

Course guide

310424 - 310424 - Energy Efficiency and Renewable Energies

Last modified: 30/01/2024

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

Degree: MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Rodríguez Cantalapiedra, Inmaculada

Others: Gutiérrez Antuñano, Miguel Ángel
Rodríguez Cantalapiedra, Inmaculada

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE3. Use the physic principles in the thermic, luminic and acoustic scope.
CE7. Manage the installations, its costs and maintenance.

Generical:

CG1. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.
CG4. Develop and/or apply ideas with originality in a context of investigation, identifying and formulating hypothesis or innovative ideas and submit them to a objectivity, coherence, and viability test.

Transversal:

06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Basic:

CB8. The students must be able to integrate knowledges and front to the complexity to formulate opinions from an information which, being incomplete or limited, includes reflections about the social and ethical responsibilities linked to the application of their knowledges and opinions.
CB7. The students must be able to apply the acquired knowledges and their ability of resolution of problems in new or little known environments inside more wide environments (or multidisciplinary) related with their study field.
CB9. The students must be able to communicate their conclusions and the knowledges and ultimate reasons which support to specialised and non-specialised audiences in a clear mode and without ambiguities.
CB10. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.

TEACHING METHODOLOGY

The subject consists of 3 hours a week of face-to-face classes in a classroom (large group).

13 weeks are devoted to theoretical classes in a large group, in which the teachers present the basic concepts and materials of the subject, present examples and carry out exercises.

The rest of the weekly hours are dedicated to laboratory practices.

Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of evaluation and directed learning activities and bibliography.

LEARNING OBJECTIVES OF THE SUBJECT

- Acquisition of knowledge about low energy consumption in the context of global warming.
- Acquisition of knowledge about design techniques and principles in energy efficiency in buildings
- Acquisition of knowledge on the implementation of renewable energy systems in buildings.
- Development of practical skills that allow an adequate use of simulation programs to properly evaluate the best solutions.
- Development of practical skills to plan an energy rehabilitation and evaluate the most appropriate option based on the initial objectives.
- Development of practical skills for the economic evaluation of the energy rehabilitation projects of a building, identifying and solving problems derived from improper design or use.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	72.00
Hours small group	5,0	4.00
Guided activities	10,0	8.00
Hours medium group	5,0	4.00
Hours large group	15,0	12.00

Total learning time: 125 h

CONTENTS

1. Energy, environment and climate

Description:

Climatic factors. Eco-friendly design. Constructions and environment. Energy in buildings. Energetic resources

Specific objectives:

Sun Design principles

Related activities:

Sustainable analysis design software.

Related competencies :

CG4. Develop and/or apply ideas with originality in a context of investigation, identifying and formulating hypothesis or innovative ideas and submit them to a objectivity, coherence, and viability test.

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CB10. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.

Full-or-part-time: 6h

Theory classes: 1h

Practical classes: 5h

2. Energy Efficiency in buildings design

Description:

Energy balance in buildings. Thermal envelope and energy demand. CTE DB HE0 and DB HE1. Programs for the Energy Certification of new buildings and existing buildings.

Related activities:

Analysis using the Ce3x program of the energy efficiency of a building

Related competencies :

CG1. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.

CE7. Manage the installations, its costs and maintenance.

CE3. Use the physic principles in the thermic, luminic and acoustic scope.

CB10. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.

CB8. The students must be able to integrate knowledges and front to the complexity to formulate opinions from an information which, being incomplete or limited, includes reflections about the social and ethical responsibilities linked to the application of their knowledges and opinions.

Full-or-part-time: 6h

Practical classes: 6h

3. Renewable energy

Description:

Active solar thermal systems. Domestic hot water: Calculation according to CTE. Wind power. Geothermal energy. Photovoltaic energy. Integration of photovoltaic systems in buildings.

Related activities:

Final project of the subject

Related competencies :

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Full-or-part-time: 13h

Theory classes: 5h

Laboratory classes: 8h

GRADING SYSTEM

EV1: Written test of knowledge control 30%

EV2: Exercises to be done in class or at home 20%

EV3: Group work, presented in writing or orally based on previously specified criteria and guidelines 40%

EV4: Reports of previously announced visits (Fabrica del sol, District clima, absorption machines) 10%

BIBLIOGRAPHY

Basic:

- SUNYER ROCA, J.. Petjada ecològica UPC Manresa. Universitat Politècnica de Catalunya. TFE [on line]. Barcelona : Universitat Politècnica de Catalunya., 2016 [Consultation: 23/01/2024]. Available on: <http://hdl.handle.net/2117/101642>.

- Bosch González, Montse; Ruiz Martorell, Galdric; López Plazas, Fabián; Rodríguez Cantalapiedra, Inma. Avaluació energètica d'edificis [Recurs electrònic] : l'experiència de la UPC, una metodologia d'anàlisi [on line]. Barcelona : Edicions UPC, 2006 [Consultation: 19/07/2020]. Available on: <http://hdl.handle.net/2099.3/36741>. ISBN 9788498800234.



RESOURCES

Hyperlink:

- Proyecto Tareb. <https://www.new-learn.info/packages/tareb/es/index.html>- Curso de energía solar térmica. http://icaen.gencat.cat/web/.content/06_relacions_institucionals_i_comunicacio/04_publicacions/quadern_practic/arxiu/03_energia_solar_termica.pdf- Código Técnico de la Edificación. <https://www.codigotecnico.org/>- Curso energía solar fotovoltaica. http://icaen.gencat.cat/web/.content/06_relacions_institucionals_i_comunicacio/04_publicacions/quadern_practic/arxiu/04_energia_solar_fotovoltaica.pdf