serving as a model for the development of the workshop work. It will be evaluated within the Workshop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



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|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Workshop | <p>The Workshop is a space of work and exchange designed to facilitate the confluence of the contents of the different subjects around architecture, guaranteeing the optimization of teaching resources and rationalizing student work. The Workshop aims to establish mechanisms of coordination and transversality throughout the studies, avoiding duplication and repetition in the contents, facilitating the efficient transit of the student between successive semesters, alleviating the negative impact that the dispersion of subjects studied in different semesters by large part of the students has in the required efficiency of the teaching system. The Workshop is proposed as a tool for the development and evaluation of the competences related to the architectural creation</p> <p>The realization of practices, as the basis of teaching, in which the student finds an immediate identification between the compositional ideas and its constructive materialization applying the theoretical knowledge of the master classes. Planning the constructive development of significant architectures, by the student, with the support and explanatory development of the processes in the interactive classes</p> <p>Compulsory partial deliveries will be made</p> |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Personalized attention

| Methodologies | Description                                                                                                                           |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Workshop      | The student must consult the doubts that arise to ensure a better development of the work to be presented as a result of the Workshop |

## Assessment

| Methodologies | Competencies     | Description                                                                                                                                                                                                                                                                                                                                                                              | Qualification |
|---------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Case study    | B6 B11 B18 C2 C5 | In the development of the classes will be exhibited works of contrasted architectural quality in which the materialization of architectural ideas is appreciated, its technical and documentary development, serving as a model for the development of the workshop work. They will be developed constructively by the student and their evaluation is done as a section of the Workshop | 0             |



|                                |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
|--------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Workshop                       | A2 B6 B11 B18 C2<br>C5 | <p>80% attendance of interactive sessions is required</p> <p>The evaluation of the obligatory practice of the workshop is not restricted to the contents, also, the authorship of the same is verified</p> <p>There will be no compensation between this evaluation and other qualifications of the subject</p> <p>The delivery of the case studies will be taken into account in the evaluation of this part</p> <p>It will be valued on 10 and will average with the qualification obtained as evaluation of the master classes whenever a 5.0 or more is obtained.</p> <p>For students who are attending the WORKSHOP for the first time, it will be an essential condition to have delivered all the parts of the subjects that comprise it. If this condition is not met, the qualification "NOT PRESENTED" will be obtained.</p> <p>In accordance with what is established in the memory of the Degree of Architect, a Workshop Evaluation Board will be convened, which will analyze the overall results of the same and decide, where appropriate, on specific cases of student assessment.</p> <p>If you do not pass the Workshop, you can recover at the next opportunity. The rating of NOT PRESENTED is not recoverable</p> <p>The students that do not exceed the part of this subject of CONSTRUCTION 3 integrated in the WORKSHOP 5 will have to present, in consecutive calls, again and with the opportune corrections, the works proposed in the workshop in which they participated until they were over</p> <p>This will apply in all opportunities and calls</p> <p>Students who have partial validation or come from exchange programs will have a treatment adjusted to each cas</p> | 80 |
| Guest lecture / keynote speech | A2 B6 B11 B18 C2       | <p>Attendance at the lectures is required at least 75% in order to be able to pass the subject (both on the first and on the second opportunity). Once the assistance is completed, it is preserved in subsequent calls</p> <p>The evaluation will be carried out by means of the objective test and the one of multiple answers, that determine an average as long as in the objective test one obtains, at least, 4.0 on 10,0</p> <p>It is evaluated in the face-to-face and multiple-choice tests</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20 |

## Assessment comments

After overcoming the required face-to-face, the student will present a reprint of his TFM that will have the following sections: 1.-Index, suitably paged 2.-Introduction or general approach. It raises the field of study, the causes and the objectives that are intended to be achieved. In this case it is intended to deepen the learning results of this subject: Integration, Coordination and Problematic of Facilities in Rehabilitation 3.-State of the question. Critical summary of the most significant referenced documents and their study methodology. In the case of building analysis, you must provide examples and methodologies that support the proposal for the building in question. 4.-Develop it. Exposed by epigraphs the ideas of the work and its data will be argued. The theoretical-academic foundations that underlie the work must appear. 5.- Conclusions, coherent with the objectives set out in section two 6.-Bibliography. A distinction must be made between the bibliography cited and used to carry out the work. If the article has DOI, it must be indicated (especially when referring to a web page) 7.-Annexes. Data tables, general plans, photographs, figures, support graphics or any supplementary material

## Sources of information

|               |                                                   |
|---------------|---------------------------------------------------|
| Basic         | Se aportarán en cada uno de los temas presentados |
| Complementary |                                                   |

## Recommendations

Subjects that it is recommended to have taken before



|                                                          |
|----------------------------------------------------------|
|                                                          |
| Subjects that are recommended to be taken simultaneously |
|                                                          |
| Subjects that continue the syllabus                      |
|                                                          |
| Other comments                                           |
|                                                          |

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.