Course guide
310707 - 310707 - Installations Physics and Energy Efficiency

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). (Compulsory subject).
Academic year: 2022 ECTS Credits: 4.5 Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Carlota E. Auguet Sangrá
Others: Inmaculada Rodríguez
Miguel Ángel Gutiérrez
Óscar Lorente Espín
M. Luisa Perea Ibáñez
Oliver Carrillo Parramón

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. FE-4 Knowledge of the materials and traditional or prefabricated construction systems used in construction, their varieties and physical and mechanical features which define them.
4. FB-5 Knowledge of the theoretical basis and the basic principles applied to the construction, of the fluid mechanics, the hydraulics, the electricity and electromagnetism, the calorimetry and thermal comfort, and the acoustics.

Transversal:
5. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
6. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
7. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
8. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.
9. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

TEACHING METHODOLOGY
- Theory master classes
- Sessions of problems made by the professor
- Sessions of problems made by the students and authorized by the professor

LEARNING OBJECTIVES OF THE SUBJECT
The student must be able to acquire and to apply the theoretical bases of the fluid mechanics and transport of energy in building. Also they have to be able to understand and to apply the concepts and methods of hygrothermy and the heat flow to the conditioning and isolation in building. Finally, they have to be able to do analysis and evaluations of the energetic requirements of a building that allows determine its energetic efficiency. Short introduction to the electricity.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>22,5</td>
<td>19.98</td>
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<tr>
<td>Self study</td>
<td>67,5</td>
<td>59.95</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>6,8</td>
<td>6.04</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,8</td>
<td>14.03</td>
</tr>
</tbody>
</table>

**Total learning time:** 112.6 h

CONTENTS

**Fluid dynamics**

**Description:**

**Specific objectives:**
Understand the energy balance of pressures.
Acquire and apply the theoretical foundations and basic principles of fluid mechanics in buildings

**Related activities:**
Problem resolution

**Full-or-part-time:** 8h
Theory classes: 3h 30m
Practical classes: 4h 30m

**Temperature and heat**

**Description:**

**Specific objectives:**
Understand the effects of thermal expansion on the stresses that occur.

**Related activities:**
Resolution of exercises on the subject.

**Full-or-part-time:** 5h
Theory classes: 2h
Practical classes: 3h
Heat spread

**Description:**
Heat transmission by convection.

**Specific objectives:**
Acquire and apply the theoretical foundations and basic principles of energy transport in buildings.
Interpret and apply the concepts and methods of heat transmission to conditioning and insulation in buildings.

**Related activities:**
Solve exercises and problems posed in class

**Full-or-part-time:** 11h
Theory classes: 5h
Practical classes: 6h

Fundamentals of hygrometry

**Description:**

**Specific objectives:**
Interpret and apply the concepts and methods of hygrothermia.
Know how to identify pathologies related to humidity in buildings.

**Related activities:**
Solve exercises proposed in class

**Full-or-part-time:** 6h
Theory classes: 3h
Practical classes: 3h

Energy demand

**Description:**

**Specific objectives:**
Carry out analyzes and evaluations of the building’s energy demand to determine its energy efficiency, using current computer tools.

**Related activities:**
Realization of practical exercises in class.

**Full-or-part-time:** 12h
Theory classes: 6h
Practical classes: 6h
**Introduction to the electricity**

**Description:**

**Full-or-part-time:** 3h
Theory classes: 3h

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**ACTIVITIES**

**First midterm exam**

**Description:**
Evaluation that counts 20%

**Full-or-part-time:** 2h
Theory classes: 2h

**Second midterm exam**

**Description:**
Second part of the subject, counts 20%

**Full-or-part-time:** 2h
Theory classes: 2h

**Final exam**

**Description:**
Final exam, 50% of final qualification

**Full-or-part-time:** 2h
Theory classes: 2h

**C2.EN.1.X Ce3x work**

**Description:**
At the end of the subject of Energy demand it will be a session out of time schedule to explain the Ce3x program. This corresponds to the tranversal competence C2.EN.1.X

**Specific objectives:**
To know the going on of the Ce3x and its apply.

**Material:**
Personal computer.

**Full-or-part-time:** 2h
Theory classes: 2h
GRADING SYSTEM

There will be a homework with the Ce3x program (T) (10%), an exam with the first part of contents (PE1) (20%), an exam with the second part of contents (PE2) (20%) and a final exam including all the contents. (ExFin) (50%)

According to Normativa Académica de Estudios de Grado y Máster de la UPC and EPSEB, the final evaluation of the subject will be done as it is described.

The final grade of the subject will be the larger between these two grades:

a) m: Arithmetic mean of the pertinent marks of T, PE1, PE2 and ExFin.

\[
m = 0.10 \cdot t + 0.25 \cdot p + 0.15 \cdot s + 0.5 \cdot f
\]

where

t = T mark
p = PE1 mark
s = PE2 mark
f = ExFin final exam mark.

b) f: Final exam mark.

Reappraisal

The student who has failed the subject with a numerical mark between 3.5 and 4.9 will have the opportunity to do an unique reappraisal exam, which will include all the contents of the subject and will be done in a settled term. If the student pass the exam, his final mark of the subject will be 5.0. It is compulsory to have done the final examen and the Ce3x exercise to be able to do the reappraisal exam.

The student won't be able to do this reappraisal exam if:

i) The student has already passed the subject.
ii) The student's final mark is less than 3.5 (including NP).

EXAMINATION RULES.

- The teacher will provide the students with the formulary at the time of the exam.
- It is not allowed to enter the room once the exam has started.
- It is not allowed to have a phone during the exam.

BIBLIOGRAPHY

Basic:

RESOURCES

Other resources:
Audiovisual Material

- DVD Humitats per capilaritat