310011 - Construction Materials II

Coordinating unit: 310 - EPSEB - Barcelona School of Building Construction
Teaching unit: 753 - TA - Department of Architectural Technology
Academic year: 2017
Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2015). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN BUILDING CONSTRUCTION SCIENCE AND TECHNOLOGY (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 9
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: JOAQUIN MONTON LECUMBERRI
Others: RICARDO JOSE GOMEZ VAL - LAIA HAURIE IBARRA - JOAN LEIVA NAVARRO - ANTONI PIDEMUNT MOLI - JUDITH RAMÍREZ CASAS - EDGAR SEGUÉS AGUASCA

Degree competences to which the subject contributes

Specific:
1. FB-4 Knowledge of the chemical features of the materials used in construction, its fabrication processes, the methodology of the trials for determining its features, its geologic origin, the environmental impact, the recycling and the residues management.
2. 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.
3. FE-5 Ability to adapt the construction materials to the typology and use of the building, manage and run the receipt and quality control of the materials, its implementation in the construction, the control of execution of the construction units and the realization of trials and final tests.
4. FE-12 Knowledge of the evaluation of the environmental impact of the construction and demolition, the sustainability in the construction, and the procedures and techniques to evaluate the energetic efficiency of the buildings.

Transversal:
5. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world's situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.
6. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
7. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
8. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
9. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
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Teaching methodology

In this subject the individual work and teamwork will be promoted.
The in-person classes will be distributed in this way:
- Thoretical classes, where the professor will explain the contents of the subject and will present practical cases to motivate the students.
- Practical classes in the laboratory
- Guided activities.

Learning objectives of the subject

At the end of the course, students should be able to:

- Describe the characteristics and properties of the different materials.
- Identify and use the current regulations of the building materials.
- Carry out a correct and backed up selection of the materials in the construction field.
- Apply the sustainable and environmental criteria related to the different life cycle phases.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 225h</th>
<th>Hours large group: 54h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 13h 30m</td>
<td>6.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 22h 30m</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 135h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# 310011 - Construction Materials II

## Content

<table>
<thead>
<tr>
<th>C1 General concepts</th>
<th>Learning time: 13h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study : 7h</td>
</tr>
</tbody>
</table>

**Description:**
In this content, the students work:
- General concepts of physics and chemistry of the materials explained in this course.
- Informational abilities.

**Related activities:**
- Theoretical and exercises classes related with concepts of physics and chemistry.
- Informational abilities class oriented to the search of information for the fulfillment of scientific-technical works.

<table>
<thead>
<tr>
<th>C2 Ceramics</th>
<th>Learning time: 42h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 24h</td>
</tr>
</tbody>
</table>

**Description:**
In this content the students work:
- Raw materials and extraction processes of the ceramic products.
- Features and physico-chemical and mechanical properties of the ceramics.
- Regulations, trials and quality control of the ceramics used in building.
- Ecological and environmental aspects of the ceramics.

**Related activities:**
- Theoretical classes.
- Laboratory.
- Attendance to a lecture o technical visit.
- Control test.
C3 Glass

**Learning time:** 42h
- Theory classes: 9h
- Practical classes: 1h
- Laboratory classes: 3h
- Guided activities: 5h
- Self study: 24h

**Description:**
In this content the students work:
- Raw materials and extraction processes of the different glasses.
- Feature and phisico-chemical and mechanical properties of the glass products.
- Regulations, trials and quality control of the glass used in building.
- Ecological and environmental aspects of the glass products.

**Related activities:**
- Theoretical classes.
- Laboratory.
- Attendance to a lecture or technical visit.
- Control test.

C4 Bituminous materials

**Learning time:** 17h
- Theory classes: 5h
- Practical classes: 1h
- Guided activities: 3h
- Self study: 8h

**Description:**
In this content the students work:
- Composition, extraction and properties of the bituminous materials.
- Implementation of these materials in building.
- Regulations and environmental aspects related with the bituminous materials.

**Related activities:**
- Theoretical class.
- Control test.
### C5 Wood

**Learning time:** 43h  
- Theory classes: 10h  
- Practical classes: 1h  
- Laboratory classes: 3h  
- Guided activities: 4h  
- Self study: 25h

**Description:**
- In this content the students work:
  - Composition and properties of the wood: Macroscopic and microscopic structure of the wood.
  - Problems and lesions of the wood in building.
  - Regulations, trials and quality control of the wood.
  - Ecological and environmental aspects of the wood.

**Related activities:**
- Theoretical class.
- Attendance to a lecture or technical visit
- Laboratory.
- Control test.

### C6 Metals

**Learning time:** 45h  
- Theory classes: 10h  
- Practical classes: 1h  
- Laboratory classes: 3h  
- Guided activities: 6h  
- Self study: 25h

**Description:**
- In this content the students work:
  - Metallic bonding.
  - Features and phisico-chemical and mechanical properties of the metals.
  - Production and configuration of the different products: metallurgy and iron and steel industry.
  - Corrosion and rusting.
  - Diagrams of phases and thermal transformations.
  - Regulations, trials and quality control of the metallic products used in building.
  - Ecological and environmental aspects of the metals.

**Related activities:**
- Theoretical classes.
- Attendance to a lecture or technical visit.
- Laboratory.
- Control test.
## C7 Plastics, composites and paints

<table>
<thead>
<tr>
<th>Learning time: 23h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Guided activities: 4h</td>
</tr>
<tr>
<td>Self study: 13h</td>
</tr>
</tbody>
</table>

### Description:
In this content the students work:
- Definition of polymer and basic concepts related: monomer, polymerization, additives...
- Classification of the different polymers: thermoplastic, thermostable, elastomer.
- Features and implementations of the different plastic families.
- Definition and basic components of a paint.
- Implementation of the paints in function of the composition.
- Compound material concept: matrix and dispersed phase.
- Implementation of the compound materials in building.
- Ecological and environmental aspects.

### Related activities:
- Theoretical classes.
- Control test.
# Planning of activities

## INFORMATIONAL SKILLS (CONTENT 1)

**Description:**
Session in charge of the EPSEB library staff. There will be shown the tools accessible to all the students for doing the research works.

**Support materials:**
Computer tools and computers of the EPSEB computer rooms.

**Specific objectives:**
- At the end of the practice the student should be able to:
  - Search information of different aspects related with the materials.
  - Distinguish between reliable and non-reliable information sources.

**Hours:** 5h  
Practical classes: 3h  
Self study: 2h

## Laboratory (ceramics)

**Description:**
Experimental work that will be done in the materials laboratory of the EPSEB.

**Support materials:**
Practice guide.

**Specific objectives:**
- At the end of the activity, the student should be able to:
  - Analyze the material properties.
  - Connect the characterization trials with the material outputs.
  - Identify the most common defects of the ceramics.

**Hours:** 4h  
Laboratory classes: 3h  
Self study: 1h

## Lecture

**Description:**
Organization of talks by leading companies in the sector and/or highly regarded professionals in the aspects related with the subject topics.

**Support materials:**
EPSEB events hall and multimedia equipment.

**Specific objectives:**
- At the end of the activity, the student should be able to:
  - Analyze the material properties.

**Hours:** 4h  
Guided activities: 2h  
Self study: 2h

**Descriptions of the assignments due and their relation to the assessment:**
The lectures will be evaluated with the formulation of questions during the exams.
**Specific objectives:**
At the end of the activity the student should be able to:
- Understand the given information.

**Laboratory (glass)**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental work that will be done in the materials laboratory of the EPSEB.</td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 1h</td>
</tr>
</tbody>
</table>

**Support materials:**
- Practice guide.

**Descriptions of the assignments due and their relation to the assessment:**
The students will deliver a report that will be evaluated.

**Specific objectives:**
At the end of the activity, the student should be able to:
- Analyze the material properties.
- Connect the characterization trials with the material outputs.
- Identify the most common imperfections of the glass.

**Control tests (all topics)**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 16h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test performed at the end of each topic.</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 10h</td>
</tr>
</tbody>
</table>

**Specific objectives:**
Follow the performance of the student during the course.

**Parcial test 1: ceramics, glass, bituminous, paints**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual exam at class for evaluating the knowledge acquired until that moment by the students.</td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

**Support materials:**
- Wordings.

**Descriptions of the assignments due and their relation to the assessment:**
Resolution of the exam.
A11 WOOD LAB PRACTICE (CONTENT 5) | Hours: 4h  
Laboratory classes: 3h  
Self study: 1h

Description:  
Experimental work that will be done in the materials laboratory of the EPSEB.

Support materials:  
Necessary materials for doing the practical phase in the lab.  
Practice guide.

Descriptions of the assignments due and their relation to the assessment:  
The students will deliver a report that will be evaluated.

Specific objectives:  
At the end of the activity, the student should be able to:  
- Analyze the material properties.  
- Connect the characterization trials with the material outputs.  
- Identify the most common imperfections of the wood.

TECHNICAL VISIT | Hours: 8h  
Guided activities: 6h  
Self study: 2h

Description:  
Technical visit to observe buildings containing the materials explained in class.

Descriptions of the assignments due and their relation to the assessment:  
The content of the visits will be considered as part of the course and will be evaluated in the tests.

Specific objectives:  
At the end of the activity, the student should be able to:  
- Understand the given information.

Laboratory (metals) | Hours: 4h  
Laboratory classes: 3h  
Self study: 1h

Description:  
Experimental work that will be done in the materials laboratory of the EPSEB.
Support materials:
Necessary materials for doing the practical phase at lab. Practices guide.

Descriptions of the assignments due and their relation to the assessment:
The students will deliver a report that will be evaluated.

Specific objectives:
At the end of the activity, the student should be able to:
. Analyze the properties of the material.
. Connect the characterization trials with the material outputs.
. Identify the corrosion and rusting processes of the metals.

Parcial exam 2: wood, metals, plastics and composites

<table>
<thead>
<tr>
<th>Hours</th>
<th>2h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes</td>
<td>2h</td>
</tr>
</tbody>
</table>

Description:
Individual exam at class for evaluating the knowledge acquired until that moment by the students.

Support materials:
Wordings

Descriptions of the assignments due and their relation to the assessment:
Resolution of the exam

Specific objectives:
At the end of the practice, the student should be able to:
. Explain the properties of the studied materials and be able to choose the most suitable.
. Understand the pathological processes of the materials and be able to prevent them.
. To value the environmental and normative aspects related with the different materials.

Qualification system

The final mark is obtained from:
Nf\text{inal} = 37,5\% \text{Np1} + 37,5\% \text{Np2} + 15\% \text{PCT} + 5\% \text{PL} + 5\% \text{VT}

Nf\text{inal}: Final mark of the subject.
Np1: Mark of the 1st exam
Np2: Mark of the 2nd exam
PCT: Tests performed at the end of each lesson
PL: Laboratory lessons
VT: Technical visits
Bibliography

Basic:


Complementary:


Tectónica. Madrid: ATC ediciones, 1996-.

Others resources:

Wood notes. Published by the building materials section.
Paint notes. Published by the building materials section
Plastic notes. Published by the building materials section